



CATALOGUE
OF
SCIENTIFIC PAPERS
1800—1900

SUBJECT INDEX

VOLUME III

PHYSICS

PART I

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ROYAL SOCIETY OF LONDON

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1800-1900

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VOLUME III

PHYSICS

PART I

GENERALITIES, HEAT, LIGHT, SOUND

CAMBRIDGE :

AT THE UNIVERSITY PRESS

1912

ARRANGED FOR A COMMITTEE OF THE ROYAL SOCIETY
UNDER THE SUPERINTENDENCE OF

HERBERT M^CLEOD, LL.D., F.R.S.

DIRECTOR OF THE CATALOGUE

with the assistance of

ALICE EVERETT, M.A., R. HARGREAVES, M.A.,
AND W. MARSHALL WATTS, D.SC.

PREFACE

IN the Preface to the Volume forming the Subject Index to the papers on Pure Mathematics for the nineteenth century, published in 1908, an outline of the history of the Royal Society's Catalogue of Scientific Papers is given; it is not necessary to repeat that account.

Volume II of the Subject Index, dealing with the papers on Mechanics, was published in 1909.

The present volume deals with the papers on Physics, as classified in the schedule of the International Catalogue of Scientific Literature. As it was found that the number of entries in this subject was too large for a single volume, the Committee decided that it should be published in two Parts, the first volume containing the entries classed under Generalities, Heat, Light and Sound, and the second those on Electricity and Magnetism. Part I contains 33344 entries referring to the papers contained in 1261 serial publications.

This order differs from that of the International Catalogue, in which Sound follows Electricity and Magnetism; the Registration Numbers are here retained, but the numbers 8990 to 9520, dealing with Sound, are interpolated between 4470 and 4900.

The Index titles were prepared in the same manner as those for Volumes I and II. Papers published from 1884 to 1900 inclusive were consulted by Referees familiar with the subjects, so that the Index titles were made from the contents of the papers and not merely from the headings. For the years from 1800 to 1883, it had been intended that the Index entries should be made from the titles in the published twelve volumes of the Catalogue arranged according to Authors' names; but it has been found necessary in a large number of cases to refer to the original papers, as the headings of the papers were not sufficiently definite to enable the Referees to classify the contents.

With the object of expediting the publication of the Physics volume, three of the Referees who assisted in the preparation of the Index titles were invited to help in sorting the slips for the Press. Mr R. Hargreaves

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undertook the section on Heat, Dr W. Marshall Watts that on Light and Miss Alice Everett that on Sound.

The subjects are arranged under the registration numbers adopted in the International Catalogue of Scientific Literature; a copy of Schedule C (Physics) of that Catalogue, as revised in 1905, is prefixed to the Index, with indication of the pages on which the titles for the different sections occur. It has occasionally been found convenient, in order to save repetition in printing, to group entries under a sub-heading which is not contained in the International Catalogue Schedule. Where this has been done the sub-heading is printed in italics. In some of these cases the words of the sub-heading are understood to exist before the entries following them, and consequently these entries commence with small letters. These minor classifications, being often made mechanically on the basis of the explicit mention of the sub-heading, are not to be taken as exhaustive; cognate entries may be found elsewhere under the same main heading. The unit of classification is thus the complete numbered heading.

At the end of the volume will be found an alphabetical index to the subdivisions under which the subject titles have been arranged; this will much facilitate reference. The index also contains references to important subjects included within some of the subdivisions but without separate headings.

The entries in the Index are arranged so that reference can be made, if necessary, to the complete titles in the Catalogue of Scientific Papers. Generally the author's name together with the date will indicate the volume in which the title of the paper may be found in full. But these clues are insufficient when the paper is anonymous, or occurs in Volume XII or in the additions to Volume VI. They are also at fault for titles marked with an asterisk showing that they belong to previous volumes; in these cases the number of the volume is given in the Index entry in small Roman numerals within brackets. The references have been made as short as possible; thus the number of only the initial page of each paper has been given; but the length of the paper may be found by reference to the Catalogue of Authors.

When an error has been found in an author's name in the Catalogue, it is corrected in the Index and a reference made to the error.

The Index contains references to some papers, of dates earlier than 1884, which were omitted in previous volumes of the Catalogue; these are indicated

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by an asterisk placed before the date. The full titles of these papers will be given in the continuation of the Catalogue of Authors.

When an author's personal name does not appear in the original heading of a paper, no attempt has been made to find the name for the Index; but this will be done for the Catalogue of Authors.

Entries on the same subject are arranged, so far as possible, in order of date irrespective of the authors' names, with the endeavour to present the subject in the historical form. This grouping of the entries, involving modifications of titles prepared by different Referees, or by the same Referee at different times, has been one of the most difficult problems in the preparation of the Index.

The abbreviations used in the Royal Society Catalogue for the names of the serials have been further shortened for the Index. As the abbreviations are not uniform in all the volumes, it will be found that the same journal may be indicated by several different abbreviations; but in each case the one selected is that which was used in the volume in which the title of the paper occurs.

In the case of serials commencing since 1883, the abbreviations adopted in the International Catalogue have been used as a guide.

The list of serials will, as in the case of Pure Mathematics, be a valuable feature of the Index. It contains the names of 1261 serials from which the entries in the Index have been taken. Each title is preceded by the abbreviation which represents the serial in the Index; the date of commencement of the serial is given, and if it is extinct the date of the last volume is added. There are appended symbols representing the names of thirty British Libraries in some of which the serials may be found; where the set is incomplete the symbol is followed by *i*. The information from which this list has been compiled was obtained, in the first instance, from published catalogues; subsequently the list was submitted to the custodians of many of the libraries, who kindly marked many serials which had not been found in the catalogues used. The thanks of the Committee for this valuable assistance are due to Mr F. Jenkinson of the Cambridge University Library, the late Mr E. W. B. Nicholson and Mr F. Madan of the Bodleian Library, the Librarian of the Radcliffe Library, the Librarian of the Cambridge Philosophical Society, Mr F. W. Clifford of the Chemical Society, to Mr R. Lloyd Praeger for obtaining information from the five Libraries in Dublin,

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Mr J. Hardy of the Royal Society of Edinburgh, Mr C. V. Crook of the Geological Museum, Mr Rupert Jones of the Geological Society, Mr J. Knight of the Royal Philosophical Society, Glasgow, Mr F. C. Nicholson of the University, Glasgow, Dr J. H. T. Tudsbery of the Institution of Civil Engineers, Dr B. Daydon Jackson, and Mr A. W. Kappel of the Linnean Society, the Librarian of the London Mathematical Society, Mr J. W. Knapman of the Pharmaceutical Society, Mr E. W. Hulme of the Patent Office Library, Mr W. H. Wesley of the Royal Astronomical Society, Mr F. Allen of the Royal Geographical Society, Mr R. W. Chambers of University College, London, Mr L. W. Fulcher of the Science Library, Science Museum, South Kensington, Dr W. N. Shaw, F.R.S., Director of the Meteorological Office, and Mr V. G. Plarr, Librarian of the Royal College of Surgeons.

Although much care has been expended in making this list as accurate as possible, it is probable that some errors will still be found, and the Director will be thankful to any one who will send corrections: portions of the list will be required for the subsequent volumes of the Index.

The following Referees have assisted at various times in the preparation of the Subject Index in Physics: Miss Alice Everett, Miss Burna Pool, Mr R. J. Dallas, Mr W. A. Davis, Mr R. Hargreaves, Dr R. A. Lehfeldt, Mr W. Lawson, Mr H. E. Schmitz, Mr J. H. Shaxby and Dr W. Marshall Watts. The Committee is indebted to them for much valuable help.

Dr W. Marshall Watts has given special assistance and supervision in the preparation of the Index titles. To him, and to Miss Bremner and the other members of the Catalogue Staff of the Royal Society, thanks are due for careful and conscientious work.

The Committee is indebted to the authorities of the British Museum, of the Natural History Museum, of the Royal College of Surgeons, of the Patent Office and of the Meteorological Office for facilities given to the type writers and revisers of the Catalogue staff in copying titles of papers from the books in the libraries, and also to the Cambridge University Library, the Chemical Society, the Geological Society, the Linnean Society, the Royal Astronomical Society, the Royal Geographical Society and the Alpine Club for the loan of books for the preparation of the Catalogue.

Besides these Libraries others have been consulted and the Committee gratefully acknowledges the assistance that has been received.

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The Committee desires to renew the record of its gratitude to the late Dr Ludwig Mond, F.R.S., for his generosity in providing funds for carrying on the work of the Catalogue, in which he took so keen an interest. Without his help it would hardly have been possible to proceed with the Catalogue in its present complete form; by his decease the members of the Committee have been deprived of a stimulating colleague who had been active in the planning of the work almost from the beginning.

The final section of the Catalogue of Scientific Papers arranged according to Authors' names, that for the period 1884 to 1900, is in active preparation. The material has now been all collected and it is hoped that the printing may soon be commenced.

The Syndics of the Cambridge University Press have undertaken the complete risk of printing and publishing, as regards both the Catalogue of Scientific Papers and the Subject Index. It will be the care of the Committee, and it is hoped of the Scientific world generally, to use their best endeavours that this public-spirited action shall not result in financial loss.

The thanks of the Committee are due to the officials of the Cambridge Press for their unfailing courtesy in the discharge of a complex task.

October, 1912.

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SUBJECT INDEX OF PHYSICS

LIST OF SERIAL PUBLICATIONS

WITH THE ABBREVIATIONS OF THEIR TITLES USED IN THE INDEX, AND LIBRARIES WHERE THE SERIALS CAN BE CONSULTED.

The date following the title of a serial indicates the year of publication of the first volume; if a second date is given it marks the termination of the serial.

The letters following the dates indicate libraries where the serials are to be found: if the serial is incomplete, the symbol of the library is followed by *i*.

B.M.	British Museum.	Linn.S.	Linnean Society.
Camb.P.S.	Cambridge Philosophical Library.	Math.S.	Mathematical Society.
Camb.U.	Cambridge University Library.	M.O.	Meteorological Office, South Kensington.
Chem.S.	Chemical Society.	N.H.M.	Natural History Museum.
Dub.N.L.I.	National Library of Ireland, Dublin.	Oxon.B.	Bodleian, Oxford.
Dub.R.C.S.	Royal College of Science, Dublin.	Oxon.B.(R.)	Deposited in Radcliffe.
Dub.R.D.S.	Royal Dublin Society.	Oxon.R.	Radcliffe, Oxford.
Dub.R.I.A.	Royal Irish Academy, Dublin.	Pharm.S.	Pharmaceutical Society, London.
Dub.T.C.	Trinity College, Dublin.	P.O.	Patent Office, London.
Edinb.R.S.	Royal Society of Edinburgh.	R.A.S.	Royal Astronomical Society.
Edinb.U.	Edinburgh University.	R.C.Surg.	Royal College of Surgeons.
Geol.M.	Geological Survey Museum, Jermyn St.	R.Geogr.S.	Royal Geographical Society.
Geol.S.	Geological Society.	R.S.	Royal Society.
Glasg.P.S.	Royal Philosophical Society of Glasgow.	S.K.	Science Museum Library, South Kensington.
Glasg.U.	Glasgow University.	U.C.L.	University College, London.
I.CE.	Institution of Civil Engineers, London.		
A. Agn.	Annales Agronomiques... Paris.		
	1851; 1875— B.M.; Chem.S.i.; Linn.S.; Oxon.B.; P.O.i.; R.S.i.		
Aarau Arch. Md.	Archiv der Medizin, Chirurgie, und Pharmacie. Aarau.		
	1816—17. R.S.		
Aarau Mt.	Mittheilungen der Aargauischen Naturforschenden Gesellschaft. Aarau.		
	1878— N.H.M.; R.S.; S.K.		
A. C.	Annales de Chimie [et de Physique], ou Recueil de Mémoires concernant la Chimie et les Arts qui en dépendent. Paris.		
	1789— B.M.; Camb.U.; Chem.S.; Dub.R.D.S.i.; Dub.T.C.i.; Edinb.R.S.; Edinb.U.; Glasg.U.; I.CE.; N.H.M.; Oxon.B.i.(R.); Pharm.S.; P.O.; R.C.Surg.; R.S.; S.K.; U.C.L.		
A. C. Anal.	Annales de Chimie Analytique appliquée à l'Industrie, à l'Agriculture, à la Pharmacie et à la Biologie. Paris.		
	1896— Chem.S.i.; P.O.		
Ac. Cæs. Leop. N. Acta ...	Nova Acta physico-medica Academiæ Cæs. Leopoldino-Carolinæ Naturæ Curiosorum. Erlangen, Bonn, Breslau.		
	1758— Camb.P.S.; Camb.U.; Chem.S.i.; Dub.T.C.; Edinb.R.S.i.; Edinb.U.; Geol.S.i.; Glasg.U.; Linn.S.i.; N.H.M.; Oxon.R.; Pharm.S.i.; R.A.S.i.; R.C.Surg.; R.S.; S.K.i.; U.C.L.i.		
	See Ac. Nt. C. N. Acta and Cæs. Leop. Ac. N. Acta .		
Acireale Ac. At.	Atti e Rendiconti dell' Accademia di Scienze, Lettere e Arti dei Zelanti e PP. dello Studio di Acireale. Acireale.		
	1890— Camb.P.S.i.; Geol.S.i.; N.H.M.i.; R.S.i.		

List of Serial Publications

- Ac. Nt. C. N. Acta** *See Ac. Cæs. Leop. N. Acta and Cæs. Leop. Ac. N. Acta.*
- A. Cond. Pon. Chauss.** *Annales des Conducteurs des Ponts et Chaussées; Recueil de Mémoires, etc., concernant le Service de Conducteurs des Ponts et Chaussées. Paris.*
1857— I.CE.i.; P.O.
- A. Cons. Arts et Mét.** *Annales du Conservatoire des Arts et Métiers. Paris.*
1861— B.M.; Camb.U.; Glasg.P.S.i.; I.CE.i.; Oxon.B.; P.O.; R.S.; S.K.i.
- A. C. Phm.** *See Par. A. Cons.*
Annalen der Chemie und Pharmacie. Lemgo, Leipzig, Heidelberg.
1832— B.M.; Camb.U.; Chem.S.; Dub.N.L.I.i.; Dub.R.C.S.i.; Edinb.R.S.i.; Edinb.U.; Glasg.P.S.; Glasg.U.i.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.; R.C.Surg.i.; R.S.; S.K.; U.C.L.i.
- Acta Mth.** *See Lieb. A.*
Acta Mathematica. Stockholm.
1882— B.M.; Camb.P.S.; Camb.U.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Glasg.U.; Math.S.; Oxon.R.; R.A.S.; R.S.; U.C.L.
- Act. S. Helv.** *Actes de la Société Helvétique des Sciences Naturelles. Lausanne, etc.*
1825— B.M.i.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; S.K.
- A. das Sc.** *See At. S. Elvet, Sch. Gs. Vh. and Sch. Nf. Gs. Vh.*
Annaes das Sciencias, etc. por huma Sociedade de Portuguezes residentes em Paris. Paris.
1818—27. B.M.; Camb.U.i.
- A. der Hydrog.** *See Par. A. das Sc.*
Annalen der Hydrographie und Maritimen Meteorologie. Herausgegeben von der Deutschen Seewarte in Hamburg. Berlin.
1875— [*Continuation of: Hydrographische Mittheilungen, 1873—74.*] B.M.; M.O.; P.O.i.; R.Geogr.S.
- A. di C.** *Annali di Chimica. Milano.*
1845—97. [*Continued as: Annali di Farmacoterapia e Chimica, 1898—*] B.M.; Camb.U.i.; Chem.S.i.; Pharm.S.i.; P.O.i.
- A. di Fm. e C.** *See Polli A.*
Annali di Farmacoterapia e Chimica. Milano, Bologna, etc.
1898— [*Continuation of: Annali di Chimica, 1845—97.*] B.M.; Camb.U.i.; Chem.S.; Glasg.P.S.i.; P.O.
- A. d'Ocul.** *Annales d'Oculistique. Charleroi, Bruxelles, Paris.*
1838— B.M.; Camb.U.i.; Oxon.R.i.; R.C.Surg.
- Aér.** *L'Aéronaute. Bulletin Mensuel Illustré de la Navigation Aérienne. Paris.*
1868— B.M.i.; P.O.; S.K.
- Aer. J.** *The Aeronautical Journal. London.*
1897— B.M.; Camb.U.i.; I.CE.i.; P.O.; R.S.; S.K.
- Aër. S. Rp.** *Annual Reports of the Aeronautical Society of Great Britain. London.*
1866—93. I.CE.i.; Oxon.B.; P.O.
- A. Gén. Civ.** *Annales du Génie Civil; Recueil de Mémoires sur les Mathématiques pures et appliquées; l'Astronomie, la Chimie, la Physique, etc. Paris.*
1862—80. B.M.; Camb.U.; Dub.R.C.S.i.; I.CE.; P.O.
- A. Gén. Sc. Ps.** *Annales générales des Sciences Physiques. Bruxelles.*
1819—21. Camb.U.; Glasg.U.; N.H.M.; R.C.Surg.; R.S.
- Ag. S. J.** *Journal of the Royal Agricultural Society of England. London.*
1840— B.M.; Camb.U.; Chem.S.; Dub.T.C.; Geol.M.; Geol.S.; Glasg.U.i.; I.CE.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- A. Hydrog.** *Annales Hydrographiques. Recueil d'Avis, Instructions, Documents, et Mémoires relatifs à l'Hydrographie et à la Navigation. Paris.*
1849— B.M.; Edinb.R.S.i.; M.O.i.; Oxon.B.; R.A.S.i.; R.Geogr.S.i.; R.S.i.
- A. Hyg. Pbl.** *Annales d'Hygiène publique [et de Médecine légale]. Paris.*
1829— B.M.; Camb.U.; Edinb.R.S.i.; Edinb.U.; Glasg.P.S.i.; Glasg.U.i.; Oxon.R.; P.O.i.; R.C.Surg.
- Aix Ac. Mm.** *Mémoires de l'Académie des Sciences, Agriculture, Arts et Belles-Lettres. Aix.*
- Aix Mm.**
- Aix Mm. Ac.** *1819— B.M.; Dub.R.I.A.; N.H.M.i.; Oxon.B.i.; R.S.i.*
- Alb. I. T.** *Transactions of the Albany Institute. Albany.*
1830— B.M.; N.H.M.; R.S.; S.K.i.

List of Serial Publications

- Al. D. Nt. Ztg.** Allgemeine Deutsche Naturhistorische Zeitung. Dresden, Leipzig, Hamburg.
1846—47; 1855—57. B.M.; Glasg.P.S.i.; N.H.M.; R.S.; S.K.i.
- Allier Bl. S. Ém.** Bulletin de la Société d'Émulation du Département de l'Allier: Sciences, Arts, et Belles-Lettres. Moulins.
1846—64. B.M.; Glasg.P.S.i.; Oxon.B.; R.S.
- A. Lndw.** Annalen der Landwirtschaft in den K. Preuss. Staaten; herausg. vom Präsidium des K. Landes-Oecon.-Collegiums. Berlin.
1843—71. [Continued as: Landwirthschaftliche Jahrbücher, 1872—.] P.O.
- Am. Ac. Mm.** Memoirs of the American Academy of Arts and Sciences. Cambridge, Boston.
1785— B.M.i.; Camb.P.S.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Geol.S.i.; I.CE.i.; Linn.S.; N.H.M.; Oxon.R.; P.O.i.; R.A.S.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
See Bost. Am. Ac. Mm.
- Am. Ac. P.** Proceedings of the American Academy of Arts and Sciences. Boston.
1846— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.i.; Edinb.R.S.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.i.; Linn.S.; Math.S.i.; N.H.M.; Oxon.R.; P.O.; R.A.S.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Am. As. P.** Proceedings of the American Association for the Advancement of Science. Washington, Salem.
1848— B.M.i.; Camb.P.S.i.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.; S.K.
- Am. C.** The American Chemist, a monthly Journal of theoretical Chemistry. New York.
1871—77. Chem.S.i.; N.H.M.; P.O.; Pharm.S.i.; S.K.i.
- Am. C. J.** American Chemical Journal. Baltimore.
1879— Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.i.; Glasg.P.S.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.; R.S.; S.K.
- A. Mcgrg.** Annales de Micrographie, spécialement consacrées à la Bactériologie, aux Protophytes et aux Protozoaires. Paris.
1888—98. Glasg.P.S.i.; Glasg.U.; N.H.M.; Oxon.R.
- Am. C. S. J.** The Journal of the American Chemical Society. New York, Easton, Pa.
1879— B.M.; Camb.P.S.; Chem.S.; Edinb.U.i.; Glasg.U.i.; N.H.M.; Pharm.S.; P.O.; S.K.; U.C.L.i.
- Am. Eng. & Railroad J.** American Engineer and Railroad Journal. New York.
1893— [Continuation of: The Railroad and Engineering Journal, 1887—92.] B.M.; I.CE.; P.O.
- Amici G. Tosc.** Giornale Toscano di Scienze Mediche, Fische, e Naturali; Amici, Bufalini, etc. Pisa.
1840—43. B.M.; Camb.U.i.; Glasg.P.S.i.; Oxon.B.
- Amiens Ac. Mm.** Mémoires de l'Académie des Sciences, Agriculture, Commerce, Belles-Lettres, et Arts du département de la Somme. Amiens.
- Amiens Mm. Ac.** 1835— B.M.; Camb.U.; Dub.T.C.i.; N.H.M.i.; Oxon.B.i.; R.S.i.
- Amiens Mm. Ac. Sc.** Transactions of the American Institute of Mining Engineers. Philadelphia, Easton, New York.
1871— Geol.S.; I.CE.; P.O.; S.K.
- A. Mines** Annales des Mines, ou Recueil des Mémoires sur l'exploitation des Mines, et sur les Sciences et les Arts qui s'y rapportent. Paris.
1817— [Continuation of: Journal des Mines, etc., 1794—1815.] B.M.; Camb.U.; Chem.S.i.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; I.CE.; N.H.M.; Oxon.B.(R.); P.O.; R.S.; S.K.
- Am. I. T.** [Reports and Transactions] of the American Institute of the City of New York. Albany.
1841— B.M.i.; I.CE.i.; P.O.i.; R.S.i.
- Am. J. Md. Sc.** American Journal of the Medical Sciences. Philadelphia.
1827— B.M.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.; Oxon.R.; R.C.Surg.; U.C.L.i.
- Am. J. Mth.** American Journal of Mathematics. Baltimore.
1878— B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.R.I.A.;

List of Serial Publications

- Dub.T.C.; Edinb.R.S.; Edinb.U.; Glasg.U.i.; I.CE.i.; Math.S.; Oxon.B.; Oxon.R.; R.A.S.; R.S.; S.K.; U.C.L.
- Am. J. Ot.**..... The American Journal of Otology. New York. 1879—82. Glasg.P.S.i.; R.S.
- Am. J. Phm.**..... American Journal of Pharmacy; published by the Philadelphia College of Pharmacy. Philadelphia. 1836— [Continuation of: Journal of the Philadelphia College of Pharmacy, 1830—35.] Chem.S.i.; Pharm.S.; P.O.i.; R.C.Surg.i.
- Am. J. Psychol.**..... The American Journal of Psychology. Baltimore, Worcester, Mass. 1888— B.M.; Edinb.U.; Oxon.B.; Oxon.R.; U.C.L.i.
- Am. J. Sc.**..... The American Journal of Science and Arts; Silliman. New Haven. 1818— B.M.; Camb.P.S.i.; Camb.U.; Chem.S.i.; Dub.N.L.I.i.; Dub.R.C.S.i.; Dub.T.C.i.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.i.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.
- See **Silliman J.**
- Am. Mcr. J.**..... The American Monthly Microscopical Journal. New York. 1880— Camb.U.; Dub.N.L.I.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.
- Am. Mcr. S. P.**..... Proceedings of the American Microscopical Society. Washington, Ithaca, N.Y. 1892—94. [Continuation of: Proceedings of the American Society of Microscopists, 1878—91.] [Continued as: Transactions of the American Microscopical Society, 1895—] Linn.S.; N.H.M.
- Am. Mcr. S. T.**..... Transactions of the American Microscopical Society. Lincoln, Buffalo. 1895— [Continuation of: Proceedings, etc., 1892—94.] Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.
- Am. Md. Ph. Reg.**..... The American Medical and Philosophical Register or Annals of Medicine, Natural History, Agriculture and the Arts. New York. 1810—14. B.M.; Edinb.U.i.; Geol.S.; R.C.Surg.; R.S.; U.C.L.
- Am. Met. J.**..... American Meteorological Journal. Detroit. 1884—96. B.M.i.; M.O.
- Am. Nt.**..... The American Naturalist. An illustrated magazine of Natural History. Philadelphia, Boston.
- Am. Ntlist.**..... 1868— B.M.; Camb.P.S.i.; Camb.U.; Edinb.R.S.i.; Edinb.U.i.; Geol.M.i.; Linn.S.i.; N.H.M.; Oxon.R.; R.Geogr.S.i.; R.S.i.; S.K.
- Am. Oph. S. T.**..... Transactions of the American Ophthalmological Society. New York, Boston, Hartford. 1865— Glasg.P.S.i.; Oxon.R.; R.C.Surg.
- Am. Phm. As. P.**..... Proceedings of the American Pharmaceutical Association. Philadelphia. 1853— Pharm.S.
- Am. Ph. S. P.**..... Proceedings of the American Philosophical Society. Philadelphia. 1840— Camb.P.S.; Camb.U.i.; Chem.S.i.; Dub.R.I.A.; Edinb.R.S.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; Math.S.i.; M.O.; N.H.M.i.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- Am. Ph. S. T.**..... Transactions of the American Philosophical Society. Philadelphia. 1771— B.M.i.; Camb.P.S.; Camb.U.i.; Chem.S.i.; Dub.R.I.A.; Edinb.R.S.; Geol.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; N.H.M.i.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
- See **Philad. T.**
- Am. Pol. J.**..... The American Polytechnic Journal. Washington. 1853—54. B.M.; P.O.
- Am. S. CE. T.**..... Transactions of the American Society of Civil Engineers. New York. 1871— I.CE.; P.O.; S.K.i.; U.C.L.i.
- Am. S. Mcr. P.**..... Proceedings of the American Society of Microscopists. Indianapolis, etc. 1878—91. [Continued as: Proceedings of the American Microscopical Society, 1892—94.] Linn.S.; N.H.M.
- Amst. Ak. Jb.**..... Jaarboek van de Koninklijke Akademie van Wetenschappen gevestigd te Amsterdam. Amsterdam. 1857— B.M.; Camb.P.S.; Dub.R.D.S.; Dub.T.C.; Edinb.R.S.i.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.; N.H.M.; R.A.S.i.; R.Geogr.S.; R.S.; U.C.L.i.
- See **Amst. Jb.**

List of Serial Publications

- Amst. Ak. F.** Koninklijke Akademie van Wetenschappen te Amsterdam. Proceedings of the Section of Sciences. Amsterdam. 1899— Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Glasg.P.S.; Glasg.U.; Oxon.B.; R.A.S.; R.Geogr.S.; R.S.; S.K.
- Amst. Ak. Vh.** Verhandelingen der Koninklijke Akademie van Wetenschappen. Amsterdam. 1854— Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.R.I.A.i.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.; R.A.S.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.i.; U.C.L.i.
- Amst. Ak. Vs.** Verslagen der Zittingen van de Wis- en Natuurkundige Afdeling der Koninklijke Akademie van Wetenschappen. 1893, 1894. [*Continuation of*: Verslagen en Mededeelingen, 1853—92.] Verslagen van de Zittingen der Wis- en Natuurkundige Afdeling van de Koninklijke Akademie van Wetenschappen. 1895, 1896. Koninklijke Akademie van Wetenschappen te Amsterdam. Verslagen van de Gewone Vergaderingen der Wis- en Natuurkundige Afdeling. Amsterdam. 1897— B.M.; Camb.P.S.; Camb.U.; Dub.T.C.; Edinb.R.S.; Glasg.P.S.; Glasg.U.; N.H.M.; R.A.S.; R.Geogr.S.; R.S.; S.K.i.; U.C.L.i.
- Amst. Ak. Vs. M.** Verslagen en Mededeelingen der Koninklijke Akademie van Wetenschappen. Afdeling Natuurkunde. Amsterdam. 1853—92. [*Continued as*: Verslagen der Zittingen, etc., 1893—.] B.M.; Camb.P.S.; Camb.U.; Dub.T.C.; Edinb.R.S.; Glasg.P.S.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.i.; R.A.S.i.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- See Amst. Vs. Ak.*
- Amst. Ak. Wet. P.** Processen-Verbaal van de Gewone Vergaderingen der Koninklijke Akademie van Wetenschappen. Afdeling Natuurkunde. Amsterdam. 1865—84. Dub.R.D.S.; Linn.S.i.; R.A.S.; R.S.
- Amst. I.** Het Instituut. Amsterdam. 1841—46. B.M.; Edinb.R.S.i.; S.K.
- Amst. Jb.**)
Amst. Jb. Ak.) *See Amst. Ak. Jb.*
Amst. N. Vh. Nieuwe Verhandelingen der eerste Klasse van het Koninklijk Nederlandsche Instituut van Wetenschappen, Letterkunde, en Schoone Kunsten te Amsterdam. Amsterdam. 1827—52. [*Continuation of*: Verhandelingen, etc., 1812—25.] B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.; Glasg.U.i.; Linn.S.; N.H.M.; R.S.; S.K.
- Amst. Ts. Nt. Wet.** Tijdschrift voor Natuurkundige Wetenschappen en Kunsten. Amsterdam. 1810—11. Camb.P.S.; R.S.
- Amst. Ts. Ws. Nt. Wet.** Tijdschrift voor de Wis- en Natuurkundige Wetenschappen, Letterkunde, en Schoone Kunsten te Amsterdam. Amsterdam. 1847—52. B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; Linn.S.; Oxon.B.; R.S.
- Amst. Vh.**)
Amst. Vh. Ak.) (Verhandelingen der Eerste Klasse van het Koninklijk Nederlandsche Instituut van Wetenschappen, Letterkunde, en Schoone Kunsten te Amsterdam. Amsterdam. 1812—25. [*Continued as*: Nieuwe Verhandelingen, etc., 1827—52.] B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.; Glasg.U.i.; N.H.M.; Oxon.B.; R.S.; S.K.)
- Amst. Vs. Ak.** *See Amst. Ak. Vs. M.*
- A. Mt.** Annali di Matematica pura ed applicata...; Tortolini. Roma, Milano. 1858— B.M.; Camb.U.i.; Dub.R.D.S.; Dub.T.C.; Edinb.U.; Glasg.U.i.; Oxon.B.(R.); R.S.; U.C.L.
- See Tortolini A.*
- A. Mth.** Annals of Mathematics. University of Virginia. Charlottesville, Va. 1884— Camb.P.S.; Camb.U.; Dub.R.I.A.i.; Edinb.R.S.; Math.S.i.; Oxon.B.; S.K.i.
- Anal.** The Analyst, including the Proceedings of the Society of Public Analysts. London. 1877— B.M.; Camb.U.i.; Chem.S.; Edinb.U.i.; Geol.S.i.; Glasg.P.S.; Glasg.U.i.; Pharm.S.; P.O.; R.S.i.; U.C.L.i.
- Angers Ac. Sc. Mm.** Mémoires de l'Académie des Sciences et Belles-Lettres d'Angers. Angers.

List of Serial Publications

- 1890—95. [*Continuation of*: Mémoires de la Société Académique de
Maine et Loire, 1857—83.] Glasg.P.S.i.; N.H.M.
- Angers S. Sc. Bl.** Bulletin de la Société d'Études Scientifiques d'Angers. Angers.
1872— B.M.; N.H.M.
- A. NH.** Annals of Natural History, or Magazine of Zoology, Botany, and
Geology. London.
1838—40. [*Continuation of*: Magazine of Zoology and Botany,
1837—38.] [*Continued as*: Annals and Magazine of Natural History,
1841—] B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.;
Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.i.;
Geol.M.; Geol.S.i.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.;
Oxon.R; P.O.i.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- Anhalt Vh. Nt. Vr.** Verhandlungen des naturhistorischen Vereins für Anhalt in Dessau.
Dessau.
1840—70.
- An. Mét. Fr.** Annuaire Météorologique de la France. Paris.
1849—52. [*Continued as*: Annuaire de la Société Météorologi-
que de France, 1853—] B.M.; Camb.U.; Dub.T.C.; Glasg.U.i.;
M.O.; R.S.
See Fr. An. Mét.
- Anvers A. S. Md.** Annales de la Société de Médecine d'Anvers. Anvers.
1841—56. Glasg.P.S.i.; R.S.
- Anvers J. Phm.** Journal de Pharmacie. Publié par la Société de Pharmacie
d'Anvers. Anvers.
1845— B.M.; Oxon.R.; Pharm.S.i.
- Ap. I. J.** The Journal of the Anthropological Institute of Great Britain and
Ireland. London.
1872— B.M.; Camb.P.S.i.; Camb.U.; Dub.N.L.I.; Edinb.R.S.;
Edinb.U.; Glasg.U.; N.H.M.; Oxon.B.; Oxon.R.; R.C.Surg.;
R.Geogr.S.; R.S.; S.K.; U.C.L.
- A. Pon. Chauss.** Annales des Ponts et Chaussées. Mémoires et documents relatifs
à l'Art des Constructions et au Service de l'Ingénieur. Paris.
1831— B.M.; Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.;
I.CE.; P.O.; R.S.i.
See Par. A. Pon. Chauss.
- A. Ps.** Annalen der Physik; Drude. Leipzig.
1900— [*Continuation of*: Annalen der Physik und Chemie,
1824—99.] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Edinb.R.S.;
Edinb.U.; Glasg.P.S.; Glasg.U.; I.CE.; N.H.M.; Pharm.S.;
P.O.; R.S.; S.K.; U.C.L.
- A. Ps. C.** Annalen der Physik und Chemie; Poggendorff, Wiedemann. Leipzig.
1824—99. [*Continuation of*: Annalen der Physik; Gilbert, 1799—
1824.] [*Continued as*: Annalen der Physik; Drude, 1900—]
B.M.; Camb.P.S.i.; Camb.U.; Chem.S.; Dub.R.I.A.; Dub.T.C.;
Edinb.R.S.; Edinb.U.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.;
N.H.M.; Oxon.B.(R.); Pharm.S.i.; P.O.; R.C.Surg.i.; R.S.;
S.K.; U.C.L.i.
See Pogg. A.
- A. Ps. C. Beibl.** Beiblätter zu den Annalen... Leipzig.
1877— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.;
Edinb.R.S.; Edinb.U.; Glasg.U.; I.CE.; N.H.M.; Oxon.B.;
Oxon.R.; P.O.; R.S.; S.K.; U.C.L.
- Arch. An. Mcr.** Archives d'Anatomie Microscopique. Paris.
1897— B.M.; Glasg.P.S.i.; Glasg.U.i.; N.H.M.; Oxon.R.
- Arch. An. Fl.** Archiv für Anatomie, Physiologie, und Wissenschaftliche Medicin;
Müller, Reichert, Du Bois-Reymond. Berlin.
1834—76. [*Continuation of*: Archiv für Anatomie und Physiologie,
1826—32.] [*Continued as*: Archiv für Anatomie und Physiologie,
1877—] B.M.; Camb.U.; Edinb.U.; Glasg.P.S.i.; Glasg.U.;
N.H.M.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.
See Müller Arch. and Reichert Arch.
- Arch. An. Fl. (An. Ab.)...** Archiv für Anatomie und Physiologie. Anatomische Abteilung.
Archiv für Anatomie und Entwicklungsgeschichte. Leipzig.
1877— [*Continuation of*: Archiv für Anatomie, Physiologie, und
Wissenschaftliche Medicin, 1834—76.] Camb.P.S.; Camb.U.;
Edinb.U.; Glasg.U.; N.H.M.i.; Oxon.R.; R.C.Surg.; R.S.;
S.K.; U.C.L.

List of Serial Publications

- Arch. An. Pl. (Pl. Ab.)** ... Archiv für Anatomie und Physiologie. Physiologische Abtheilung. Archiv für Physiologie. Leipzig.
1877— [Continuation of: Archiv für Anatomie, Physiologie, und Wissenschaftliche Medicin, 1834—76.] Camb.P.S.; Camb.U.; Edinb.U.; Glasg.U.; N.H.M.i.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Arch. Augenh.** Archiv für Augenheilkunde. Wiesbaden.
1879— [Continuation of: Archiv für Augen- und Ohrenheilkunde, 1869—78.] B.M.; Camb.U.; Glasg.P.S.i.
- Arch. de l'Électr.** Archives de l'Electricité; A. de la Rive. Genève.
1841—45. B.M.; Camb.U.; P.O.; R.C.Surg.; R.S.i.
- Arch. de Pl.** Archives de Physiologie normale et pathologique. Paris.
1868—98. [Continuation of: Journal de la Physiologie, 1858—65.] [Continued as: Journal de Physiologie et de Pathologie Générale, 1899—] B.M.; Camb.U.; Edinb.U.; Glasg.P.S.i.; Oxon.R.; R.C.Surg.; R.S.; U.C.L.
- Arch. f. Oph.** Archiv für Ophthalmologie. Berlin, Leipzig.
1854— B.M.; Camb.U.; Edinb.U.; Glasg.U.; Oxon.R.; R.C.Surg.; R.S.i.
- Arch. Gén. Md.** Archives Générales de Médecine. Paris.
1823— B.M.; Camb.U.; Edinb.U.; Glasg.P.S.i.; Glasg.U.i.; Oxon.R.; R.C.Surg.
- Arch. Hyg.** Archiv für Hygiene. München, Leipzig.
1883— Camb.U.; Chem.S.i.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; Oxon.R.; P.O.i.; R.C.Surg.
- Arch. Md. Exp.** Archives de Médecine Expérimentale et d'Anatomie Pathologique. Paris.
1889— Camb.U.i.; Edinb.U.; Glasg.U.; Oxon.R.; R.C.Surg.; R.S.
- Arch. Md. Nv.** Archives de Médecine Navale. Paris.
1864— B.M.; Edinb.U.i.; Glasg.P.S.i.; R.C.Surg.
- Arch. Md. Phm. Mil.** ... Archives de Médecine et de Pharmacie Militaires. Paris.
1883— [Continuation of: Recueil de Mémoires de Médecine, de Chirurgie, et de Pharmacie Militaires, 1815—82.] B.M.; R.C.Surg.i.
- Arch. Mikr. An.** Archiv für mikroskopische Anatomie. Bonn.
1865— B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.; Edinb.U.; Glasg.U.; Linn.S.; N.H.M.i.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Arch. Mth. Ntvd.** Archiv for Mathematik og Naturvidenskab. Kristiania.
1876— B.M.; Camb.U.; Dub.R.I.A.i.; Edinb.R.S.; Glasg.U.i.; Math.S.i.; N.H.M.; Oxon.B.; Oxon.R.i.; R.S.
- Arch. Mth. Ps.** Archiv der Mathematik und Physik; Grunert. Greifswald, Leipzig.
1841— B.M.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Edinb.U.; Glasg.U.; Math.S.i.; Oxon.B.(R.); R.S.; U.C.L.i.
- Arch. Néerl.** Archives Néerlandaises des Sciences Exactes et Naturelles. La Haye, Harlem.
1866— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.M.i.; Geol.S.i.; Glasg.P.S.; Glasg.U.i.; Linn.S.; Math.S.; N.H.M.; Oxon.R.; P.O.; R.S.; S.K.; U.C.L.i.
- Arch. Ohrh.** Archiv für Ohrenheilkunde. Würzburg.
1864— R.C.Surg.
- Arch. Oph.** Archives of Ophthalmology. New York.
1879— [Continuation of: Archives of Ophthalmology and Otology, 1869—78.] B.M.i.; Glasg.U.i.; Oxon.R.; R.C.Surg.
- Arch. Oph. Ot.** Archives of Ophthalmology and Otology. New York.
1869—78. [Continued as: Archives of Ophthalmology, 1879—, and Archives of Otology, 1879—] B.M.; Glasg.P.S.i.; Glasg.U.i.; Oxon.R.; R.C.Surg.
- Arch. Ot.** Archives of Otology. New York.
1879— [Continuation of: Archives of Ophthalmology and Otology, 1869—78.] B.M.i.; Glasg.U.i.; Oxon.R.; R.C.Surg.
- Arch. Phm.** Archiv des Apothekervereins im nördlichen Teutschland. Archiv der Pharmacie. Schmalkalden, Lemgo, Hannover, etc.
1822— Chem.S.i.; Pharm.S.i.; P.O.; R.C.Surg.i.
- Arch. Sc.** Archives of Science and Transactions of the Orleans County Society of Natural Sciences. Newport, U.S.

List of Serial Publications

- 1870—74. B.M.; Geol.S.i.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; R.S.
- Arch. Sc. Fs. Nt.** Bibliothèque Universelle. Archives des Sciences Physiques et Naturelles. Genève.
- 1846— [Continuation of: Bibliothèque Universelle des Sciences, etc., 1816—45.] B.M.; Camb.U.; Chem.S.i.; Dub.N.L.I.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.; Edinb.U.; Glasg.U.; I.CE.i.; M.O.i.; N.H.M.; Oxon.B.; P.O.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.
- See **Bb. Un. Arch.**
- Arch. Z. Exp.** Archives de Zoologie Expérimentale et Générale. Paris.
- 1872— B.M.; Camb.U.; Dub.N.L.I.; Dub.R.D.S.; Edinb.R.S.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Arcueil Mm.** Mémoires de Physique et de Chimie de la Société d'Arcueil. Paris.
- Arcueil Mm. Fs.** { 1807—17. B.M.; Camb.U.; Chem.S.i.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.; Oxon.B.; P.O.; R.C.Surg.; R.S.; S.K.
- Arg. S. Ci. A.** Anales de la Sociedad Científica Argentina. Buenos Aires.
- 1876— B.M.i.; I.CE.i.; N.H.M.
- Arnhem Ntk.** Naturkundig Tijdschrift, inhoudende Phijsica, Chemie, Pharmacie, Natuurlijke Historie en Literatuur. Arnhem.
- 1843—60. N.H.M.
- Arras Mm. S. E.** Mémoires de la Société Royale d'Arras, pour l'Encouragement des Sciences, etc. Arras.
- 1817— Camb.U.; Glasg.P.S.i.; Oxon.B.i.
- As.** L'Astronomie. Revue d'Astronomie populaire, de Météorologie et de Physique du Globe. Paris.
- 1882—94. B.M.; Camb.U.i.; Edinb.R.S.; R.A.S.; R.S.i.; S.K.
- As. & Asps.** Astronomy and Astrophysics. Northfield, Minn.
- 1892—94. [Continuation of: The Sidereal Messenger, 1883—91.] [Continued as: The Astrophysical Journal, 1895—] B.M.; Camb.P.S.i.; Dub.N.L.I.i.; R.A.S.; R.S.; S.K.
- A. Sc. Lomb. Ven.** Annali delle Scienze del Regno Lombardo-Veneto. Padova, Venezia.
- 1831—45. B.M.; Camb.U.; Dub.T.C.i.; Oxon.B.
- A. Sc. Nt.** Annales des Sciences Naturelles, comprenant la Physiologie animale et végétale, l'Anatomie comparée des deux règnes, la Zoologie, la Botanique, la Minéralogie et la Géologie. Paris.
- 1824— B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.; Dub.T.C.; Geol.M.i.; Geol.S.i.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.i.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- As. Fr. C. R.** Association Française pour l'Avancement des Sciences. Compte Rendu. Paris, etc.
- 1872— B.M.; Camb.U.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.; M.O.i.; N.H.M.; P.O.; R.A.S.i.; R.C.Surg.i.; R.S.; S.K.
- Ashmol. S. F.** Abstracts of the Proceedings of the Ashmolean Society. Oxford.
- 1844—81. Camb.U.; Dub.R.D.S.; Edinb.R.S.i.; Geol.S.i.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.i.; R.S.; S.K.i.
- Ashmol. S. T.** Transactions of the Ashmolean Society. Oxford.
- 1834—76. Camb.U.; Dub.R.D.S.; Edinb.R.S.; N.H.M.i.; Oxon.B.i.; Oxon.R.; P.O.i.; R.S.i.; S.K.i.
- As. J.** The Astronomical Journal. Boston.
- 1851—61; 1888— B.M.; Camb.U.; Glasg.U.i.; Oxon.B.; Oxon.R.i.; R.A.S.; R.S.i.; S.K.
- See **Gould As. J.**
- As. Nr.** Astronomische Nachrichten; Schumacher. Altona.
- 1823— B.M.; Camb.U.; Dub.R.I.A.i.; Edinb.R.S.; Edinb.U.i.; Glasg.U.i.; I.CE.i.; Oxon.B.(R.); R.A.S.; R.S.; S.K.i.; U.C.L.i.
- Asps. J.** The Astrophysical Journal. Chicago.
- 1895— [Continuation of: Astronomy and Astrophysics, 1892—94.] B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.R.D.S.; Glasg.U.; Oxon.R.i.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.
- As. Researches** Asiatic Researches; or Transactions of the Society, instituted in Bengal, for inquiring into the History and Antiquities, Arts, Sciences, and Literature of Asia. Calcutta.
- 1788—1836. B.M.; Camb.U.; Edinb.R.S.i.; Edinb.U.; Geol.S.;

List of Serial Publications

- Glasg.U.i.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.;
R.A.S.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- As. S. Mm.** Memoirs of the [Royal] Astronomical Society of London. London.
1822— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.;
Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.i.;
Glasg.U.; I.CE.; Oxon.B.; Oxon.R.; P.O.i.; R.A.S.; R.Geogr.
S.i.; R.S.; S.K.i.; U.C.L.
- As. S. M. Not.**..... Monthly Notices of the [Royal] Astronomical Society of London.
London.
1827— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.;
Edinb.R.S.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.;
Oxon.B.i.; Oxon.R.i.; P.O.i.; R.A.S.; R.Geogr.S.i.; R.S.;
S.K.i.; U.C.L.
- As. S. Pac. Pb.**..... Publications of the Astronomical Society of the Pacific. San
Francisco.
1889— B.M.; Camb.U.i.; Dub.R.D.S.i.; Glasg.U.i.; R.A.S.; R.S.i.
- Assur. Mg.** The Assurance Magazine and Journal of the Institute of Actuaries.
London.
1830—67. [Continued as: Journal of the Institute of Actuaries,
1869—] B.M.; Camb.U.i.; Edinb.R.S.i.; Geol.S.i.; R.A.S.i.;
R.S.i.; U.C.L.i.
- A. Tél.** Annales Télégraphiques, publiées sous le patronage du Directeur
Général des Lignes Télégraphiques. Paris.
1855— B.M.i.; Camb.U.i.; I.CE.i.; P.O.
- Aten. It.** L'Ateneo Italiano. Parigi.
1853—54. B.M.; Glasg.P.S.i.; R.S.; U.C.L.
- Athènes Obs. Nat. A.** ... Annales de l'Observatoire National d'Athènes. Athènes.
1896— Edinb.R.S.; M.O.; R.A.S.; R.S.
- At. Sc. It.** Riunione degli Scienziati Italiani. Atti. Pisa, etc.
1839—75. B.M.; Camb.U.; N.H.M.; R.S.
- At. S. Elvet.**..... Atti della Società Elvetica delle Scienze Naturali. Lugano.
1833, 1860. N.H.M.; S.K.
See Act. S. Helv., Sch. Gs. Vh., and Sch. Nf. Gs. Vh.
- Aube Mm. S. Ac.** { Mémoires de la Société [Académique] d'Agriculture, des Sciences,
Aube Mm. S. Ag. { et des Lettres du département de l'Aube. Troyes.
1823— B.M.; Camb.U.i.; Dub.T.C.i.; Oxon.B.; R.S.i.
- Augsb. Nt. Vr. B.** Bericht des Naturhistorischen [Naturwissenschaftlichen] Vereins in
Augsburg. Augsburg.
1848— Dub.R.I.A.i.; Glasg.P.S.i.; N.H.M.; R.S.i.
- Ausl.** Das Ausland. München, Stuttgart.
1828—93. B.M.; Camb.U.i.; N.H.M.i.; Oxon.B.i.; R.Geogr.S.i.
- Aust. As. Ep.** Report of the.....Meeting of the Australasian Association for the
Advancement of Science. Sydney.
1888— Camb.P.S.; Camb.U.; Chem.S.; Dub.R.D.S.; Dub.R.I.A.;
Edinb.R.S.; Edinb.U.i.; Geol.M.; Geol.S.; Glasg.U.i.; I.CE.i.;
Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.;
R.Geogr.S.; R.S.; S.K.
- Auvergne A. Sc.**..... Annales Scientifiques, Littéraires, et Industrielles de l'Auvergne,
publiées par l'Académie des Sciences, Belles-Lettres, et Arts de
Clermont-Ferrand. Clermont-Ferrand.
1828—58. [Continued as: Mémoires de l'Académie, etc., 1859—]
B.M.; Camb.U.; Oxon.B.; R.S.
- Bamb. Nf. Gs. B.**..... Bericht des Naturforschenden Gesellschaft zu Bamberg. Bamberg.
1852— N.H.M.
- Barcel. Ac. Bl.**..... Boletín de la Real Academia de Ciencias y Artes de Barcelona.
Barcelona.
1840—42; 1892— N.H.M.
- Barcel. Ac. Mm.**..... Memorias de la Real Academia de Ciencias Naturales y Artes de
Barcelona. Barcelona.
1876— N.H.M.
- B. A. Rp.** Report of the.....Meeting of the British Association for the
Advancement of Science. London.
1831— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.;
Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.;
Glasg.P.S.; Glasg.U.; I.CE.; Linn.S.; M.O.; N.H.M.; Oxon.B.i.;
Oxon.R.; Pharm.S.i.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.;
R.S.; S.K.; U.C.L.

List of Serial Publications

- Barrow F.C. Ep.** Barrow Naturalists' Field Club and Literary and Scientific Association. Annual Report and Proceedings. Barrow. 1877— B.M.; Camb.U.; Geol.S.i.; N.H.M.; Oxon.B.i.
- Basel B.**..... Bericht über die Verhandlungen der Naturforschenden Gesellschaft in Basel. Basel. 1835—52. B.M.; Camb.P.S.; Dub.T.C.; Geol.S.i.; Linn.S.; N.H.M.; R.S.
- Basel Vh.** Verhandlungen der Naturforschenden Gesellschaft in Basel. Basel. 1857— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Geol.S.; Linn.S.; N.H.M.; Oxon.R.; R.A.S.i.; R.S.; S.K.; U.C.L.i.
- Batav. Gn. Vh.** Verhandelingen van het Bataviaasch Genootschap der Kunsten en Wetenschappen. Batavia. 1778— B.M.; Camb.U.; Edinb.R.S.i.; Edinb.U.i.; Glasg.P.S.i.; Linn.S.i.; N.H.M.i.; Oxon.B.; R.Geogr. S.i.; R.S.
- Batav. Ntk. Ts.** Natuurkundig Tijdschrift voor Nederlandsch-Indië. Batavia. 1850— Camb.P.S.; Camb.U.; Edinb.R.S.i.; Linn.S.; N.H.M.; R.A.S.i.; R.S.i.; S.K.i.; U.C.L.i.
- Bath S. J.**..... Journal of the Bath and West of England Society for the Encouragement of Agriculture, Arts, Manufactures and Commerce. Bath. 1853— B.M.; Camb.U.; Dub.T.C.; Geol.M.; Oxon.B.; P.O.; S.K.
- Baumgartner Z.**..... Zeitschrift für Physik, Mathematik, und verwandte Wissenschaften; Baumgartner und von Ettiingshausen. Wien. 1826—42. B.M.; Camb.U.i.; Oxon.B.i.(R.); R.S.i.; U.C.L.i.
- Bayeux Mm.** Mémoires de la Société d'Agriculture, Sciences, Arts et Belles-Lettres de Bayeux. Bayeux. 1842— B.M.; Oxon.B.; R.S.i.
- Bb. Brit.** Bibliothèque Britannique, ou Recueil extrait des Ouvrages Anglais périodiques et autres: partie des Sciences et Arts. Genève. 1796—1815. B.M.; Edinb.U.; N.H.M.; Oxon.B.; P.O.; R.S.
- Bb. It.**..... Biblioteca Italiana, ossia Giornale di Letteratura, Scienze, etc. Milano. 1816—56. B.M.; Edinb.R.S.i.; Oxon.B.
- Bb. Mth.** Bibliotheca Mathematica. Stockholm, Leipzig. 1827— B.M.; Camb.U.; Glasg.U.; Oxon.B.; Oxon.R.; R.S.; S.K.i.; U.C.L.
- Bb. Un.** Bibliothèque Universelle des Sciences, Belles-Lettres, et Arts, faisant suite à la Bibliothèque Britannique rédigée à Genève. Partie des Sciences. Genève. 1816—45. [Continued as: Archives des Sciences Physiques et Naturelles, 1846—] B.M.; Camb.U.; Dub.R.I.A.i.; Edinb.R.S.i.; Edinb.U.; Glasg.U.; N.H.M.; Oxon.B.; P.O.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.
- Bb. Un. Arch.** Bibliothèque Universelle. Archives des Sciences Physiques et Naturelles. Genève. 1846— [Continuation of: Bibliothèque Universelle des Sciences, etc., 1816—45.] B.M.; Camb.U.; Chem.S.i.; Dub.N.L.I.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.; Edinb.U.; Glasg.U.; I.CE.i.; M.O.i.; N.H.M.; Oxon.B.; P.O.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.
- Belfast NH. S. P.** } See **Arch. Sc. Ps. Nt.**
Belfast NH. S. Rp. & P. } Report and Proceedings of the Belfast Natural History and Philo-
 sophical Society. Belfast. 1852— B.M.i.; Camb.P.S.; Dub.N.L.I.; Dub.R.D.S.; Dub.T.C.;
 Edinb.R.S.i.; Geol.S.i.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; P.O.i.;
 R.A.S.
- Beng. As. S. J.**..... Journal of the Asiatic Society of Bengal. Calcutta. 1832— B.M.; Camb.P.S.i.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.;
 Dub.T.C.; Edinb.R.S.i.; Geol.S.; Glasg.U.i.; I.CE.i.; Linn.S.;
 N.H.M.; Oxon.B.; Oxon.R.i.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- Beng. As. S. P.** } See **Beng. J. As. S.**
 Proceedings of the Asiatic Society of Bengal. Calcutta. 1865— B.M.; Camb.P.S.i.; Camb.U.; Dub.T.C.; Edinb.R.S.i.;
 Edinb.U.i.; Geol.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; N.H.M.;
 Oxon.B.; Oxon.R.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.
- Beng. J. As. S.**..... } See **Beng. As. S. J.**
- Berg-Hm. Jb.** Berg- und Hüttenmännisches Jahrbuch der k.k. Schemnitzer-

List of Serial Publications

- Bergakademie und der k.k. Montan-Lehranstalten zu Leoben und Pöbbram. Wien.
 1851— B.M.i.; Geol.S.i.; I.CE.i.; P.O.i.; S.K.
 See **Jb. Berg-Hm., Leoben Berg-Hm. Jb. and Wien Berg-Hm. Jb.**
- Berg-Hm. Ztg.** Berg- und Hüttenmännische Zeitung; mit besonderer Berücksichtigung der Mineralogie und Geologie; Hartmann. Nordhausen, Leipzig.
 1842— B.M.; I.CE.i.; N.H.M.; P.O.; S.K.
- Berl. Ab.** Abhandlungen der Königlichen Akademie der Wissenschaften zu Berlin. Berlin.
Berl. Ak. Ab. { 1804— B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.; Edinb.R.S.; Edinb.U.; Geol.M.i.; Geol.S.i.; Glasg.U.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.i.; R.A.S.i.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
- Berl. Ak. Mb.** Monatsberichte der K. Preuss. Akademie der Wissenschaften zu Berlin. Berlin.
 1856—81. [*Continuation of: Berichte, etc., 1836—55.*] [*Continued as: Sitzungsberichte, etc., 1882—*] B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; Math.S.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.i.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- See **Berl. Mb.**
- Berl. Ak. Sb.** Sitzungsberichte der K. Preussischen Akademie der Wissenschaften zu Berlin. Berlin.
 1882— [*Continuation of: Monatsberichte, etc., 1856—81.*] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.i.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.i.; Linn.S.; Math.S.; N.H.M.i.; Oxon.B.; Oxon.R.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- Berl. A. Tel.** Annalen der Telegraphie. Berlin.
 1872. Glasg.P.S.i.; P.O.
- Berl. B.** Bericht über die zur Bekanntmachung geeigneten Verhandlungen der K. Preuss. Akademie der Wissenschaften zu Berlin. Berlin.
 1836—55. [*Continued as: Monatsberichte, etc., 1856—81.*] B.M.; Dub.R.I.A.i.; Edinb.R.S.; Geol.S.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.B.; P.O.; R.A.S.i.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.
- Berl. B.** Berichte der Deutschen Chemischen Gesellschaft. Berlin.
 1868— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.L.; Glasg.P.S.; Glasg.U.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.; R.C.Surg.i.; R.S.; S.K.; U.C.L.i.
- See **D. C. Gs. B.**
- Berl. Gs. Erdk. Vh.** Verhandlungen der Gesellschaft für Erdkunde zu Berlin. Berlin.
 1873— B.M.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.; Glasg.P.S.i.; N.H.M.; Oxon.B.; R.Geogr.S.; R.S.; S.K.
- Berl. Gsndhamt. Arb.** ... Arbeiten aus dem Kaiserlichen Gesundheitsamte. Berlin.
 1886— [*Continuation of: Mittheilungen, 1881—84.*] Camb.U.; Edinb.U.; Glasg.P.S.i.; Glasg.U.i.; Oxon.R.; P.O.; R.C.Surg.; R.S.
- Berl. Gs. Nt. Fr. Mg.** Magazin der Gesellschaft Naturforschender Freunde zu Berlin, für die neuesten Entdeckungen in der gesammten Naturkunde. Berlin.
 1807—18. B.M.; Camb.U.; Edinb.R.S.; Edinb.U.i.; Glasg.P.S.i.; Oxon.R.; R.C.Surg.; R.S.
- Berl. Gs. Nt. Fr. N. Schr.** Neue Schriften der Gesellschaft Naturforschender Freunde zu Berlin. Berlin.
 1795—1803. B.M.; Camb.U.; N.H.M.; Oxon.R.; R.C.Surg.; S.K.
- Berl. Mb.** See **Berl. Ak. Mb.**
- Berl. Mm.** Mémoires de l'Académie Royale des Sciences de Berlin. Berlin.
Berl. Mm. Ac. { 1770—1804. B.M.i.; Camb.U.; Dub.R.D.S.i.; Dub.T.C.i.; Edinb.R.S.; Edinb.U.; Glasg.U.i.; N.H.M.; Oxon.B.; P.O.; R.S.; S.K.; U.C.L.

List of Serial Publications

- Berl. Mt. Gs. Nf.**..... Mittheilungen aus den Verhandlungen der Gesellschaft Naturforschender Freunde zu Berlin. Berlin. 1836—39. B.M.; Glasg.P.S.i.; N.H.M.; Oxon.R.; R.S.
- Berl. Nf. Fr. Sb.**..... Sitzungs-Berichte der Gesellschaft Naturforschender Freunde zu Berlin. Berlin. 1860—. B.M.; Camb.P.S.i.; Edinb.R.S.i.; Geol.S.; Glasg.P.S.i.; N.H.M.; Oxon.R.; R.S.i.; S.K.i.
- Berl. Pol. Gs. Vh.**..... Verhandlungen der Polytechnischen Gesellschaft. Berlin. 1851— [Continuation of: Berichte, etc., 1839—51.] R.S.i.
- Berl. Pol. Gs. Vort.**..... Vorträge in der Polytechnischen Gesellschaft zu Berlin. Berlin. 1854—55. Glasg.P.S.i.; R.S.
- Berl. Ps. Gs. Vh.**..... Verhandlungen der Physikalischen Gesellschaft in Berlin. Berlin. 1882—98. [Continued as: Verhandlungen der Deutschen Physikalischen Gesellschaft, 1899—] Camb.P.S.i.; Camb.U.; Glasg.U.; N.H.M.; Oxon.B.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.i.
- Berl. Ps. Reichsanst. Ab.**..... Wissenschaftliche Abhandlungen der Physikalisch-Technischen Reichsanstalt. Berlin. 1894— Camb.P.S.; Camb.U.i.; Chem.S.; Edinb.R.S.; Glasg.U.i.; P.O.; S.K.; U.C.L.
- Berl. Strnw. Beob.-Ergebn.**..... Beobachtungs-Ergebnisse der Königlichen Sternwarte zu Berlin. Berlin. 1881— R.A.S.; R.S.
- Berl. Tel. Vr. Z.**..... Zeitschrift des Deutsch-Oesterreichischen Telegraphen-Vereins. Herausg. in dessen Auftrage von der K. Preuss. Telegraphen-Direction. Berlin. 1854—69. I.CE.; P.O.
See Berl. Z. Tel. and Tel. Vr. Z.
- Berl. Vh. Md. Gs.**..... Verhandlungen der Berliner Medicinischen Gesellschaft. Berlin. 1865— R.C.Surg.i.
- Berl. Z. Tel.**..... *See Berl. Tel. Vr. Z. and Tel. Vr. Z.*
- Bern Mt.**..... Mittheilungen der Naturforschenden Gesellschaft in Bern. Bern. 1843— B.M.; Camb.P.S.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; N.H.M.; R.S.; S.K.
- Béziers S. Sc. Bil.**..... Bulletin de la Société d'Étude des Sciences Naturelles de Béziers. Béziers. 1876— N.H.M.; R.S.i.
- Birm. Ph. S. P.**..... Proceedings of the Birmingham Philosophical Society. Birmingham. 1876— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Edinb.U.i.; Geol.M.; Glasg.P.S.; Glasg.U.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.i.; R.Geogr.S.i.; R.S.; U.C.L.i.
- Bl. Cb.**..... Biologisches Centralblatt. Erlangen, Leipzig. 1881— B.M.; Camb.U.; Edinb.R.S.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- Bil. As.**..... Bulletin Astronomique publié sous les Auspices de l'Observatoire de Paris. Paris. 1884— B.M.; Camb.U.; Edinb.R.S.; Oxon.R.; R.A.S.; S.K.
- Bil. Phm.**..... Bulletin de Pharmacie; Parmentier, etc. Paris. 1809—14. [Continued as: Journal de Pharmacie, 1815—41.] B.M.; Camb.U.; Chem.S.; Oxon.B.; Pharm.S.; P.O.; R.C.Surg.; R.S.
- Bil. Sc. Fr. Blg.**..... Bulletin Scientifique de la France et de la Belgique. London, Paris, Berlin. 1888— [Continuation of: Bulletin Scientifique...du Nord et des pays voisins, 1869—87.] Camb.U.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.R.
- Bil. Sc. Mth.**..... Bulletin des Sciences Mathématiques. Paris. 1885— [Continuation of: Bulletin des Sciences Mathématiques et Astronomiques, 1870—84.] Camb.U.; Dub.T.C.; Edinb.R.S.; Glasg.U.; Math.S.; Oxon.B.; Oxon.R.; R.A.S.; R.S.; S.K.; U.C.L.
- Bil. Sc. Mth. As.**..... Bulletin des Sciences Mathématiques et Astronomiques. Paris. 1870—84. [Continued as: Bulletin des Sciences Mathématiques, 1885—] B.M.; Camb.U.; Edinb.R.S.; Glasg.U.; Math.S.; Oxon.R.; R.A.S.i.; R.S.; S.K.; U.C.L.i.
- Bil. Sc. Nord.**..... Bulletin Scientifique, Historique et Littéraire du Département du Nord et des pays voisins. Lille.

List of Serial Publications

- 1869—87. [*Continued as:* Bulletin scientifique de la France et de la Belgique, 1888—] Camb.U.; Geol.M.; Glasg.P.S.i.
- Bil. V. It.** *Bullettino del Vulcanismo Italiano.* Roma.
- 1874—97. Camb.U.; Geol.M.; Glasg.P.S.i.
- Bode As. Jb.** { Astronomisches Jahrbuch, nebst einer Sammlung der neuesten in die astronomischen Wissenschaften einschlagenden Abhandlungen, Beobachtungen, und Nachrichten; Bode. Berlin.
- Bode Jb.** { 1776—1829. Dub.T.C.i.; Glasg.U.; R.A.S.; R.S.i.
- Böhm. Gs. Ab.**..... { Abhandlungen der K. Böhmisches Gesellschaft der Wissenschaften. Prag.
- 1785—1892. B.M.i.; Camb.P.S.; Camb.U.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.; R.C.Surg.i.; R.S.i.; S.K.i.
- See **Frag Ab.**
- Böhm. Gs. Ws. Jbr.** Jahresbericht der Königl. Böhm. Gesellschaft der Wissenschaften. Prag.
- 1876— B.M.i.; Camb.P.S.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; R.S.
- Bologna Ac. Mm.** { Memorie della Accademia delle Scienze dell' Istituto di Bologna. Bologna.
- Bologna Ac. Sc. Mm.** ... { 1850— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; N.H.M.; Oxon.B.; R.A.S.; R.S.; S.K.i.; U.C.L.i.
- Bologna Mm. Ac.** {
- Bologna Mm. Ac. Sc.** ... { Memorie dell' Istituto Nazionale Italiano: Classe di Fisica e di Matematica. Bologna.
- Bologna Mm. I. It.** {
- 1806—13. B.M.; Camb.U.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.i.; N.H.M.; Oxon.B.i.; R.C.Surg.; R.S.i.
- Bologna Mm. S. Md.** ... { Memorie della Società Medica di Bologna. Bologna.
1807. Glasg.P.S.i.
- Bologna N. A.**..... { Nuovi Annali delle Scienze naturali; Alessandrini, Bertolini, Gherardi, e Ranzani. Bologna.
- 1838—54. Camb.U.; Geol.S.i.; N.H.M.; Oxon.B.i.; R.Geogr.S.i.; R.S.
- See **N. A. Sc. Nt.**
- Bologna N. Cm.** { Novi Commentarii Academiae Scientiarum Instituti Bononiensis. Bononia.
- 1834—49. Camb.U.; Edinb.R.S.; N.H.M.; Oxon.B.; R.S.
- Bologna Opusc. Sc.** { Opuscoli Scientifici. Bologna.
- 1817—23. B.M.; Camb.U.; Edinb.R.S.i.; N.H.M.; R.C.Surg.i.; S.K.
- Bologna Opusc. Sc. N. Col.** { Nuova collezione d' Opuscoli Scientifici. Bologna.
- 1824—25. Camb.U.
- Bologna Rd.**..... { Rendiconto delle Sessioni dell' Accademia delle Scienze dell' Istituto di Bologna. Bologna.
- 1851— B.M.; Camb.U.i.; Dub.T.C.; Edinb.R.S.i.; Glasg.U.i.; N.H.M.i.; Oxon.B.i.; R.A.S.i.; R.S.i.; U.C.L.i.
- Bône Ac. Hip. Bil.**..... { Bulletin de l'Académie d'Hippone. Bône.
- 1865— Camb.U.; N.H.M.i.
- Bonn Cor.-Bl. NH. Vr.** ... { Correspondenzblatt des Naturhistorischen Vereins für Rheinland und Westphalen. Bonn.
- Bonn NH. Vr. Cor.-Bl.** ... { 1844— Dub.R.D.S.; Dub.R.I.A.i.; Glasg.P.S.i.; Linn.S.; N.H.M.
- Bonn NH. Vr. Vh.** { Verhandlungen des Naturhistorischen Vereins der Preussischen Rheinlande, Westfalens und des Reg.-Bezirks Osnabrück. Bonn.
- 1844— B.M.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.R.; R.C.Surg.i.; R.S.i.; S.K.
- See **Bonn Vh. NH. Vr. and Rheinl. Westphal. Vh.**
- Bonn Niedr. Gs. Sb.** { Sitzungsberichte der Niederrheinischen Gesellschaft für Natur- und Heilkunde zu Bonn. Bonn.
- Bonn Sb. Niedr. Gs.** { 1854— B.M.i.; Camb.U.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.R.; R.S.i.; S.K.
- See **Rheinl. Westphal. Sb.**
- Bonn Vh. NH. Vr.**..... { See **Bonn. NH. Vr. Vh. and Rheinl. Westphal. Vh.**
- Bordeaux Ac. Act.**..... { Recueil des Actes de l'Académie des Sciences, Belles-Lettres, et Arts de Bordeaux. Bordeaux.
- 1839— B.M.i.; Dub.R.I.A.i.; Dub.T.C.i.; N.H.M.i.; Oxon.B.i.; R.S.i.
- See **Bordeaux Act.**

List of Serial Publications

- Bordeaux Ac. Sc. Sé. Pbl.** } Séances publiques de l'Académie Royale des Sciences, Belles-Lettres,
Bordeaux Ac. Sé. Pbl. ... } et Arts de Bordeaux. Bordeaux.
 1819—37. N.H.M.
- Bordeaux Act.** } See **Bordeaux Ac. Act.**
Bordeaux Act. Ac. Sc. ... }
Bordeaux J. Md. } Journal de Médecine de Bordeaux. Bordeaux.
 1843?—61. R.C.Surg.i.
- Bordeaux Mm. S. Sc. ...** } Mémoires de la Société des Sciences Physiques et Naturelles de
Bordeaux Mm. S. Sc. Ps. } Bordeaux. Bordeaux.
 1855— Camb.P.S.; Dub.R.D.S.; Dub.T.C.; Edinb.R.S.; Geol.S.;
 Glasg.P.S.; Linn.S.; Math.S.; N.H.M.; Oxon.B.; R.A.S.; R.S.;
 S.K.
 See **Bordeaux S. Sc. Mm.**
- Bordeaux Obs. A.** } Annales de l'Observatoire de Bordeaux. Paris, Bordeaux.
 1885— Dub.R.D.S.; R.A.S.; R.S.
- Bordeaux S. L. Act.** } Actes de la Société Linnéenne de Bordeaux. Bordeaux.
 1830— [Continuation of: Bulletin d'Histoire Naturelle de la
 Société, etc., 1826—29.] B.M.; Camb.U.; Dub.R.D.S.i.; Dub.
 R.I.A.i.; Geol.S.i.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; R.S.i.;
 U.C.L.i.
- Bordeaux S. Md. Mm.** } Mémoires et Bulletins de la Société Medico-Chirurgicale des Hôpitaux
 et Hospices de Bordeaux. Paris, Bordeaux.
 1866—71.
 Mémoires et Bulletins de la Société de Médecine et de Chirurgie de
 Bordeaux. Paris, Bordeaux.
 1872— Dub.R.D.S.; R.S.
- Bordeaux S. Sc. Mm. ...** } See **Bordeaux Mm. S. Sc.**
Bordeaux S. Sc. FV. } Procès-Verbaux des Séances de la Société des Sciences Physiques
 et Naturelles de Bordeaux. Paris, Bordeaux.
 1894— Camb.P.S.; Dub.R.D.S.i.; Edinb.R.S.; Math.S.; N.H.M.;
 R.A.S.; R.S.
- Bost. Am. Ac. Mm.** } Memoirs of the American Academy of Arts and Sciences. Cambridge,
Bost. Mm. Am. Ac. } Boston.
 1785— B.M.i.; Camb.P.S.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.;
 Dub.T.C.i.; Edinb.R.S.; Geol.S.i.; I.CE.i.; Linn.S.; N.H.M.;
 Oxon.R.; P.O.i.; R.A.S.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
 See **Am. Ac. Mm.**
- Bost. S. Md. Sc. J.** } Journal of the Boston Society of Medical Sciences. Boston.
 1897— Glasg.P.S.i.; R.C.Surg.
- Bost. S. NH. P.** } Proceedings of the Boston Society of Natural History. Boston.
 1841— B.M.; Camb.P.S.i.; Camb.U.; Dub.R.I.A.; Edinb.R.S.;
 Edinb.U.i.; Geol.S.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; Oxon.R.;
 R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Brain** } Brain: a Journal of Neurology. London, New York.
 1878— B.M.; Camb.U.; Glasg.P.S.i.; Oxon.B.; Oxon.R.;
 R.C.Surg.; U.C.L.
- Br. Archt. I. Fp.** } Papers read at the Royal Institute of British Architects. London.
 1854—78. B.M.; Camb.U.i.; Edinb.R.S.i.; P.O.; S.K.; U.C.L.i.
 See **Br. Archt. Fp.**
- Br. Archt. I. T.** } Transactions of the Institute of British Architects of London.
 London.
 1836—42; 1879—92. B.M.i.; Camb.U.; Dub.T.C.; Edinb.R.S.i.;
 Edinb.U.i.; I.CE.i.; Oxon.B.; P.O.; R.S.; U.C.L.i.
 See **Br. Archt. T.**
- Br. Archt. J.** } Journal of the Royal Institute of British Architects. London.
 1885— Camb.U.i.; Edinb.U.i.; Glasg.U.i.; I.CE.; Oxon.B.; P.O.;
 U.C.L.
- Br. Archt. Fp.** } See **Br. Archt. I. Fp.**
Br. Archt. Fp. (& T.) }
Br. Archt. T. } See **Br. Archt. I. T.**
- Braunsch. Vr. Nt. Jbr.** } Jahresbericht des Vereins für Naturwissenschaft zu Braunschweig.
 Braunschweig, Altenburg.
 1879— Dub.R.I.A.i.; Edinb.R.S.; Linn.S.; N.H.M.; R.S.
- Brem. Ab.** } Abhandlungen herausgegeben vom Naturwissenschaftlichen Vereine
 zu Bremen. Bremen.
 1868— B.M.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.;
 Linn.S.; N.H.M.; R.S.; S.K.

List of Serial Publications

- Brescia At. Cm.** { Commentarj della Accademia di Scienze, Lettere, Agricoltura ed
Brescia Cm. { Arti del Dipartimento del Mella. Brescia.
Brescia Cm. Aten. { 1808—11.
 { Commentarj dell' Ateneo di Brescia. Brescia.
 { 1812— B.M.; Camb.U.; N.H.M.i.; Oxon.B.i.; R.S.i.
Bresl. Jbr. Schl. Gs. { Jahresbericht der Schlesischen Gesellschaft für vaterländische
Bresl. Schl. Gs. Jbr. { Cultur. Breslau.
 { 1850— [Continuation of: Uebersicht der Arbeiten, etc., 1824—49.]
 { Dub.R.D.S.i.; Dub.R.I.A.i.; Geol.S.i.; N.H.M.; R.C.Surg.i.;
 { R.S.; S.K.
Bresl. Schl. Gs. Übs. { Uebersicht der Arbeiten und Veränderungen der Schlesischen
 { Gesellschaft für vaterländische Cultur. Breslau.
 { 1824—49. [Continued as: Jahresbericht, etc., 1850—] B.M.; Geol.
 { S.i.; N.H.M.; R.S.; S.K.
Brest S. Ac. Bil. { Bulletin de la Société Académique de Brest. Brest.
 { 1858— B.M.; Camb.U.i.; S.K.i.
Brighton NH. S. Rp. { Brighton and Sussex Natural History and Philosophical Society.
 { Annual Report. Brighton.
 { 1855— Geol.S.i.; Glasg.P.S.i.; N.H.M.; R.S.i.
Bristol Nt. S. P. { Proceedings of the Bristol Naturalists' Society. Bristol.
 { 1866— B.M.i.; Camb.U.i.; Geol.M.; Geol.S.i.; Linn.S.; N.H.M.;
 { R.C.Surg.i.; R.S.i.; U.C.L.i.
Br. Met. S. P. { Proceedings of the [British] Meteorological Society. London.
 { 1861—71. [Continued as: Quarterly Journal of the [Royal] Meteorological
 { Society, 1872—] Camb.U.; Dub.R.D.S.; Edinb.R.S.;
 { Glasg.P.S.i.; M.O.; Oxon.B.; R.A.S.; R.S.; S.K.
Brosche Z. { Zeitschrift für Natur- und Heilkunde; Brosche, Carus, Choulant, etc.
 { Dresden.
 { 1820—30. Edinb.U.i.; Glasg.P.S.i.; R.C.Surg.; R.S.; U.C.L.i.
Brown-Séguard J. Pl. { Journal de la Physiologie de l'Homme et des Animaux; Brown-
 { Séguard. Paris.
 { 1858—65. [Continued as: Archives de Physiologie, etc., 1868—98.]
 { B.M.; Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.; Oxon.B.;
 { Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
Br. Phm. Conf. P. { Proceedings of the British Pharmaceutical Conference. London.
 { 1864—69. [Continued as: Transactions, etc., 1870—] B.M.;
 { Camb.U.i.; Chem.S.; Glasg.P.S.i.; Oxon.B.; Pharm.S.; R.S.
Brugnatelli G. { Giornale di Fisica, Chimica, e Storia Naturale; Brugnatelli, etc.
 { Pavia.
 { 1808—27. B.M.; Camb.U.; Dub.T.C.; N.H.M.i.; Oxon.B.; P.O.;
 { R.C.Surg.; R.S.
Brünn Jh. Nw. Sect. { Jahreshft der Naturwissenschaftlichen Section der K. K. Mährisch-
 { Schlesischen Gesellschaft für Ackerbau, Natur- und Landes-
 { Kunde. Brünn.
 { 1858. S.K.
Brünn Mt. { Mittheilungen der kaiserlich-königlichen Mährisch-Schlesischen
 { Gesellschaft zur Beförderung des Ackerbaues, der Natur- und
 { Landeskunde in Brünn. Brünn.
 { 1821—91. B.M.; R.S.i.; S.K.i.
Brünn Notb. { Notizen-Blatt der Historisch-statistischen Section der K. K. Mährisch-
 { Schlesischen Gesellschaft zur Beförderung des Ackerbaues, der
 { Natur- und Landes-Kunde in Brünn. Brünn.
 { 1855— B.M.; Glasg.P.S.i.; S.K.
Brünnow As. Not. { Astronomical Notices; Brünnow. Ann Arbor, Mich.
 { 1858—62. R.A.S.; R.S.i.
Brünn Vh. { Verhandlungen des Naturforschenden Vereins zu Brünn. Brünn.
 { 1863— Camb.U.i.; Dub.R.I.A.; Linn.S.; N.H.M.; R.S.
Brux. Ac. Bil. { Bulletins de l'Académie Royale des Sciences, etc., de Belgique.
 { Bruxelles.
 { 1834— B.M.i.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.;
 { Edinb.R.S.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.;
 { Math.S.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.; R.C.Surg.;
 { R. Geogr.S.i.; R.S.; S.K.i.
See Brux. Bil. Ac.
Brux. Ac. Cent. Anniv. { Centième Anniversaire de Fondation (1772—1872) de l'Académie
 { Royale de Belgique. Bruxelles.
 { 1872. B.M.; Camb.U.; Chem.S.; Dub.R.I.A.; Edinb.R.S.; Geol.S.;

List of Serial Publications

- Glasg. P.S.; Glasg. U.; I.CE.; Linn.S.; N.H.M.; P.O.; R.A.S.;
R.Geogr.S.; R.S.; S.K.
- Brux. Ac. Md. Bil.**..... Bulletin de l'Académie Royale de Médecine de Belgique à Bruxelles.
Bruxelles.
1841— B.M.; Camb.U.; Dub.R.D.S.; Dub.T.C.i.; Glasg.P.S.i.;
Oxon.B.(R.); R.C.Surg.i.; R.S.
- Brux. Ac. Md.
(Mm. Sav. Étr.)**... Mémoires de l'Académie Royale de Médecine de Belgique: Mémoires
des Concours et des Savants Étrangers. Bruxelles.
1847— B.M.; Camb.U.; Glasg.P.S.i.; Oxon.B.(R.); R.C.Surg.; R.S.
- Brux. Ac. Mm.** Mémoires de l'Académie Royale des Sciences, des Lettres et des
Beaux-Arts de Belgique. Bruxelles.
1820— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.;
Edinb.R.S.i.; Edinb.U.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.;
Oxon.B.(R.); P.O.i.; R.A.S.i.; R.C.Surg.; R.Geogr.S.i.; R.S.;
S.K.i.
- Brux. Ac. Sc. Mm.**..... }
See **Brux. Mm. Ac. Sc.**
Annales des Travaux Publiés de Belgique. Bruxelles.
1843— B.M.; I.CE.i.; P.O.; S.K.i.
- Brux. A. Tr. Pbl.** Annales des Universités de Belgique. Bruxelles.
1842—63. Camb.U.; Oxon.B.; P.O.; R.S.i.
- Brux. A. Un.** }
See **Brux. Ac. Bil.**
Bulletin Belge de la Photographie. Bruxelles.
1862—81. B.M.; Glasg.P.S.i.; P.O.
- Brux. Bil. Ac.** }
Brux. Bil. Pht. }
Journal de la Société Centrale d'Agriculture de Belgique. Bruxelles.
1854— B.M.; Glasg.P.S.i.; P.O.
- Brux. J. S. Ag.** }
See **Brux. Ac. Mm.**
Mémoires Couronnés et Mémoires des Savants Étrangers, publ. par
l'Acad. Roy. des Sciences, etc. de Belgique. 4to. Bruxelles.
1818— B.M.i.; Camb.P.S.; Camb.U.; Dub.T.C.; Edinb.R.S.i.;
Edinb.U.; Geol.S.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.;
Oxon.B.(R.); P.O.i.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.i.
- Brux. Mm. Ac. Sc.** }
Brux. Mm. Cour. 4°..... }
Mémoires Couronnés et autres Mémoires, publ. par l'Acad. Roy. des
Sciences, etc. de Belgique. 8vo. Bruxelles.
1840— B.M.; Camb.P.S.; Camb.U.; Dub.T.C.; Edinb.R.S.;
Geol.S.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.;
P.O.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.
- Brux. Mm. Cour. 8°**..... }
Bulletin de la Société Belge d'Astronomie. Comptes Rendus des
Séances mensuelles de la Société et Revue des Sciences d'Observation,
Astronomie, Météorologie, Géodésie et Physique du Globe.
Bruxelles.
1896— R.A.S.
- Brux. S. Blg. As. Bil.** ... Bulletin de la Société Belge de Géologie, de Paléontologie et
d'Hydrologie. Bruxelles.
1887— B.M.; Geol.M.; Geol.S.; Glasg.P.S.i.; N.H.M.; R.S.; S.K.;
U.C.L.
- Brux. S. Blg. Gl. Bil.**..... }
Annales de la Société Belge de Microscopie. Bruxelles.
1875— Camb.P.S.i.; Glasg.P.S.i.; N.H.M.; P.O.i.
- Brux. S. Blg. Mcr. A.** ... }
Bulletin de la Société Belge de Microscopie. Bruxelles, Paris.
1875— Camb.P.S.i.; Glasg.P.S.i.; N.H.M.; P.O.i.
- Brux. S. Sc. A.** }
Annales de la Société Scientifique de Bruxelles. Bruxelles.
1877— B.M.; Dub.N.L.I.i.; Edinb.R.S.; I.CE.i.; N.H.M.
- Bt. Ch.** }
Botanisches Centralblatt. Cassel.
1880— B.M.; Camb.U.; Edinb.R.S.i.; Glasg.P.S.i.; Glasg.U.;
Linn.S.; N.H.M.; R.S.; S.K.; U.C.L.
- Bt. Gz.** }
The Botanical Gazette. Crawfordsville.
1875— Glasg.P.S.i.; Glasg.U.i.; Linn.S.i.; N.H.M.; Pharm.S.i.;
S.K.i.; U.C.L.i.
- Bt. Not.**..... }
Botaniska Notiser. Lund.
1839— B.M.; Camb.U.; Glasg.P.S.i.; Linn.S.; N.H.M.
- Btr. An. Pl.** }
Beiträge zur Anatomie und Physiologie; Eckhard. Giessen.
1858—88. Camb.U.; Edinb.U.; N.H.M.; Oxon.B.; R.S.; U.C.L.i.
- Btr. Geops.** }
Beiträge zur Geophysik. Stuttgart, Leipzig.
1887— Camb.U.; Edinb.U.; Geol.M.; Geol.S.; M.O.; Oxon.B.;
R.Geogr.S.; R.S.; S.K.
- Bt. Ztg.**..... }
Botanische Zeitung. Berlin, Leipzig.
1843— B.M.; Camb.U.; Edinb.R.S.; Edinb.U.i.; Glasg.P.S.i.;
Glasg.U.; Linn.S.; N.H.M.; R.S.; S.K.; U.C.L.i.

List of Serial Publications

- Bucarest Ac. Rom. A.** ... Analele Academiei Romane. Bucuresci.
1880— B.M.; Camb.U.i.; M.O.i.; N.H.M.i.
- Bucarest S. Sc. Bl.** Buletinul Societății de Științe Fizice (Fizica, Chimia și Mineralogia) din Bucuresci-România.
[1892]—[1896].
Buletinul Societății de Științe din Bucuresci-România. Bucuresci.
(Bulletin de la Société des Sciences Bucarest-Roumanie.)
[1897]— Glasg.P.S.; Glasg.U.; N.H.M.; R.S.i.; U.C.L.i.
- Buda Tudománytár** Tudománytár Közre bocsátja a Magyar Tudós Társaság. [Repertory of Science.] Budan.
1833—48. B.M.; Glasg.P.S.i.; R.S.i.
- Cadiz Period. M. Ci.** Periódico mensual de Ciencias matemáticas y físicas. Cadiz.
1848. B.M.; R.S.
- Caen Ac. Mm.** Mémoires de l'Académie des Sciences, Arts et Belles-Lettres de Caen. Caen.
- Caen Mm. Ac.** 1811— B.M.i.; Camb.U.i.; Dub.T.C.i.; N.H.M.i.; Oxon.B.i.; R.S.i.; S.K.i.
- Caen Mm. S. L.** Mémoires de la Société Linnéenne du Calvados [de Normandie]. Caen.
1824— B.M.; Camb.U.; Edinb.U.i.; Geol.M.; Geol.S.i.; Linn.S.i.; N.H.M.; R.S.i.; U.C.L.i.
- Caen S. L. Bl.** Bulletin de la Société Linnéenne de Normandie. Caen.
1855— B.M.; Camb.U.; Geol.S.i.; Glasg.P.S.i.; Linn.S.; N.H.M.; R.S.i.; U.C.L.i.
- Caen Tr.** Précis des Travaux de la Société d'Agriculture, etc. de Caen. Caen.
1811—58. B.M.; Camb.U.i.
- Cæs. Leop. Ac. N. Acta.** Nova Acta physico-medica Academiae Cæs. Leopoldino-Carolinæ Naturæ Curiosorum. Erlangen, Bonn, Breslau.
1758— Camb.P.S.; Camb.U.; Chem.S.i.; Dub.T.C.; Edinb.R.S.i.; Edinb.U.; Geol.S.i.; Glasg.U.; Linn.S.i.; N.H.M.; Oxon.R.; Pharm.S.i.; R.A.S.i.; R.C.Surg.; R.S.; S.K.i.; U.C.L.i.
- Calc. J. NH.** See **Ac. Cæs. Leop. N. Acta and Ac. Nt. C. N. Acta.**
The Calcutta Journal of Natural History. Calcutta.
1841—48. B.M.; Camb.U.; Dub.R.D.S.; Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.R.; P.O.; R.S.; S.K.
- Calc. QJ.** Quarterly Journal of the Medico-Physical Society. Calcutta.
1857. Edinb.U.i.; Glasg.P.S.i.
- Calif. Ac. P.** Proceedings of the California Academy of Natural Sciences. San Francisco.
1854— B.M.i.; Camb.P.S.i.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.i.; Glasg.P.S.; Linn.S.i.; N.H.M.; P.O.i.; R.Geogr.S.; R.S.i.; S.K.i.
- Camb. and Dubl. Mth. J.** The Cambridge and Dublin Mathematical Journal; Thomson and Ferrers. Cambridge.
1846—54. B.M.; Camb.P.S.i.; Camb.U.; Dub.T.C.i.; Edinb.R.S.; Edinb.U.; Glasg.U.; N.H.M.; Oxon.B.; R.S.; U.C.L.
- Camb. (M.) Mth. M.** The Mathematical Monthly; Runkle. Cambridge (Massachusetts).
1859—61. B.M.; Camb.U.; Oxon.B.; P.O.; R.A.S.i.; R.S.; U.C.L.
- Camb. Mth. J.** See **Camb. (U.S.) Mth. M.**
The Cambridge Mathematical Journal. London.
1839—45. B.M.; Camb.P.S.; Camb.U.; Dub.T.C.; Edinb.U.; Glasg.U.; Math.S.i.; Oxon.B.i.; R.S.; U.C.L.
- Camb. Ph. S. P.** Proceedings of the Cambridge Philosophical Society. Cambridge.
1866— B.M.i.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; I.CE.; Linn.S.i.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.i.; Oxon.R.i.; P.O.; R.A.S.i.; R.C.Surg.i.; R.S.; S.K.; U.C.L.
- Camb. Ph. S. T.** Transactions of the Cambridge Philosophical Society. Cambridge.
1822— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.T.C.i.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.i.; Linn.S.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Camb. (U.S.) Mth. M.** See **Camb. (M.) Mth. M.**
- Cantù Cronaca** Cronaca: Giornale di Scienze, Lettere, Arti, Economia, Industria; Cantù. Milano.
1855—58. Glasg.P.S.i.; R.S.

List of Serial Publications

- Card. Nt. S. T.**..... Cardiff Naturalists' Society. Reports and Transactions. Cardiff.
1868— B.M.i.; Camb.U.i.; Dub.R.D.S.; Geol.M.i.; Geol.S.i.;
Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.B.i.; R.S.i.
- Carl Epm.**..... Repertorium für physikalische Technik, für mathematische und
astronomische Instrumentenkunde; Carl. München.
1865—82. [*Continued as*: Repertorium der Physik; Exner, 1883—91.]
B.M.; Camb.U.i.; Dub.N.L.I.i.; I.CE.i.; M.O.; Oxon.R.; P.O.;
R.S.; S.K.
- Carlsruhe Vh. Nw. Vr.**... Verhandlungen des Naturwissenschaftlichen Vereins. Carlsruhe.
1864— B.M.i.; Dub.R.I.A.; Geol.S.i.; N.H.M.
See Karlsruhe Nt. Vr. Vh.
- Časopis** Časopis pro Pěstování Matematiky a Fysiky. Prag.
1872— B.M.
- Catania Ac. Gioen. At.**... Atti dell' Accademia Gioenia di Scienze Naturali in Catania. Catania.
1825— B.M.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.i.;
Linn.S.i.; Math.S.i.; N.H.M.; Oxon.B.; R.S.; S.K.i.
See Catania At. Ac. Gioen.
- Catania Ac. Gioen. Bil.**... Bullettino mensile della Accademia Gioenia di Scienze Naturali in
Catania. Catania.
1888— Dub.R.I.A.; Edinb.R.S.; Math.S.i.; N.H.M.; R.S.
- Catania At. Ac. Gioen.**... *See Catania Ac. Gioen. At.*
- Cattaneo Bb. Farm.** Biblioteca di Farmacia, Chimica, etc.; Cattaneo. Milan.
1834—45. [*Continuation of*: Giornale, etc., 1824—33.] B.M.
- Cattaneo G. Farm.**..... Giornale di Farmacia, etc.; Cattaneo. Milan.
1824—33. [*Continued as*: Biblioteca, etc., 1834—45.] B.M.
- Cb. Md. Ws.**..... Centralblatt für die Medicinischen Wissenschaften. Berlin.
1863— B.M.; Camb.U.i.; Edinb.U.; Glasg.P.S.i.; Glasg.U.i.;
Oxon.R.; R.C.Surg.; R.S.i.; U.C.L.i.
- Cb. Mn.** Centralblatt für Mineralogie, Geologie und Palaeontologie. Stuttgart.
1900— B.M.; Camb.U.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.;
Glasg.P.S.i.; Glasg.U.; N.H.M.; Oxon.R.; R.S.; S.K.
- Cb. Pl.**..... Centralblatt für Physiologie. Leipzig, Wien.
1887— B.M.; Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.;
Oxon.R.; R.C.Surg.; U.C.L.i.
- C. CB.** Chemisches Central-Blatt. Leipzig.
1856— Camb.U.i.; Chem.S.i.; N.H.M.; Oxon.R.; Pharm.S.i.;
P.O.; R.S.; S.K.; U.C.L.i.
- CE. I. P.**..... Minutes of Proceedings of the Institution of Civil Engineers, con-
taining Abstracts of the Papers and of the Discussions. London.
1837— B.M.; Camb.P.S.; Camb.U.; Dub.R.C.S.; Dub.R.D.S.;
Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.i.;
Glasg.U.; I.CE.; Oxon.B.; Oxon.R.i.; P.O.; R.Geogr.S.; R.S.;
S.K.; U.C.L.
- See I. CE. P.*
- CE. I. T.**..... Transactions of the Institution of Civil Engineers. London.
1836—42. B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.;
Dub.R.D.S.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.U.; I.CE.;
Oxon.B.; Oxon.R.; P.O.; R.Geogr.S.; R.S.; U.C.L.i.
- Cg. Int. Chron.** Congrès International de Chronométrie. Comptes Rendus des
Travaux, Procès-Verbaux, Rapports et Mémoires. Paris.
1889, 1900. Camb.U.; R.S.i.; S.K.
- Cg. Int. Hyg. C. R.**..... Congrès International d'Hygiène et de Demographie. Comptes-
Rendus [Arbeiten, Transactions, Actas]. Paris, etc.
1878— Glasg.P.S.i.; I.CE.i.; Oxon.R.i.; P.O.i.; R.C.Surg.i.
- Cg. Int. Md. C. R.** Comptes-Rendus [Atti, Verhandlungen, Transactions] du Congrès
International de Médecine. Paris, etc.
- Cg. Md. Int. At.** 1867— B.M.; Camb.U.i.; Glasg.P.S.i.; Oxon.R.; R.C.Surg.
See Int. Md. Cg. T. and Int. Md. Cg. Vh.
- C. Gz.** Chemical Gazette. London.
1842—59. B.M.; Camb.U.; Chem.S.; Dub.T.C.i.; Edinb.U.i.;
I.CE.i.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.; P.O.i.; S.K.;
U.C.L.
- Chambéry Mm. Ac. Sav.** Mémoires de la Société Académique de Savoie. Chambéry.
1825— Camb.U.; Dub.R.I.A.; Dub.T.C.; N.H.M.; Oxon.B.; R.S.i.
See Sav. Ac. Mm.
- Charleston Md. J.** Charleston Medical Journal and Review; Gaillard, de Saussure, etc.
Charleston.

List of Serial Publications

- 1848—60. [*Continuation of*: The Southern Journal of Medicine, etc., 1846—47.] B.M.
Charleston South. J. Md. The Southern Journal of Medicine, etc.; Smith and Sinkler. Charleston.
 1846—47. [*Continued as*: Charleston Medical Journal and Review, 1848—60.] B.M.
Chemist The Chemist. London.
 1840—58. B.M.; Camb.U.i.; Chem.S.; Dub.T.C.i.; Edinb.U.i.; I.CE.i.; Oxon.B.; Pharm.S.; P.O.; R.C.Surg.; R.S.; S.K.i.
Chemnitz B. Bericht der Naturwiss. Gesellsch. zu Chemnitz. Chemnitz.
 1859— Edinb.R.S.i.; N.H.M.; R.S.i.
Cherb. Mm. S. Ac. Mémoires de la Société Académique de Cherbourg. Cherbourg.
 1835— B.M.; Camb.U.i.; Edinb.R.S.i.; N.H.M.i.; Oxon.B.i.
Cherb. Mm. S. Sc. Mémoires de la Société Impériale des Sciences Naturelles de Cherbourg. Cherbourg.
Cherb. S. Sc. Mm. }
Cherb. S. Sc. Nt. Mm. } 1852— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; I.CE.i.; Linn.S.; N.H.M.; R.A.S.i.; R.S.; S.K.
Chil S. Sc. Act. Actes de la Société Scientifique du Chili (Sociedad científica de Chile). Santiago.
 1892— B.M.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.; Linn.S.i.; N.H.M.; R.S.i.
Christiania F. Forhandlinger i Videnskabs-Selskabet i Christiania. Christiania.
 1859— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.i.; Glasg.P.S.; N.H.M.; Oxon.B.; R.Geogr.S.i.; R.S.; U.C.L.i.
Christiania Skr. (Mth.-Nt. Kl.) Skrifter udgivne af Videnskabs-selskabet i Christiania. Mathematisk-Naturvidenskabelig Klasse. Christiania.
 1894— B.M.; Camb.P.S.; Dub.R.I.A.i.; Edinb.R.S.; Glasg.P.S.; N.H.M.; Oxon.B.; R.Geogr.S.; R.S.; U.C.L.i.
Ciel et Terre Ciel et Terre. Revue populaire d'Astronomie, de Météorologie et de Physique du Globe. Bruxelles.
 1881— B.M.; Edinb.R.S.i.; M.O.; R.A.S.
Cincin. S. NH. J. The Journal of the Cincinnati Society of Natural History. Cincinnati.
 1878— B.M.; Camb.P.S.; Edinb.R.S.; Geol.S.i.; N.H.M.; R.S.
Civing. Der Civilingenieur: Zeitschrift für das Ingenieurwesen. Freiberg, Leipzig.
 1854—96. B.M.; Camb.U.i.; Dub.R.I.A.i.; I.CE.; P.O.
Clermont Mm. Ac. Sc. Mémoires de l'Académie des Sciences, Belles Lettres, et Arts de Clermont-Ferrand. Clermont-Ferrand.
 1859— [*Continuation of*: Annales Scientifiques, etc., 1828—58.] B.M.; Camb.U.; Glasg.P.S.i.; R.S.i.
C. N. The Chemical News and Journal of Physical Science. London.
 1860— Camb.P.S.; Camb.U.i.; Chem.S.; Dub.N.L.I.i.; Dub.R.C.S.i.; Dub.R.D.S.i.; Edinb.U.; Geol.M.; Geol.S.i.; Glasg.P.S.; I.CE.i.; N.H.M.; Oxon.B.i.; Oxon.R.; Pharm.S.; P.O.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
Cn. I. P. Proceedings of the Canadian Institute, Toronto. Toronto.
 1879—90; 1897— [*Continuation of*: The Canadian Journal, 1853—78.] B.M.; Camb.P.S.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.i.; Edinb.U.; Geol.S.i.; Glasg.P.S.; I.CE.i.; Linn.S.; Math.S.i.; N.H.M.; Oxon.B.; P.O.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.i.
Cn. I. T. Transactions of the Canadian Institute. Toronto.
 1889— B.M.; Camb.P.S.; Dub.R.D.S.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.; I.CE.i.; Linn.S.; Math.S.i.; N.H.M.; P.O.; R.A.S.; R.Geogr.S.; R.S.
Cn. J. The Canadian Journal of Industry, Science, and Art. Toronto.
 1853—78. [*Continued as*: Proceedings of the Canadian Institute, 1879—] B.M.i.; Dub.R.I.A.; Edinb.R.S.; Geol.S.; I.CE.; N.H.M.; P.O.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.i.
Cn. Nt. The Canadian Naturalist and Geologist, and Proceedings of the Natural History Society of Montreal. Montreal.
 1857—83. [*Continued as*: The Canadian Record of Science, 1884—] B.M.; Camb.U.i.; Edinb.U.i.; Geol.S.i.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.; R.S.; U.C.L.i.
Cn. Rc. Sc. The Canadian Record of Science, including the Proceedings of the

List of Serial Publications

- Natural History Society of Montreal, and replacing the Canadian Naturalist. Montreal.
- 1884— [Continuation of: The Canadian Naturalist, 1857—83.]
B.M.; Camb.U.i.; Dub.R.D.S.; Edinb.R.S.; Geol.S.i.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; R.S.; S.K.i.
- Cn. R. S. P. & T.** Proceedings and Transactions of the Royal Society of Canada. Montreal.
1883— Camb.P.S.; Camb.U.; Chem.S.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Geol.M.i.; Geol.S.; Glasg.P.S.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.
- Coimbra I.** O Instituto, jornal scientifico e litterario; Forjaz. Coimbra.
1853— B.M.; R.Geogr.S.i.
- Colmar S. H. Nt. Bil.** ... Bulletin de la Société d'Histoire Naturelle de Colmar. Colmar.
1860—85. N.H.M.
- Colo. Sc. S. P.** Proceedings of the Colorado Scientific Society. Denver.
1883— Camb.P.S.i.; Chem.S.i.; Edinb.R.S.; Geol.S.i.; Glasg.P.S.; N.H.M.; P.O.
- Con. des Temps** Connaissance des Temps, à l'usage des Astronomes et des Navigateurs. Paris.
1679— B.M.i.; Camb.U.; Dub.T.C.; Glasg.U.i.; I.CE.i.; Oxon.B.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.i.
- Conegl. Scuola Vit. En.A.** Annali della R. Scuola di Viticoltura e di Enologia in Conegliano. Conegliano.
1892—93. [Continuation of: Nuova Rassegna di Viticoltura ed Enologia della R. Scuola di Conegliano, 1887—91.] [Continued as: La Revista. Periodico della R. Scuola di Viticoltura e di Enologia di Conegliano, 1895—] Kew Gardens.i.
- Conegl. Scuola Vit. En. Rv.** La Revista. Periodico della R. Scuola di Viticoltura e di Enologia di Conegliano. Conegliano.
1895— [Continuation of: Annali della R. Scuola di Viticoltura e di Enologia in Conegliano, 1892—93.] Kew Gardens.
- Conn. Ac. T.** Transactions of the Connecticut Academy of Arts and Sciences. New Haven.
1866— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Glasg.P.S.; Linn.S.; Math.S.i.; N.H.M.; Oxon.R.; P.O.; R.A.S.; R.Geogr.S.; R.S.; S.K.
- Conn. Mm. Ac.** Memoirs of the Connecticut Academy of Arts and Sciences. New Haven.
1810—16. Linn.S.i.; N.H.M.i.; R.S.
- Cornwall Gl. S. T.** Transactions of the Royal Geological Society of Cornwall. Penzance.
1818— B.M.i.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; Geol.M.; Geol.S.; Glasg.U.i.; I.CE.i.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.; R.S.; S.K.i.; U.C.L.i.
- Cornwall Pol. S. Rp.** Reports and Transactions of the Royal Polytechnic Society of Cornwall. Falmouth.
- Cornwall Pol. S. T.** {
1833— B.M.; Camb.U.i.; Dub.R.D.S.; Edinb.R.S.i.; Geol.M.i.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; M.O.i.; N.H.M.; Oxon.B.i.; P.O.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.
- Cosmos** Cosmos. Revue Encyclopédique Hebdomadaire des Progrès des Sciences; Moigno. Paris.
1852—70. B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; I.CE.i.; N.H.M.; Oxon.B.; P.O.; R.A.S.i.; R.S.; S.K.i.
- C. R.** See **Moigno Cosmos**.
Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences. Paris.
1835— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.D.S.; Edinb.R.S.i.; Edinb.U.; Geol.M.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.; Linn.S.; M.O.i.; N.H.M.; Oxon.B.; Oxon.R.i.; Pharm.S.i.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.
- Crc. Ac. Sc. Bil.** Bulletin International de l'Académie des Sciences de Cracovie. Cracovie.
1889— B.M.; Camb.U.; Chem.S.; Dub.R.I.A.i.; Edinb.R.S.; Geol.S.; Glasg.U.; N.H.M.; Oxon.B.; Oxon.R.i.; R.A.S.i.; R.S.; U.C.L.i.

List of Serial Publications

- Crell C. A.**..... Chemische Annalen für die Freunde der Naturlehre; Crell. Helmstädt.
1784—1804. B.M.; Camb.U.; Chem.S.; Glasg.P.S.i.; N.H.M.; P.O.; R.C.Surg.; R.S.; S.K.
- Crelle J.**..... Journal für die reine und angewandte Mathematik; Crelle. Berlin.
1826— B.M.; Camb.U.; Dub.N.L.I.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Glasg.U.; I.CE.i.; Math.S.i.; Oxon.B.(R.); R.S.; S.K.i.; U.C.L.
- Crelle J. Bank.** See **Crelle J. Mth.**
Journal für die Baukunst; Crelle. Berlin.
1829—51. B.M.; Camb.U.; Glasg.U.; P.O.
- Crelle J. Mth.** See **Crelle J.**
- Croydon Micr. Cl. P. & T.** Proceedings and Transactions of the Croydon Microscopical and Natural History Club. Croydon.
1878— [Continuation of: Report, etc., 1871—78.] Camb.U.; Geol.S.i.; Glasg.P.S.i.; Linn.S.; N.H.M.; P.O.; U.C.L.i.
- C. S. J.** The [Quarterly] Journal of the Chemical Society of London. London.
1849— [Continuation of: Memoirs and Proceedings, etc., 1841—48.] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.M.i.; Geol.S.; Glasg.P.S.; I.CE.; N.H.M.i.; Oxon.B.; Oxon.R.i.; Pharm.S.; P.O.; R.C.Surg.; R.S.; S.K.; U.C.L.
- C. S. Mm.** Memoirs and Proceedings of the Chemical Society of London. London.
1841—48 [Continued as: The Quarterly Journal, 1849—] B.M.; Camb.P.S.; Chem.S.; Dub.R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Geol.S.; Glasg.P.S.; Glasg.U.i.; N.H.M.; Oxon.B.(R.); Pharm.S.; P.O.; R.S.; S.K.; U.C.L.
- C. S. P.** Proceedings of the Chemical Society. London.
1885— B.M.; Camb.P.S.; Camb.U.i.; Chem.S.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.i.; Geol.M.i.; Glasg.U.; N.H.M.i.; Oxon.R.; Pharm.S.; P.O.; R.S.; S.K.; U.C.L.
- Cuyper Ev. Un.** Revue Universelle des Mines, de la Métallurgie, etc.; de Cuyper. Paris, Liège.
1857— B.M.; Camb.U.; Dub.R.I.A.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; N.H.M.; P.O.; S.K.
- C. Ztg.** See **Ev. Un. Mines.**
Chemiker-Zeitung. Central-Organ für Chemiker, Apotheker, Techniker, Ingenieure, Fabrikanten. Cöthen.
1877— Chem.S.i.; P.O.i.; S.K.i.
- Cztg. Opt.** Central-Zeitung für Optik und Mechanik. Leipzig.
1880— Edinb.U.i.; P.O.i.; R.S.i.
- D. Alpvr. Z.** Zeitschrift des Deutschen [und des Oesterreichischen] Alpenvereins. München.
1870— B.M.; Camb.U.; Oxon.B.; R.Geogr.S.
- Danzig Schr.** Schriften der Naturforschenden Gesellschaft in Danzig. Danzig.
1863— [Continuation of: Neueste Schriften, etc., 1820—62.] Camb.P.S.; Camb.U.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; Oxon.R.i.; R.S.; S.K.i.
- Darmst. Notb.** Notizblatt des Vereins für Erdkunde und verwandte Wissenschaften zu Darmstadt und des Mittelrheinischen Geologischen Vereins. Darmstadt.
1855— B.M.; Geol.M.; Geol.S.; Glasg.P.S.i.; N.H.M.i.; R.Geogr.S.; R.S.i.; S.K.
- Dax S. Borda Bll.** Bulletin de la Société de Borda à Dax. Dax.
1876— N.H.M.; U.C.L.i.
- D. Bt. Gs. B.** Berichte der Deutschen Botanischen Gesellschaft. Berlin.
1883— B.M.; Camb.U.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.; Pharm.S.; R.S.; S.K.; U.C.L.
- D. C. Gs. B.** Berichte der Deutschen Chemischen Gesellschaft. Berlin.
1868— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.; Glasg.P.S.; Glasg.U.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.; R.C.Surg.i.; R.S.; S.K.; U.C.L.i.
- Delft Éc. Pol. A.** See **Berl. B.**
Annales de l'École Polytechnique de Delft. Leide.

List of Serial Publications

- 1885—97. Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Math.S.; R.A.S.; R.S.; S.K.
Denison Un. Sc. Lb. Bll. Bulletin of the Scientific Laboratories of Denison University. Granville, Ohio.
 1885— B.M.; Camb.P.S.; Dub.R.I.A.; Edinb.R.S.; N.H.M.; P.O.; S.K.i.
Der Nf. Der Naturforscher. Halle.
 1774—1804. B.M.; Camb.U.; Geol.S.i.; Glasg.P.S.i.; Linn.S.; N.H.M.; R.S.i.; S.K.
Des Moines Anal. The Analyst: a monthly Journal of Pure and Applied Mathematics. Des Moines, Iowa.
 1874—83. Camb.U.; Edinb.R.S.; R.S.
Devon. As. T. Reports and Transactions of the Devonshire Association for the Advancement of Science, Literature, and Art. Plymouth, London.
 1862— Camb.U.i.; Geol.M.; Geol.S.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.; R.S.; S.K.
D. Gl. Gs. Z. Zeitschrift der Deutschen Geologischen Gesellschaft. Berlin.
 1849— B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.U.i.; N.H.M.; Oxon.R.; R.S.i.; S.K.i.
D. Gs. Ostas. Mt. Mittheilungen der Deutschen Gesellschaft für Natur- und Völkerkunde Ostasiens. Yokohama.
 1873— B.M.; Edinb.R.S.i.; Geol.S.i.; R.Geogr.S.; S.K.
Dijon Ac. Mm. Mémoires de l'Académie des Sciences, Arts, et Belles-lettres de Dijon. Dijon.
Dijon Ac. Sc. Mm. 1769— B.M.i.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.i.; Geol.S.i.; N.H.M.; Oxon.B.i.; R.A.S.; R.C.Surg.i.; R.Geogr.S.i.; R.S.i.; S.K.i.
Dijon Mm. Ac. 1769— B.M.i.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.i.; Geol.S.i.; N.H.M.; Oxon.B.i.; R.A.S.; R.C.Surg.i.; R.Geogr.S.i.; R.S.i.; S.K.i.
Dijon Sé. Ac. Séances publiques de l'Académie des Sciences, Arts, et Belles-lettres de Dijon. Dijon.
 1810—29. B.M.i.; N.H.M.
Dingler Polytechnisches Journal; Dingler. Stuttgart.
 1820— B.M.; Camb.U.; Chem.S.i.; Dub.N.L.L.i.; Dub.R.C.S.i.; Dub.R.D.S.i.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; P.O.; R.S.i.; S.K.
D. Meere Jbr. Jahresbericht der Commission zur Wissenschaftlichen Untersuchung der Deutschen Meere in Kiel. Berlin.
 1871—93. [*Continued as:* Wissenschaftliche Meeresuntersuchungen, etc., 1896—] Camb.U.; Edinb.R.S.i.; Glasg.P.S.i.; Linn.S.; M.O.; N.H.M.; Oxon.R.; R.Geogr.S.i.; R.S.i.; S.K.
D. Ml. Gs. Nb. Nachrichtenblatt der Deutschen Malakozoologischen Gesellschaft. Frankfurt am Main.
 1869— B.M.; Camb.U.; Glasg.P.S.i.; N.H.M.
D. Mth. Vr. Jbr. Jahresbericht der deutschen Mathematiker-Vereinigung. Berlin, Leipzig.
 1890— Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Math.S.i.; Oxon.B.; R.S.
D. Nf. B. Bericht über die Versammlung der Deutschen Naturforscher und Aerzte.
 1822—83. Irregular, *see* Tageblatt. Camb.U.i.; Geol.S.i.; N.H.M.i.; Oxon.R.i.; R.C.Surg.i.; R.S.i.; S.K.i.
See D. Nf. Vsm. B.
D. Nf. Festschr. Festschrift für die 59. Versammlung Deutscher Naturforscher und Aerzte. Berlin.
 1886. Dub.R.I.A.; N.H.M.; Oxon.R.; S.K.
D. Nf. Tbl. Tageblatt der... Versammlung Deutscher Naturforscher und Aerzte.
 1836—89. Irregular, *see B. and Vh.* Camb.U.; Geol.S.i.; N.H.M.; Oxon.R.i.; R.C.Surg.i.
D. Nf. Vh. Verhandlungen der Gesellschaft Deutscher Naturforscher und Aerzte. Leipzig.
 1890— [*Continuation of:* Bericht, Tagebl. etc., 1822—89.] Camb.U.; N.H.M.; Oxon.R.; R.C.Surg.
See D. Nf. B.
D. Nf. Vsm. B. *See D. Nf. B.*
Dn. Vd. Selsk. Skr. Det Kongelige Danske Videnskabernes Selskabs Skrivter. Kiöbenhavn.
 1801—18. B.M.; Camb.P.S.i.; Camb.U.; Edinb.R.S.; N.H.M.; Oxon.B.; R.S.
See Kiöb. Dn. Vd. Selsk. Skr.

List of Serial Publications

- Donders Arch.** Archiv für die Holländischen Beiträge zur Natur- und Heilkunde; Donders. Utrecht. 1858—64. [*Continued as*: Nederlandsch Archief voor Genees- en Natuurkunde, 1865—70.] B.M.; Camb.U.; N.H.M.; R.C.Surg.; R.S.
- Donders Ndl. Gast. Oogl. Vs.** Jaarlijksch Verslag betrekkelijk de Verpleging en 't Onderwijs in het Nederlandsch Gasthuis voor Ooglijders; Donders. Utrecht, 1860—85. [*Continued as*: Nederlandsch Gasthuis voor Behoeftige en Minvermogene Ooglijders te Utrecht. Verslag, 1885—] Glasg.P.S.i.; R.S.
- Dorpat Sb.** Sitzungsberichte der Naturforscher-Gesellschaft zu Dorpat. Dorpat. 1853— Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.; N.H.M.; R.S.i.; S.K.i.
- Dorpat Schr.** Schriften herausgegeben von der Naturforscher-Gesellschaft bei der Universität Dorpat. Dorpat. 1884— B.M.; Camb.U.; Edinb.R.S.i.; N.H.M.; Oxon.R.
- Dorset F.C. P.** Proceedings of the Dorset Natural History and Antiquarian Field Club. Sherborne. 1877— B.M.; Camb.P.S.; Camb.U.i.; Geol.S.i.; Linn.S.; N.H.M.; Oxon.B.i.
- Douai Mm. S. Ag.** Mémoires de la Société d'Agriculture, de Sciences et d'Arts [du Département du Nord] séant à Douai. Douai. 1826—89. B.M.; Camb.U.i.; Dub.T.C.i.; Oxon.B.; R.S.i.
- Doubs S. Mm.** Mémoires et Comptes Rendus de la Société [Libre] d'Émulation du Doubs. Besançon. 1841— B.M.; N.H.M.i.
- D. Ps. Gs. Vh.** Verhandlungen der Deutschen Physikalischen Gesellschaft. Leipzig. 1899— [*Continuation of*: Verhandlungen der Physikalischen Gesellschaft in Berlin, 1882—98.] Camb.P.S.; Camb.U.; Edinb.R.S.; Edinb.U.i.; Glasg.U.; N.H.M.; Oxon.B.(R.); P.O.; R.A.S.; R.S.; S.K.; U.C.L.i.
- Dresden Ausz. Protokoll.** Auszüge aus den Protokollen der Gesellschaft für Natur- und Heilkunde in Dresden. Dresden. 1832—34. B.M.; Glasg.P.S.i.; R.S.
- Dresden Erdk. Jbr.** Jahresbericht des Vereins für Erdkunde zu Dresden. Dresden. 1865— B.M.; Geol.S.i.; Glasg.P.S.i.; N.H.M.; Oxon.B.; R.Geogr.S.; R.S.i.; S.K.
- Dresden Isis Festschr.** ... Festschrift der Naturwissenschaftlichen Gesellschaft Isis in Dresden. Dresden. 1885. B.M.; Dub.R.I.A.; Geol.S.; Glasg.P.S.i.; N.H.M.; S.K.
- Dresden Isis Sb.** Sitzungsberichte der Naturwissenschaftlichen Gesellschaft Isis in Dresden. Dresden. 1861— Camb.U.i.; Dub.T.C.; Geol.S.; N.H.M.; S.K.
See Dresden Sb. Isis.
- Dresden Jbr. Nt. Heilk.** Jahresberichte [Sitzungsberichte] der Gesellschaft für Natur- und Heilkunde. Dresden. 1858— Glasg.P.S.i.; R.C.Surg.i.; R.S.i.; S.K.i.
See Dresden Sb. Nt. Heilk.
- Dresden Lndw. V.-St.** ... Die landwirtschaftlichen Versuchs-Stationen. Organ für wissenschaftliche Forschungen auf dem Gebiete der Landwirtschaft. Dresden, Chemnitz. 1859— B.M.i.; Camb.U.; Chem.S.i.; Glasg.U.i.; Oxon.B.; P.O.i.; R.S.i.
See Lndw. V.-St.
- Dresden Sb. Isis** *See Dresden Isis Sb.*
- Dresden Sb. Nt. Heilk.** ... *See Dresden Jbr. Nt. Heilk.*
- Dubl. J. Md. C. Sc.** Dublin Journal of Medical and Chemical Science. Dublin. 1832—45. [*Continued as*: The Dublin [Quarterly] Journal of Medical Science, 1846—] B.M.; Camb.U.i.; Dub.N.L.I.i.; Dub.R.D.S.i.; Dub.T.C.i.; Pharm.S.i.; R.C.Surg.
- Dubl. J. Md. Sc.** The Dublin [Quarterly] Journal of Medical Science. Dublin.
- Dubl. QJ. Md. Sc.** 1846— [*Continuation of*: Dublin Journal of Medical and Chemical Science, 1832—45.] B.M.; Camb.U.i.; Dub.N.L.I.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; Oxon.B.(R); Pharm.S.i.; P.O.; R.C.Surg.; U.C.L.i.
- Dubl. R. S. J.** Journal of the Royal Dublin Society. Dublin. 1856—78. B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.; Dub.R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Geol.M;

List of Serial Publications

- Geol.S.; Glasg.U.i.; I.CE.i.; Linn.S.; M.O.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.
- Dubl. S. J.**..... Transactions and Journal of the Dublin Society. Dublin. 1799—1810. B.M.; Dub.N.L.I.; Dub.R.D.S.; Dub.T.C.; Geol.S.i.; N.H.M.; Oxon.B.i.; R.S.; S.K.
See **Dubl. S. T.**
- Dubl. S. Sc. P.**..... The Scientific Proceedings of the Royal Dublin Society. Dublin. 1877— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.; Dub. R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.; I.CE.; Linn.S.; Math.S.i.; M.O.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Dubl. S. Sc. T.**..... The Scientific Transactions of the Royal Dublin Society. Dublin. 1877— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.; Dub. R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.; I.CE.; Linn.S.; Math.S.; M.O.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Dubl. S. T.**..... *See* **Dubl. S. J.**
- Durham Un. Ph. S. P.**... Proceedings of the University of Durham Philosophical Society. Newcastle-upon-Tyne. 1900— Camb.P.S.; Camb.U.i.; Edinb.R.S.; Geol.S.i.; Glasg.P.S.i.; N.H.M.; Oxon.B.; S.K.i.
- D. Vjschr. Gandhpf.**..... Deutsche Vierteljahrsschrift für öffentliche Gesundheitspflege. Braunschweig. 1869— B.M.; Camb.U.i.; Glasg.P.S.i.; I.CE.i.; Oxon.R.; U.C.L.i.
- D. Z. Thmd.**..... Deutsche Zeitschrift für Thiermedizin und vergleichende Pathologie. Leipzig. 1875— Camb.U.; Glasg.P.S.i.; Oxon.R.; R.C.Surg.
- Eastbourne NH. S. Pp. (& T.)**..... { Papers (Transactions) of the Eastbourne Natural History Society with Annual Report. Eastbourne.
- Eastbourne NH. S. T.**... { 1869— Geol.S.i.; N.H.M.i.; R.S.i.; S.K.i.
- Éclair. Élect.**..... L'Éclairage Électrique. Paris. 1894— B.M.; Glasg.U.i.; I.CE.; P.O.
- Edinb. FC. T.**..... Transactions of the Edinburgh Naturalists' Field Club. Edinburgh. 1881— Camb.U.; Glasg.P.S.i.; Linn.S.i.; N.H.M.
- Edinb. Gl. S. T.**..... Transactions of the Edinburgh Geological Society. Edinburgh. 1868— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.i.; Geol.M.; Geol.S.; Glasg.P.S.; N.H.M.; P.O.; R.Geogr.S.; R.S.; U.C.L.
- Edinb. J. Md. Sc.**..... Edinburgh Journal of Medical Science. Edinburgh. 1826—27. B.M.; Camb.U.; Dub.T.C.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; R.C.Surg.
- Edinb. J. Nt. Gg. Sc.**..... The Edinburgh Journal of Natural and Geographical Science. Edinburgh. 1830—31. B.M.; Camb.U.; Edinb.R.S.; Edinb.U.; Linn.S.; N.H.M.; Oxon.B.i.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.
- Edinb. J. Sc.**..... The Edinburgh Journal of Science, exhibiting a view of the progress of discovery in Natural Philosophy, Chemistry, Mineralogy, Geology, Botany, etc.; David Brewster. Edinburgh. 1824—1832. [*Continued in:* The London and Edinburgh Philosophical Magazine, etc., 1832—] B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.; M.O.i.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.; R.C.Surg.; R.S.; S.K.
- Edinb. M. J. Md. Sc.**... London and Edinburgh Monthly Journal of Medical Science. London, Edinburgh. 1841—55. [*Continued as:* Edinburgh Medical Journal, 1855—] B.M.; Glasg.P.S.i.; Pharm.S.i.; R.C.Surg.
- Edinb. Mm. Wern. S.**... Memoirs of the Wernerian Natural History Society. Edinburgh. 1808—39. B.M.; Camb.U.i.; Dub.R.D.S.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; R.C.Surg.i.; R.S.; S.K.; U.C.L.i.
See **Edinb. Wern. S. Mm.**
- Edinb. Mth. S. P.**..... Proceedings of the Edinburgh Mathematical Society. London, Edinburgh.

List of Serial Publications

- 1883— B.M.; Camb.P.S.; Camb.U.; Edinb.R.S.; Edinb.U.;
Glasg.U.; Math.S.; R.S.i.
- Edinb. N. Ph. J.** The Edinburgh New Philosophical Journal, exhibiting a view of the progressive Improvements, etc. in the Sciences, etc.; Robert Jameson. Edinburgh.
- 1826—64. [*Continuation of:* The Edinburgh Philosophical Journal, 1819—26.] B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.T.C.i.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.i.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.
- Edinb. Ph. J.** The Edinburgh Philosophical Journal, exhibiting a view of the Progress of Discovery in Natural Philosophy, etc.; David Brewster and Robert Jameson. Edinburgh.
- 1819—26. [*Continued as:* The Edinburgh New Philosophical Journal, 1826—64.] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.; Linn.S.i.; N.H.M.; Oxon.B.i.; Oxon.R.; Pharm.S.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Edinb. P. Fa. S.** Proceedings of the Royal Physical Society of Edinburgh. Edinburgh.
- 1854— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.S.; S.K.; U.C.L.i.
- Edinb. P. R. S.** Proceedings of the Royal Society of Edinburgh. Edinburgh.
- Edinb. R. S. P.** 1845— B.M.i.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.; Edinb.R.S.; Edinb.U.; Geol.M.i.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.; Linn.S.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.i.; Oxon.R.; Pharm.S.i.; P.O.i.; R.A.S.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- Edinb. R. S. T.** Transactions of the Royal Society of Edinburgh. Edinburgh.
- 1788— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.M.i.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.; Linn.S.; Math.S.i.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.i.; R.A.S.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.
- See Edinb. T. R. S.*
- Edinb. Sc. S. Arts F.** Transactions of the Royal Scottish Society of Arts. Edinburgh.
- Edinb. Sc. S. Arts T.** 1841— B.M.i.; Camb.U.; Dub.R.D.S.; Edinb.R.S.; Edinb.U.; Glasg.P.S.; Glasg.U.; I.CE.; P.O.; R.S.; S.K.
- See Edinb. T. Sc. S. Arts and Sc. S. Arts T.*
- Edinb. T. R. S.** *See Edinb. R. S. T.*
- Edinb. T. Sc. S. Arts.** *See Edinb. Sc. S. Arts F. and Sc. S. Arts T.*
- Edinb. Wern. S. Mm.** *See Edinb. Mm. Wern. S.*
- Educ. Times** The Educational Times, and Journal of the College of Preceptors. London.
- 1847— B.M.; Camb.P.S.i.; Camb.U.i.; Dub.N.L.I.; Glasg.U.i.; Math.S.i.; Oxon.B.i.; Oxon.R.i.; R.S.i.; S.K.i.
- Elect.** The Electrician. London.
- 1862— B.M.i.; Camb.P.S.i.; Camb.U.i.; Dub.N.L.I.i.; Dub.R.C.S.i.; Edinb.R.S.i.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Oxon.B.i.; Oxon.R.i.; P.O.; R.S.i.; S.K.; U.C.L.i.
- Elect. Rv.** The Electrical Review. London.
- 1892— [*Continuation of:* The Telegraphic Journal and Electrical Review, 1872—91.] B.M.; Camb.U.; Dub.N.L.I.; Edinb.U.; Glasg.P.S.; Glasg.U.; I.CE.; P.O.; R.S.; S.K.
- Electr. S. P.** The Transactions and Proceedings of the London Electrical Society. London.
- Electr. S. T.** 1837—40. [*Continued as:* Proceedings, 1841—43.] B.M.; Camb.U.i.; Glasg.P.S.i.; I.CE.i.; Oxon.B.; Pharm.S.; P.O.; R.S.; S.K.
- Elekttech. Z.** Elektrotechnische Zeitschrift. Berlin, München.
- 1880— B.M.; Glasg.U.; I.CE.; P.O.; S.K.i.
- Emden Nf. Gs. Jbr.** Jahresbericht.....der Naturforschenden Gesellschaft in Emden. Emden.
- 1837— Dub.R.I.A.; R.S.
- E. Mg.** The Entomological Magazine. London.
- 1833—38. B.M.; Camb.U.; Edinb.U.i.; Geol.S.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.
- Eng. S. T.** Transactions of the Society of Engineers. London.

List of Serial Publications

- 1860— B.M.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Glasg.P.S.i.;
Glasg.U.i.; I.CE.; Oxon.B.; P.O.; R.S.i.; U.C.L.
- Ens. Mth.**..... L'Enseignement Mathématique. Revue Internationale. Paris.
1899— Math.S.; S.K.
- Erdm. J. Pr. C.** Journal für praktische Chemie; Erdman, etc. Leipzig.
1834— [Continuation of: Journal für technische und ökonomische
Chemie, 1828—33.] B.M.; Camb.U.; Chem.S.; Dub.N.L.I.i.;
Dub.R.C.S.i.; Dub.R.D.S.i.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.;
N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.; R.C.Surg.i.; R.S.;
S.K.; U.C.L.i.
- See J. Pr. C.*
- Erdm. J. Tech. C.** Journal für technische und ökonomische Chemie; Erdman. Leipzig.
1828—33. [Continued as: Journal für praktische Chemie, 1834—]
B.M.; Chem.S.; N.H.M.; P.O.; R.S.; S.K.
- Erfurt Ak. Jb.**..... Jahrbücher der königlichen Akademie gemeinnütziger Wissen-
schaften zu Erfurt. Erfurt.
1860— B.M.; N.H.M.
- Erlang. Ab.** Abhandlungen der Physikalisch-Medicinischen Societät in Erlangen.
Frankfurt-am-Main.
1810—12. B.M.; Glasg.P.S.i.; R.C.Surg.; R.S.; U.C.L.i.
- Erlang. Pa. Md. S. Sb.** ... Sitzungsberichte der Physikalisch-Medicinischen Societät zu Er-
langen. Erlangen.
- Erlang. Sb. Pa. Md. S.** ... { 1864— B.M.; Camb.P.S.; Dub.R.D.S.; Edinb.R.S.i.; Glasg.U.i.;
Linn.S.i.; Math.S.i.; N.H.M.; R.C.Surg.i.; R.S.i.
- Erlenmeyer Z.** Zeitschrift für Chemie und Pharmacie etc.; Erlenmeyer. Erlangen,
Heidelberg.
1860—64. [Continued as: Zeitschrift für Chemie, 1865—71.] B.M.;
Camb.U.; Chem.S.; N.H.M.; Oxon.R.i.; S.K.i.
- Erman Arch. Rs.** Archiv für wissenschaftliche Kunde von Russland; Erman. Berlin.
1841—67. B.M.; Camb.U.; N.H.M.; Oxon.B.; R.Geogr.S.; R.S.i.;
S.K.
- Essex I. Bil.**..... Bulletin of the Essex Institute. Salem (Mass.).
1869— [Continuation of: Proceedings, etc., 1848—68.] Camb.P.S.;
Edinb.R.S.i.; Geol.S.i.; Glasg.P.S.i.; Linn.S.i.; N.H.M.;
Oxon.R.i.; P.O.i.; R.Geogr.S.; R.S.; S.K.
- Essex I. P.** Proceedings of the Essex Institute. Salem (Mass.).
1848—68. [Continued as: Bulletin, etc., 1869—] B.M.i.; Camb.P.S.;
Dub.R.I.A.; Edinb.R.S.i.; Linn. S.i.; N.H.M.; Oxon.R.i.; R.S.;
S.K.
- Essex Ntlist.** The Essex Naturalist; being the Journal of the Essex Field Club.
Buckhurst Hill.
1887— [Continuation of: Transactions of the Essex Field Club,
1880—86.] B.M.; Camb.P.S.; Camb.U.; Edinb.R.S.; Geol.M.;
Geol.S.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.B.; R.S.;
U.C.L.
- Eure Rec. S. Ag.**..... { Recueil de la Société d'Agriculture, Sciences, Arts, et Belles-Lettres
Eure S. Ag. Rec. { du département de l'Eure. Evreux.
1830—39. B.M.; Camb.U.; Oxon.B.; R.S.
- Évk.** A'Magyar Tudós Társaság' Évkönyvei. Pest.
1833—46.
A'Magyar Tudományos Akademia Évkönyvei. Budá.
1860—89. B.M.; Edinb.R.S.i.; Geol.S.i.; N.H.M.; Oxon.B.;
R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
- See Mag. Tud. Ak. Évk.*
- Exner Rpm.**..... Repertorium der Physik; Exner. München, Leipzig.
1883—91. [Continuation of: Repertorium für physikalische Technik,
etc.; Carl, 1865—82.] B.M.; Camb.U.i.; Dub.N.L.I.i.; Edinb.U.;
I.CE.i.; Oxon.R.; P.O.; R.S.; S.K.
- Fechner Cb.**..... Centrallblatt für Naturwissenschaften und Anthropologie; Fechner.
Leipzig.
1853—54. B.M.; Glasg.P.S.i.; N.H.M.
- Fed. I. Mn. E. T.** Transactions of the Federated Institution of Mining Engineers.
Newcastle-upon-Tyne.
1889—98. [Continued as: Transactions of the Institution of Mining
Engineers, 1898—] Camb.U.; Edinb.R.S.i.; Geol.M.; Geol.S.;
Glasg.P.S.; Glasg.U.; I.CE.; Oxon.B.; Oxon.R.i.; P.O.; S.K.

List of Serial Publications

- Férussac Bll. Sc. Mth.** ... Bulletin des Sciences Mathématiques, Astronomiques, Physiques et Chimiques; de Férussac. Paris. 1824—31. B.M.; Edinb.U.i.; Geol.S.; Glasg.U.i.; Oxon.R.; P.O.; R.C.Surg.; U.C.L.
- Férussac Bll. Sc. Nt.** ... Bulletin des Sciences Naturelles et de Géologie; de Férussac. Paris. 1824—31. B.M.; Geol.S.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.B.; P.O.; R.C.Surg.; R.S.
- Finist. S. Sc. Bll.** ... Bulletin de la Société d'Études Scientifiques du Finistère. Morlaix. 1879— N.H.M.
- Firenze Ac. Georg. At.** ... Atti della R. Accademia economico-agraria dei Georgofili. Firenze. 1817— [Continuation of: Atti della (Real) Società Economica di Firenze ossia de' Georgofili, 1791—1812.] B.M.; Camb.U.; Dub.T.C.i.; Edinb.R.S.i.; Oxon.B.
- See **Firenze At. Ac. Georg.**
- Firenze A. Ms. Fis.** ... Annali del R. Museo di Fisica e Storia Naturale. Firenze. 1866. Glasg.P.S.i.; M.O.; N.H.M.; Oxon.B.i.; R.A.S.; R.S.; S.K.
- Firenze A. Ms. Imp.** ... Annali del Museo Imperiale di Fisica e Storia Naturale di Firenze. Firenze. 1808—10. B.M.; Camb.U.i.; M.O.; N.H.M.; Oxon.B.; R.A.S.; R.S.i.; S.K.
- Firenze At. Ac. Georg.** ... See **Firenze Ac. Georg. At.**
- Firenze R. I. Pb.** ... Pubblicazioni del R. Istituto di Studi Superiori Pratici e di Perfezionamento in Firenze. Sezione di Scienze Fisiche e Naturali. Firenze. 1877— B.M.; Glasg.P.S.i.; N.H.M.; R.S.
- Firenze S. Georg. At.** ... Atti della (Real) Società Economica di Firenze ossia de' Georgofili. Firenze. 1791—1812. [Continued as: Atti della R. Accademia economico-agraria dei Georgofili, 1817—] B.M.; Camb.U.
- Flora** ... Flora, oder Allgemeine Botanische Zeitung; herausgegeben von der Königl. Bayer. Botanischen Gesellschaft. Regensburg. 1818— Camb.U.i.; Dub.R.D.S.; Edinb.R.S.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.; N.H.M.; R.S.i.; S.K.; U.C.L.i.
- Föld. Közl.** ... Földtani Közlöny. Havi folyóirat kiadja a Magyarhoni Földtani Társulat. (Geologische Mittheilungen.) Zeitschrift der Ungarischen Geologischen Gesellschaft. Budapest. 1872— B.M.; Camb.U.i.; Geol.M.; Geol.S.; N.H.M.; R.S.i.; S.K.i.
- Forsch. Ag.-Ps.** ... Forschungen auf dem Gebiete der Agrilkultur-Physik. Heidelberg. 1878—98. Chem.S.; P.O.
- Förster Al. Bauztg.** ... Allgemeine Bauzeitung; Förster. Wien. 1836— B.M.; Camb.U.; I.CE.i.; P.O.
- Franklin I. J.** ... Journal of the Franklin Institute of the State of Pennsylvania. Philadelphia. 1828— B.M.; Camb.U.; Chem.S.i.; Dub.R.I.A.; Geol.S.i.; Glasg.P.S.i.; I.CE.; M.O.i.; Oxon.B.; P.O.; R.A.S.i.; R.Geogr.S.; R.S.; U.C.L.i.
- Fr. An. Mét.** ... Annuaire Météorologique de la France. Paris. 1849—52. [Continued as: Annuaire de la Société Météorologique de France, 1853—] B.M.; Camb.U.; Dub.T.C.; Glasg.U.i.; M.O.; R.S.
- See **An. Mét. Fr.**
- Fr. Cg. Sc.** ... Sessions des Congrès Scientifiques de France. 1833—79. B.M.; Camb.U.; N.H.M.; R.C.Surg.i.
- Freiberg Jb. Berg.-Hm.** ... Jahrbuch für den Berg- und Hüttenmann. Herausg. von der Königl. Berg-Akademie zu Freiberg. Freiberg. 1837—72. [Continued as: Jahrbuch für das Berg- und Hüttenwesen, 1873—] B.M.; Glasg.P.S.i.; N.H.M.; P.O.i.; R.S.i.; S.K.i.
- Freiburg B.** ... Berichte über die Verhandlungen der Naturforschenden Gesellschaft zu Freiburg i. B. Freiburg i. B. 1855— B.M.; Camb.U.i.; Dub.R.I.A.; Linn.S.i.; N.H.M.; Oxon.R.; R.C.Surg.i.; R.S.; S.K.
- Fresenius Z.** ... Zeitschrift für Analytische Chemie; Fresenius. Wiesbaden. 1862— B.M.; Camb.U.; Chem.S.; Dub.N.L.L.; Edinb.U.i.; Glasg.P.S.; N.H.M.; Oxon.R.; Pharm.S.; P.O.; R.C.Surg.; R.S.; S.K.
- Frkf. a. M. Ps. Vr. Jbr.** ... (Jahresbericht des Physikalischen Vereins zu Frankfurt am Main. Frankfurt am Main. 1838— B.M.i.; Glasg.U.i.; M.O.i.; P.O.i.; R.S.i.; S.K.i.)
- Frkf. Jbr. Ps. Vr.** ... (Jahresbericht des Physikalischen Vereins zu Frankfurt am Main. Frankfurt am Main. 1838— B.M.i.; Glasg.U.i.; M.O.i.; P.O.i.; R.S.i.; S.K.i.)

List of Serial Publications

- Frkf. Ps. Vr. Jb.** Jahrbuch zur Verbreitung Naturwissenschaftlicher Kenntnisse, veranstaltet vom Physikalischen Vereine zu Frankfurt. Frankfurt.
1831. Glasg.P.S.i.; R.S.; S.K.
- Froriep Not.** Notizen aus dem Gebiete der Natur- und Heilkunde; Froriep. Erfurt, Weimar.
1821—62. B.M.i.; Camb.U.i.; Glasg.U.i.; N.H.M.; Oxon.R.i.; R.C.Surg.; R.S.i.
- Fr. S. Ag. Bil.** Bulletin des Séances de la Société (Centrale) d'Agriculture de France. Paris.
1837— P.O.i.
- Fr. S. Ag. Mm.** Mémoires d'Agriculture, d'Économie rurale et domestique publiés par la Société d'Agriculture. Paris.
1801— B.M.; Edinb.R.S.i.; Oxon.B.
- Fr. S. Bt. Bil.** Bulletin de la Société Botanique de France. Paris.
1854— B.M.; Camb.U.; Dub.N.L.I.i.; Dub.R.D.S.; Dub.R.I.A.i.; Dub.T.C.i.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.; Pharm.S.i.; S.K.
- Fr. S. Mét. An.** *See Par. Bil. S. Bt.*
Annuaire de la Société Météorologique de France. Paris.
1853— [Continuation of: Annuaire Météorologique de la France, 1849—52.] B.M.; Camb.U.; Dub.T.C.i.; Glasg.U.i.; M.O.
- Fr. S. Mét. N. Mét.** Nouvelles Météorologiques publiées sous les auspices de la Société Météorologique de France. Paris.
1868—76. B.M.i.; M.O.; R.S.i.
- Fr. S. Mn. Bil.** Bulletin de la Société Minéralogique de France. Meulan, Paris.
1878— B.M.; Dub.T.C.; Geol.M.; Geol.S.; N.H.M.; Oxon.R.; R.S.; S.K.
- Fr. S. Z. Bil.** Bulletin de la Société Zoologique de France. Paris.
1876— B.M.; Camb.U.; Edinb.R.S.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.R.i.; S.K.
- Fschr. Md.** Fortschritte der Medicin. Berlin.
1883— Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Oxon.B.; R.C.Surg.
- Fschr. Mth.** Jahrbuch über die Fortschritte der Mathematik. Berlin.
1868— B.M.; Camb.U.; Dub.N.L.I.i.; Dub.R.C.S.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; Math.S.; Oxon.R.; R.S.; U.C.L.
- Fschr. Ps.** Die Fortschritte der Physik. Berlin.
1845— Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Edinb.U.; Glasg.U.; I.CE.i.; Oxon.B.(R.); P.O.; R.A.S.i.; R.S.; S.K.; U.C.L.
- Fschr. Röntgenstr.** Fortschritte auf dem Gebiete der Röntgenstrahlen. Hamburg.
1897— Glasg.P.S.i.; Oxon.R.; R.S.; S.K.
- Gand. A. Ac.** Annales Academiæ Gandavensis. Gandavi (Ghent).
1819—31. B.M.; Camb.U.; N.H.M.; Oxon.B.; R.S.
- G. Arcad.** Giornale Arcadico di Scienze, etc. Roma.
1819—71. B.M.; N.H.M.; Oxon.B.
- Gard Aperçu Tr.** Notice [ou Aperçu analytique] des Travaux de l'Académie Royale du Gard. Nîmes.
1807—? B.M.; Camb.U.; Oxon.B.
- Gard. Chron.** *See Gard Not. Tr. Ac.*
The Gardener's Chronicle. London.
1841— Camb.U.; Dub.N.L.I.i.; Dub.T.C.i.; Edinb.U.i.; Linn.S.; N.H.M.; Oxon.B.; P.O.; S.K.i.
- Gard Not. Tr. Ac.** } *See Gard Aperçu Tr.*
- Gard Tr. Ac.** }
- Gauss Resultate** Resultate aus den Beobachtungen des Magnetischen Vereins; Gauss und Weber. Göttingen, Leipzig.
1837—42. B.M.; Camb.U.; Chem.S.; R.S.
- Gehlen J.** Journal für die Chemie und Physik; Gehlen. Berlin.
1806—10. B.M.; Edinb.R.S.; Edinb.U.i.; Glasg.U.; N.H.M.; Oxon.R.; R.S.
- Gen. Bil. I. Nt.** Bulletin de l'Institut National Gênévois. Genève.
1853— B.M.; Camb.U.; Dub.R.D.S.; N.H.M.; Oxon.B.i.; P.O.i.; R.S.
- See Gen. I. Nt. Bil.*

List of Serial Publications

- Gén. Civ.** Le Génie Civil. Revue Générale des Industries Françaises et Étrangères, etc. Paris.
1880— B.M.; I.CE.; P.O.; S.K.
- Gen. I. Nt. Bll.** See **Gen. Bll. I. Nt.**
- Gen. I. Nt. Mm.** Mémoires de l'Institut National Gènevois. Genève.
1854— B.M.; Camb.U.; Dub.R.D.S.; N.H.M.i.; Oxon.B.; R.S.; S.K.i.
- Gen. Mm. S. Ps.** Mémoires de la Société de Physique et d'Histoire Naturelle de Genève. Genève.
1821— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.S.; Glasg.U.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.i.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.; R.S.; U.C.L.i.
- See **Gen. S. Ps. Mm.**
- Genova Mm. I. Ligure**... Memorie dell' Istituto Ligure. Genova.
1806. B.M.; Camb.U.; R.S.
- Genova Mm. S. Md.**..... Memorie della Società Medica di Emulazione di Genova. Genova.
1802—04. R.C.Surg.
- Genova S. Lig. At.**..... Atti della Società Ligustica di Scienze Naturali e Geografiche. Genova.
1890— B.M.; N.H.M.; R.S.
- See **Gen. Mm. S. Ps.**
- Gen. S. Ps. Mm.** See **Gen. Mm. S. Ps.**
- Gergonne A. Mth.** Annales de Mathématiques, pures et appliquées; Gergonne. Nîmes, Paris.
1810—31. B.M.; Dub.T.C.; Edinb.U.i.; Glasg.U.i.; Oxon.B.(R.); R.A.S.i.; R.S.; U.C.L.
- Gg. J.**..... The Geographical Journal. Including the Proceedings of the Royal Geographical Society. London.
1893— [Continuation of: Proceedings, etc., 1857—92.] B.M.i.; Camb.P.S.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.U.; I.CE.; Linn.S.; M.O.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Gg. Jb.** Geographisches Jahrbuch. Gotha.
1866— B.M.; Camb.U.; Edinb.U.i.; M.O.i.; N.H.M.i.; Oxon.B.; Oxon.R.; R.Geogr.S.; S.K.
- Gg. S. J.** Journal of the Royal Geographical Society of London. London.
1832—80. B.M.; Camb.P.S.i.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.; Linn.S.; M.O.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.Geogr.S.; R.S.; S.K.
- Gg. S. P.** Proceedings of the Royal Geographical Society of London. London.
1857—92. [Continued as: The Geographical Journal, 1893—] Camb.P.S.i.; Camb.U.; Dub.T.C.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.; Linn.S.; M.O.; N.H.M.; Oxon.B.; Oxon.R.; P.O.i.; R.A.S.i.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Giessen Oberh. Gs. B.** ... Berichte der Oberhessischen Gesellschaft für Natur- und Heilkunde. Giessen.
1847— B.M.i.; Camb.P.S.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; P.O.i.; R.Geogr.S.i.; R.S.i.; S.K.
- Gilbert A.**..... Annalen der Physik; Gilbert. Halle und Leipzig.
1799—1824. [Continued as: Annalen der Physik und Chemie, 1824—] Camb.U.; Chem.S.; Edinb.U.; Glasg.U.i.; N.H.M.; Oxon.B.(R.); P.O.; R.C.Surg.; R.S.; S.K.
- Gill Tech. Mcr. Rep.**..... Gill's Technological [and Microscopic] Repository. London.
1827—30. [Continuation of: The Technical Repository, 1822—27.] B.M.; Camb.U.i.; Edinb.R.S.; Glasg.P.S.i.; I.CE.; Oxon.B.; P.O.
- Gill Tech. Rep.** The Technical Repository; Gill. London.
1822—27. [Continued as: Gill's Technological [and Microscopic] Repository, 1827—30.] B.M.; Camb.U.; Edinb.R.S.i.; Glasg.U.i.; I.CE.i.; Oxon.B.; P.O.; R.S.; S.K.
- Glasg. I. Eng. T.**..... Transactions of the Institution of Engineers [and Shipbuilders] in Scotland. Glasgow.
1857— Camb.U.i.; Glasg.U.; I.CE.; P.O.; U.C.L.i.
- See **Glasg. T. I. Eng.**
- Glasg. Md. J.** Glasgow Medical Journal. Glasgow.

List of Serial Publications

- 1828—32; 1854— B.M.; Camb.U.; Dub.T.C.; Edinb.U.i.;
Glasg.U.; Oxon.B.i.; Oxon.R.i.; Pharm.S.i.; R.C.Surg.;
U.C.L.i.
- Glasg. Ph. S. P.** { Proceedings of the [Royal] Philosophical Society of Glasgow. Glasgow.
Glasg. P. Ph. S. { 1841— B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.i.;
Edinb.R.S.; Geol.M.i.; Geol.S.i.; Glasg.P.S.; Glasg.U.i.; I.CE.i.;
N.H.M.; Oxon.B.; Pharm.S.i.; P.O.i.; R.A.S.; R.Geogr.S.i.;
R.S.; S.K.; U.C.L.i.
- Glasg. T. I. Eng.** See **Glasg. I. Eng. T.**
Gleanings Sc. Gleanings in Science. Calcutta.
1829—31. B.M.; Edinb.R.S.i.; I.CE.; M.O.i.; N.H.M.; S.K.;
U.C.L.i.
- Gl. Mg.** The Geological Magazine or Monthly Journal of Geology. London.
1864— B.M.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Geol.M.;
Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.; Linn.S.; N.H.M.; Oxon.R.;
P.O.i.; R.Geogr.S.; S.K.; U.C.L.
- Gl. S. P.** Proceedings of the Geological Society of London. London.
1826—45. [Continued in: The Quarterly Journal, etc., 1845—]
B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Dub.R.D.S.;
Dub.R.I.A.i.; Dub.T.C.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.;
I.CE.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.A.S.; R.C.Surg.;
R.Geogr.S.; R.S.; S.K.; U.C.L.
- Gl. S. QJ.** The Quarterly Journal of the Geological Society of London. London.
1845— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.;
Edinb.U.; Geol.M.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.;
Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.; R.C.Surg.;
R.Geogr.S.; R.S.; S.K.; U.C.L.
- Gl. Sv. Mm.** Memoirs of the Geological Survey of Great Britain and of the
Museum of Economic Geology in London. London.
1846— Camb.U.; Dub.R.C.S.; Dub.T.C.; Edinb.R.S.; Edinb.U.;
Geol.M.; Geol.S.; Glasg.U.i.; I.CE.; N.H.M.; Oxon.B.; Oxon.R.;
P.O.; R.S.; S.K.; U.C.L.
- See **Mm. Gl. Sv.**
- G. Mt.** Giornale di Matematiche ad uso degli Studenti delle Università
Italiane; Battaglini. Napoli.
1863— B.M.; Camb.U.; Dub.R.C.S.i.; Dub.R.I.A.i.; Math.S.i.;
Oxon.B.; R.S.; U.C.L.i.
- Görl. Ab.** Abhandlungen der Naturforschenden Gesellschaft zu Görlitz. Görlitz.
1827— B.M.; Camb.U.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; N.H.M.;
R.S.; S.K.
- Götheb. Hndl.** Götheborgs Kongl. Vetenskaps och Vitterhets Samhälles Handlingar.
Götheborg.
1850— B.M.; Camb.P.S.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.
R.S.i.; N.H.M.; R.S.i.
- Götheb. N. Hndl.** Nya Handlingar af Kongl. Wetenskaps och Witterhets Samhället i
Götheborg. Götheborg.
1808—22. Edinb.R.S.i.; Glasg.P.S.i.; R.S.
- Gött. Ab.** Abhandlungen der k. Gesellschaft der Wissenschaften. Göttingen.
1838— [Continuation of: Commentationes, etc., 1778—1837.] B.M.;
Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Glasg.U.;
Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.C.Surg.i.; R.S.; U.C.L.i.
- Gött. Cm.** Commentationes Societatis Regiæ Scientiarum Göttingensis. Got-
tingen.
1778—1808. B.M.i.; Camb.U.; Dub.R.I.A.i.; Edinb.R.S.; Glasg.
U.i.; N.H.M.; Oxon.B.; R.C.Surg.; R.S.; U.C.L.
- Commentationes recentiores Societatis, etc. Göttingen.
1808—37. [Continued as: Abhandlungen, etc., 1838—] B.M.;
Camb.U.; Edinb.R.S.i.; Glasg.U.i.; N.H.M.; Oxon.B.; Oxon.R.;
R.A.S.i.; R.C.Surg.; R.S.; U.C.L.
- Gött. Nr.** Nachrichten von der k. Gesellschaft der Wissenschaften und der
Georg-Augusts-Universität zu Göttingen. Göttingen.
1845— B.M.* Camb.P.S.; Camb.U.i.; Dub.R.D.S.i.; Dub.R.I.A.i.;
Dub.T.C.i.; Edinb.R.S.; Glasg.U.i.; Linn.S.; Math.S.i.; N.H.M.;
Oxon.B.; Oxon.R.; R.A.S.i.; R.C.Surg.i.; R.S.
- Gött. Stud. Vr.** (Studien des Göttingischen Vereins Bergmännischer Freunde;
Gött. Vr. Stud. Haussmann. Göttingen.
1824—58. Geol.S.i.; R.S.; S.K.

List of Serial Publications

- Gould As. J.**..... The Astronomical Journal; Gould. Cambridge, Mass.
1851—61. B.M.; Camb.U.; Glasg.U.i.; Oxon.B.; Oxon.R.i.;
R.A.S.; R.S.; S.K.
See As. J.
- Gratz Mt. NW. Vr. Steierm.**..... Mittheilungen des Naturwissenschaftlichen Vereins für Steiermark.
Gratz.
1863— B.M.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.;
Linn.S.i.; M.O.i.; N.H.M.; R.S.; U.C.L.i.
See Steierm. Mt.
- Graub. Nf. Gs. Jbr.**..... Jahres-Bericht der Naturforschenden Gesellschaft Graubünden's.
Chur.
1854— B.M.i.; Camb.U.i.; Glasg.P.S.i.; N.H.M.; R.S.i.
- 's Gravenh. I. Ing. Ts.** ... Tijdschrift van het Koninklijk Instituut van Ingenieurs. 's Graven-
hage.
1870— [*Continuation of*: Verhandelingen, etc., 1848—69.] B.M.;
I.CE.i.; P.O.
- 's Gravenh. I. Ing. Vh.** .. Verhandelingen van het Koninklijk Instituut van Ingenieurs.
's Gravenhage.
1848—69. [*Continued as*: Tijdschrift, etc. 1870—] B.M.; I.CE.i.;
P.O.
- Graz I. Pl. Us.**..... Untersuchungen aus dem Institute für Physiologie und Histologie in
Graz. Leipzig.
1870—73. B.M.i.; Glasg.P.S.i.; N.H.M.i.; R.C.Surg.i.; R.S.i.
- Grenoble Ac. Delph. Bll.** Bulletin de l'Académie Delphinale, ou Société des Sciences et Arts
de Grenoble. Grenoble.
1846— B.M.; Camb.U.i.; Oxon.B.; R.S.i.
- Gruithuisen N. Analekt.** Neue Analekten für Erd- und Himmelskunde. Gruithuisen.
München.
1832—36. B.M.; R.A.S.; R.S.
- Grunert Arch.** Archiv der Mathematik und Physik; Grunert. Greifswald,
Leipzig.
1841— B.M.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Edinb.U.;
Glasg.U.; Math.S.i.; Oxon.B.(R.); R.S.; U.C.L.i.
See Arch. Mth. Ps.
- Grunert Met. Opt.** Beiträge zur Meteorologischen Optik, etc.; Grunert. Leipzig.
1848—50. B.M.; Camb.U.; Glasg.P.S.i.; M.O.; R.A.S.
- G. Teix. J. Sc.** Jornal de Sciencias Mathematicas e Astronomicas, publicado pelo
Dr Francisco Gomes Teixeira. Coimbra.
1878— Math.S.; R.S.i.
- Guy's Hosp. Ep.**..... Guy's Hospital Reports. London.
1836— Camb.U.; Edinb.U.; Glasg.P.S.i.; Glasg.U.i.; Oxon.B.(R.);
R.C.Surg.; R.S.; U.C.L.i.
- Gz. C. It.** Gazzetta Chimica Italiana. Palermo.
1871— B.M.; Camb.P.S.i.; Camb.U.; Chem.S.; Edinb.U.; P.O.;
R.S.i.; S.K.
- Haarl. Ms. Teyl. Arch.**... Archives du Musée Teyler. Haarlem.
1866— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.i.; Edinb.R.S.;
Glasg.P.S.; N.H.M.; Oxon.R.; R.A.S.; R.S.; S.K.
See Haarl. Arch. Ms. Teyl.
- Haarl. Ntk. Vh.** Natuurkundige Verhandelingen van de [Bataafsche] Hollandsche
Maatschappij der Wetenschappen te Haarlem. Haarlem.
Haarl. Ntk. Vh. Mtsch.... {
Haarl. Vh...... { 1799— B.M.; Camb.U.i.; Dub.R.D.S.; Geol.S.i.; Glasg.U.i.;
N.H.M.; R.S.; S.K.i.
- Habana Ac. A.** Anales de la Real Academia de Ciencias Medicas, Fisicas y Naturales
de la Habana. Revista Cientifica. Habana.
1864— N.H.M.
- Haidinger Ab.**..... Naturwissenschaftliche Abhandlungen; Haidinger. Wien.
1847—51. Camb.U.; Chem.S.i.; Edinb.R.S.i.; Geol.S.; Linn.S.;
N.H.M.; R.A.S.i.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.
- Haidinger B.** Berichte über die Mittheilungen von Freunden der Naturwissen-
schaften in Wien; Haidinger. Wien.
1847—51. Camb.U.; Chem.S.i.; Edinb.R.S.; Geol.S.i.; Linn.S.;
N.H.M.; R.A.S.; R.Geogr.S.; R.S.
- Hain. Mm. S.** Mémoires et Publications de la Société des Sciences, des Arts et des
Hain. S. Mm. { Lettres du Hainaut. Mons.
1839— B.M.; Dub.T.C.i.; N.H.M.; Oxon.B.i.; R.S.i.; S.K.

List of Serial Publications

- Hall Bij.** Bijdragen tot de Natuurkundige Wetenschappen; Hall, etc. Amsterdam.
1826—32. B.M.; Camb.U.; N.H.M.; R.S.; S.K.
- Halle Ab. Nf. Gs.** Abhandlungen der Naturforschenden Gesellschaft zu Halle. Halle.
1853— B.M.; Camb.U.; Edinb.R.S.i.; Glasg.P.S.i.; N.H.M.; Oxon.R.; R.C.Surg.i.; R.S.; S.K.
See Halle Nf. Gs. Ab.
- Halle Jbr. Nf. Gs.** Jahresbericht der Naturforschenden Gesellschaft zu Halle. Halle.
1823—25. Glasg.P.S.i.; R.S.
- Halle Jbr. NW. Vr.** Jahresbericht des Naturwissenschaftlichen Vereins für Sachsen und Thüringen in Halle. Berlin.
1848—52. [*Continued as:* Zeitschrift für die gesammten Naturwissenschaften, 1853—] Edinb.R.S.; Geol.S.i.; Glasg.P.S.i.; N.H.M.; Oxon.R.i.; R.S.; S.K.i.
- Halle Nf. Gs. Ab.** *See Halle Ab. Nf. Gs.*
- Halle Nf. Gs. B.** Bericht über die Sitzungen der Naturforschenden Gesellschaft zu Halle. Halle.
1853—92. B.M.; Camb.U.i.; Edinb.R.S.i.; Glasg.P.S.i.; R.C.Surg.i.; R.S.i.
See Halle Sb. Nf. Gs.
- Halle Nf. Gs. Festschr.** Festschrift.....der Naturforschenden Gesellschaft zu Halle. Halle.
1879. Glasg.P.S.i.; N.H.M.; Oxon.R.; R.S.; S.K.
- Halle Sb. Nf. Gs.** *See Halle Nf. Gs. B.*
- Halle Z. Nw.** Zeitschrift für die gesammten Naturwissenschaften; herausgegeben von dem Naturwissenschaftlichen Vereine für Sachsen und Thüringen in Halle; Giebel. Berlin.
1853— [*Continuation of:* Jahresbericht des Naturwissenschaftlichen Vereins, 1848—52.] B.M.; Camb. U.; Dub.N.L.I.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.S.; S.K.
See Z. Nw.
- Hamb. Mth. Gs. Mt.** Mittheilungen der Mathematischen Gesellschaft in Hamburg. Leipzig.
1889— Math.S.
- Hamb. Nt. Vr. Ab.** Abhandlungen aus dem Gebiete der Naturwissenschaften, herausg. vom Naturwissensch. Verein von Hamburg-Altona. Hamburg.
1846— Camb.U.; Edinb.R.S.i.; Geol.S.i.; Linn.S.i.; N.H.M.; R.S.; S.K.
- Hamb. Nt. Vr. Vh.** Verhandlungen des Naturwissenschaftlichen Vereins von Hamburg-Altona. Hamburg.
1877—81; 1894— Dub.R.I.A.i.; Linn.S.i.; N.H.M.; R.S.
- Hamb. Ws. Anst. Jb.** Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten. Hamburg.
1884— Camb.U.; Edinb.R.S.; Linn.S.; N.H.M.; S.K.
- Hann. A.** Hannöversche Annalen für die gesammte Heilkunde. Hannover.
1836—46. B.M.; Glasg.P.S.i.; R.C.Surg.
- Hann. Archt.-Vr. Z.** Zeitschrift des Architekten- und Ingenieur-Vereins zu Hannover. Hannover.
Hann. Z. Archt.-Vr. 1855— Camb.U.i.; I.CE.; P.O.
- Harl. Arch. Ms. Teyl.** ... *See Haarl. Ms. Teyl. Archt.*
- Harv. As. Obs. A.** Annals of the Astronomical Observatory of Harvard College. Cambridge, Mass.
1856— B.M.; Camb.P.S.; Camb.U.i.; Edinb.R.S.i.; Glasg.U.i.; M.O.i.; Oxon.B.; P.O.i.; R.A.S.; R.S.; S.K.i.; U.C.L.i.
- Hedw.** Hedwigia: Notizblatt für kryptogamische Studien, nebst Repertorium für kryptog. Literatur. Dresden.
1852— B.M.; Camb.U.i.; Dub.N.L.I.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.; N.H.M.
- Heidl. Nt. Md. Vh.** Verhandlungen des Naturhistorisch-Medicinischen Vereins zu Heidelberg. Heidelberg.
Heidl. Vh. Nt. Md. 1857— Camb.U.i.; Chem.S.i.; Dub.R.I.A.; Geol.S.; Linn.S.i.; N.H.M.i.; R.S.i.
- Helsingf. Acta.** Acta Societatis Scientiarum Fennicæ. Helsingfors.
1842— B.M.; Camb.P.S.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.; Glasg.U.i.; N.H.M.; Oxon.B.; R.A.S.; R.Geogr.S.i.; R.S.; S.K.
- Helsingf. Öfv.** Öfversigt af Finska Vetenskaps-Societetens Förhandlingar. Helsingfors.

List of Serial Publications

- 1853— B.M.; Camb.P.S.i.; Camb.U.i.; Dub.R.D.S.; Dub.R.I.A.;
Edinb.R.S.i.; Glasg.U.i.; M.O.i.; N.H.M.; Oxon.B.; R.A.S.;
R Geogr.S.i.; R.S.
- Henle u. Pfeufer Z.** Zeitschrift für rationelle Medicin; Henle und Pfeufer. Zürich,
Heidelberg, Leipzig.
- 1844—69. B.M.; Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Oxon.R.;
R.C.Surg.; R.S.; U.C.L.
- Hermbstädt Bll.** Bulletin des Neuesten und Wissenswürdigsten aus der Naturwissen-
schaft, etc.; Hermbstädt. Berlin.
- 1809—13. [Continued as: Museum des Neuesten, etc., 1814—18.]
B.M.; Camb.U.; R.S.
- Hermbstädt Ms.** Museum des Neuesten und Wissenswürdigsten aus dem Gebiete der
Naturwissenschaft, der Künste, der Fabriken, der Manufakturen,
der technischen Gewerbe, der Landwirthschaft, der Produk-
ten-
waaren und Handelskunde, und der bürgerlichen Haushaltung,
etc.; Hermbstädt. Berlin.
- 1814—18. [Continuation of: Bulletin des Neuesten, etc., 1809—13.]
B.M.; Camb.U.; R.S.
- Hermst. Vh.** Verhandlungen und Mittheilungen des Siebenbürgischen Vereins
für Naturwissenschaften. Hermannstadt.
- 1850— B.M.; Camb.U.; Dub.R.I.A.i.; N.H.M.; R.S.; S.K.
- Herts. NH. S. T.** Transactions of the Hertfordshire Natural History Society and Field
Club. London, Watford, Hertford.
- 1880— [Continuation of: Transactions of the Watford Natural
History Society and Hertfordshire Field Club, 1875—79.] B.M.;
Camb.U.; Dub.R.I.A.i.; Geol.M.; Geol.S.; Glasg.P.S.; Linn.S.;
N.H.M.; Oxon.B.; R.S.; U.C.L.
- Hisinger Afh.** { Afhandlingar i Fysik, Kemi, och Mineralogie; Hisinger och
Hisinger Afh. Fys. { Berzelius. Stockholm.
- 1806—18. Glasg.P.S.i.; Glasg.U.i.; N.H.M.; R.C.Surg.; R.S.; S.K.
- Hoeven en Vriese Ts.** ... Tijdschrift voor Natuurlijke Geschiedenis en Physiologie; Hoeven
en Vriese. Amsterdam.
- 1834—45. B.M.; Camb.U.; N.H.M.
- Holländ. Mg.** Holländisches Magazin der Naturkunde. Frankfurt-am-Main.
- 1802—05. Glasg.P.S.i.; R.S.
- Hufeland J. Arzn.** Journal der practischen Arzneykunde [und Wundarzneykunst];
Hufeland, etc. Jena.
- 1795—1844. B.M.; Glasg.P.S.i.; R.C.Surg.
- Humb.** Humboldt. Monatsschrift für die gesammten Naturwissenschaften.
Stuttgart.
- 1882—90. B.M.; Glasg.P.S.i.; P.O.; S.K.
- I. CE. P.** Minutes of Proceedings of the Institution of Civil Engineers, con-
taining Abstracts of the Papers and of the Discussions. London.
- 1837— B.M.; Camb.P.S.; Camb.U.; Dub.R.C.S.; Dub.R.D.S.;
Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.i.;
Glasg.U.; I.CE.; Oxon.B.; Oxon.R.i.; P.O.; R.Geogr.S.; R.S.;
S.K.; U.C.L.
- See **CE. I. P.**
- I. Égypt. Bll.** Bulletin de l'Institut Egyptien. Le Caire.
- 1859— Camb.P.S.i.; Camb.U.i.; N.H.M.; R.Geogr.S.i.; U.C.L.i.
- Iékat. S. Our. Bll.** Bulletin de la Société Ouralienne d'Amateurs des Sciences Naturelles.
Ekaterinburg.
- 1874— Edinb.R.S.i.; Geol.S.i.; N.H.M.i.
- I. Elect. E. J.** Journal of the Institution of Electrical Engineers, late the Society
of Telegraph Engineers and Electricians. London.
- 1890— [Continuation of: Journal of the Society of Telegraph
Engineers and Electricians, 1872—89.] B.M.; Camb.P.S.i.;
Camb.U.; Dub.T.C.i.; Edinb.R.S.i.; Glasg.U.i.; I.CE.; Oxon.B.;
Oxon.R.; P.O.; R.S.; S.K.; U.C.L.
- I. Gl. Sv. Mm.** Memoirs of the Geological Survey of India. Calcutta.
- 1859— B.M.; Camb.P.S.; Camb.U.i.; Dub.N.L.I.; Dub.R.C.S.;
Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.U.;
I.CE.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.C.Surg.;
R.Geogr.S.; R.S.; U.C.L.i.
- Il Cim.** Il Cimento, Rivista di Scienze, Lettere, ed Arti. Torino.
- 1852—55. B.M.

List of Serial Publications

- Il Polit.** Il Politecnico; Repertorio mensile di Studj applicati alla Prosperità e Coltura sociale.
1839—44; 1860—65.
Il Politecnico; Repertorio di Studj letterarj, scientifici e tecnici. Milano.
1866— B.M.i.; I.CE.i.; P.O.
- Il Progresso**..... Il Progresso delle Scienze, Lettere, ed Arti. Napoli.
First series undated; Second series 1832—64. Camb.U.; Oxon.B.
- Il Tempo** Il Tempo, Giornale Italiano di Medicina, etc. Firenze.
1858—60. B.M.; Glasg.P.S.i.
- I. M.E. P.** Institution of Mechanical Engineers. Proceedings. Birmingham, London.
1847— B.M.; Camb.P.S.i.; Camb.U.; Dub.R.D.S.; Glasg.P.S.; Glasg.U.; I.CE.; Oxon.R.i.; P.O.; R.S.; S.K.i.; U.C.L.
- I. Mn. E. T.** *See M.E. I. P.*
Transactions of the Institution of Mining Engineers. Newcastle-upon-Tyne.
1898— [Continuation of: Transactions of the Federated Institution of Mining Engineers, 1889—98.] Camb.U.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.; Oxon.B.; P.O.; S.K.
- Ing.**..... Der Ingenieur; Zeitschrift für das gesammte Ingenieurwesen; Bornemann. Freiberg.
1848—50. B.M.; I.CE.; P.O.
- Inghirami Opusc.** Nuova Collezione di Opuscoli e Notizie di Scienze; Inghirami. Fiesole.
1820—23. B.M.
- Innsb. Ferd. Z.** Zeitschrift des Ferdinandeums für Tirol und Vorarlberg. Innsbruck.
1852— B.M.; N.H.M.; R.S.
- Innsb. Nt. Md. B.** Berichte des Naturwissenschaftlich-Medizinischen Vereins in Innsbruck. Innsbruck.
1870— B.M.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Linn.S.i.; N.H.M.; Oxon.R.; R.S.
- Intell. Obs.** The Intellectual Observer; a Review of Natural History, Microscopic Research, and Recreative Science. London.
1862—68. [Continuation of: Recreative Science, 1859—62.] [Continued as: The Student and Intellectual Observer, 1868—71.] B.M.; Camb.U.; Geol.S.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.; R.S.i.; S.K.
- Int. Md. Cg. T.** Comptes-Rendus [Acti, Verhandlungen, Transactions] du Congrès International de Médecine. Paris, etc.
- Int. Md. Cg. Vh.** {
1867— B.M.; Camb.U.i.; Glasg.P.S.i.; Oxon.R.; R.C.Surg.
See Cg. Int. Md. C. R. and Cg. Md. Int. At.
- Iowa Ac. Sc. P.** Proceedings of the Iowa Academy of Sciences. Des Moines.
1875— B.M.i.; Edinb.R.S.i.; N.H.M.; Oxon.B.i.; P.O.; R.S.i.; U.C.L.i.
- Ir. Ac. F.** Proceedings of the Royal Irish Academy. (Science.) Dublin.
1836— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.; Dub.R.C.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.; Linn.S.; Math.S.i.; M.O.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.i.; R.A.S.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.
- Ir. Ac. T.** Transactions of the Royal Irish Academy. Science. Dublin.
1787— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.; Glasg.U.i.; I.CE.; Linn.S.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.i.; R.A.S.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.
- Ir. Gl. S. J.** Journal of the Royal Geological Society of Ireland. London, Dublin, Edinburgh.
1864—87. [Continuation of: Journal of the Geological Society of Dublin, 1833—64.] B.M.; Camb.U.; Dub.R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.M.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.; R.C.Surg.; R.Geogr.S.i.; R.S.
- Ir. Ntlist.** The Irish Naturalist: A Monthly Journal of General Irish Natural History. Dublin, Belfast, London.
1892— B.M.; Camb.P.S.i.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Dub.T.C.; Geol.M.i.; Geol.S.; Linn.S.; N.H.M.; S.K.

List of Serial Publications

- Isère S. Bil.** Bulletin de la Société de Statistique, des Sciences Naturelles, et des Arts Industriels du département de l'Isère. Grenoble.
1838— B.M.i.; N.H.M.; Oxon.B.; R.S.i.
- I. & S. I. J.** The Journal of the Iron and Steel Institute. London.
1872— Camb.U.; Chem.S.i.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.;
Edinb.U.; Geol.M.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.i;
I.CE.; Oxon.B.; P.O.; R.S.; S.K.; U.C.L.
- I. Solvay Tr.** Institut Solvay. Travaux de Laboratoire. Bruxelles.
1896— Glasg.P.S.i.; R.S.
- It. S. Gl. Bil.** Bollettino della Società Geologica Italiana. Rome.
1882— B.M.; Geol.M.; Geol.S.; Glasg.P.S.i.; N.H.M.; Oxon.R.
- It. S. Met. An.** Annuario Meteorologico Italiano pubblicato per cura del Comitato direttivo della Società Meteorologica Italiana. Torino, Roma, Firenze.
1886—92 B.M.; M.O.
- Jam. I. J.** Journal of the Institute of Jamaica. Kingston, Jamaica.
1891— B.M.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; N.H.M.;
R.Geogr.S.i.; R.S.; S.K.
- J. Anal. C.** The Journal of Analytical [and Applied] Chemistry. Easton, Pa.
1887—93. Chem.S.; P.O.i.
- J. An. Pl.** The Journal of Anatomy and Physiology, normal and pathological.
London, Cambridge, Edinburgh.
1867— B.M.; Camb.P.S.; Camb.U.; Edinb.R.S.; Edinb.U.;
Glasg.P.S.; Glasg.U.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.;
R.C.Surg.; R.S.; S.K.; U.C.L.
- Jap. As. S. T.** Transactions of the Asiatic Society of Japan. Yokohama.
1872— B.M.; Camb.U.; Edinb.R.S.; N.H.M.; Oxon.B.; Oxon.R.;
P.O.i.; R.Geogr.S.i.; R.S.
- Jap. Seism. S. T.** Transactions of the Seismological Society of Japan. Yokohama.
1880—92. [Continued as: Seismological Journal of Japan, 1893—95.]
Camb.U.; Dub.R.I.A.; Edinb.R.S.; Geol.M.; Glasg.U.i; I.CE.i.;
N.H.M.i.; R.A.S.i.; R.Geogr.S.; R.S.i.; U.C.L.i.
- Jb. Berg- Hm.** Berg- und Hüttenmännisches Jahrbuch der k.k. Schemnitz-
Bergakademie und der k.k. Montan-Lehranstalten zu Leoben und
Pörfam. Wien.
1851— B.M.i.; Geol.S.i.; I.CE.i.; P.O.i.; S.K.
*See Berg- Hm. Jb., Leoben Berg- Hm. Jb., and Wien Berg-
Hm. Jb.*
- Jb. Berg- Hw.** Jahrbuch für das Berg- und Hüttenwesen im Königreiche Sachsen.
Freiberg.
1873— [Continuation of: Jahrbuch für den Berg- und Hüttenmann,
1837—72.] B.M.; Geol.S.; I.CE.; N.H.M.i.; P.O.; S.K.
- Jb. Mijnw. Ned. Ind.** Jaarboek van het Mijnwezen in Nederlandsch Oost-Indië. Amsterdam.
1872— B.M.; Geol.S.; Glasg.P.S.i.; I.CE.; N.H.M.; P.O.; S.K.i.
- J. Bt.** The Journal of Botany, British and Foreign. London.
1863— B.M.; Camb.U.; Dub.N.L.I.i; Dub.R.C.S.; Glasg.U.;
Linn.S.; N.H.M.; Oxon.B.; Pharm.S.; P.O.i.; R.C.Surg.i;
R.S.i.; S.K.i.
- J. C. Méd.** Journal de Chimie Médicale, de Pharmacie, et de Toxicologie.
Paris.
1825—76. B.M.; Camb.U.; Edinb.U.i; Glasg.P.S.i.; Glasg.U.i;
Oxon.B.(R.); Pharm.S.i.; R.C.Surg.i; R.S.i.
- J. de Ps.** Journal de Physique, de Chimie, et d'Histoire Naturelle; de
Lamétherie, etc. Paris.
1794—1823. B.M.; Camb.U.; Geol.S.; Glasg.U.i; N.H.M.i.;
Oxon.B.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- J. de Ps.** Journal de Physique Théorique et Appliquée; d'Almeida. Paris.
1872— Camb.P.S.i.; Camb.U.; Dub.R.C.S.; Glasg.U.i; I.CE.i.;
Oxon.R.; P.O.; R.S.; S.K.
- Jena. Sb.** Sitzungsberichte der Jenaischen Gesellschaft für Medicin und
Naturwissenschaft. Jena.
1877—86. Edinb.R.S.i.; Linn.S.i.; Oxon.R.; R.S.; S.K.
- Jena. Z.** Jenaische Zeitschrift für Naturwissenschaft, herausg. von der
Medicinisch-Naturwissenschaftlichen Gesellschaft zu Jena.
Jena.
1864— B.M.; Camb.P.S.i.; Camb.U.; Chem.S.i.; Dub.N.L.I.i;

List of Serial Publications

- Dub.R.D.S.i.; Edinb.R.S.; Edinb.U.i.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Jern-Kont. A.** Jern-Kontoret's Annaler. En Tidskrift för Svenska Bergshand-
teringen. Stockholm.
1817— B.M.; I.CE.i.; P.O.; R.S.i.; S.K.
- J. Gén. Civ.** Journal du Génie Civil des Sciences et des Arts. Paris.
1828—48. B.M.i.; Camb.U.; P.O.
- J. H. Un. Cir.** The Johns Hopkins University Circulars. Baltimore.
1879— Camb.P.S.; Camb.U.; Dub.N.L.I.i.; Dub.R.I.A.i.;
Edinb.R.S.i.; Edinb.U.; Glasg.P.S.; Glasg.U.i.; Math.S.i.;
N.H.M.; Oxon.B.; Oxon.R.; R.A.S.i.; R.Geogr.S.i.; R.S.;
S.K.; U.C.L.i.
- J. I. Archip.** Journal of the Indian Archipelago and Eastern Asia. Singapore.
1847—58. B.M.i.; Camb.U.; Edinb.R.S.i.; Geol.S.; Glasg.P.S.i.;
N.H.M.; P.O.; R.Geogr.S.; R.S.; S.K.i.
- J. Lndw.** Journal für Landwirthschaft. Celle, Göttingen, Berlin.
1853— B.M.i.; P.O.i.
- J. Mscrgr.** Journal de Micrographie. Paris.
1877—92. Camb.U.; Glasg.P.S.i.; N.H.M.; Oxon.R.; P.O.i.
- J. Mscr. Sc.** Quarterly Journal of Microscopical Science; Lankester and Busk.
London.
1853— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.;
Dub.R.C.S.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.;
Glasg.U.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; Pharm.S.;
P.O.; R.C.Surg.; R.S.; S.K.; U.C.L.
- See **Mscr. J. and QJ. Mscr. Sc.**
- J. Méd. Chir. Phm.** Journal de Médecine, Chirurgie, Pharmacie, etc.. Paris.
1801—17. [Continued as: Nouveau Journal de Médecine, etc.
1818—22.] Edinb.U.i.; R.C.Surg.; R.S.
- J. Mines** Journal des Mines, ou Recueil de Mémoires sur l'exploitation des
Mines, et sur les Sciences et les Arts qui s'y rapportent. Paris.
1794—1815. [Continued as: Annales des Mines, 1817—] B.M.;
Camb.U.; Dub.T.C.; Edinb.R.S.; Geol.S.; I.CE.; Linn.S.i.;
N.H.M.; Oxon.B.(R.); R.S.i.; S.K.
- J. Phm.** Journal de Pharmacie et des Sciences accessoires. Paris.
1815—41. [Continuation of: Bulletin de Pharmacie, 1809—14.]
[Continued as: Journal de Pharmacie et de Chimie, 1842—]
Camb.U.; Chem.S.; Edinb.R.S.i.; Edinb.U.; Glasg.U.; Oxon.B.;
Pharm.S.; P.O.; R.C.Surg.; R.S.i.; U.C.L.i.
- J. Pl. Pth. Gén.** Journal de Physiologie et de Pathologie Générale. Paris.
1899— [Continuation of: Archives de Physiologie, etc., 1868—
98.] B.M.; Edinb.U.; Glasg.P.S.i.; Oxon.R.; R.C.Surg.; R.S.;
U.C.L.
- J. Fr. C.** Journal für praktische Chemie; Erdman, etc. Leipzig.
1834— [Continuation of: Journal für technische und ökonomische
Chemie, 1828—33.] B.M.; Camb.U.; Chem.S.; Dub.N.L.I.i.;
Dub.R.C.S.i.; Dub.R.D.S.i.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.;
N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.; R.C.Surg.i.; R.S.;
S.K.; U.C.L.i.
- See **Erdm. J. Fr. C.**
- J. Fs. C.** The Journal of Physical Chemistry. Ithaca, N.Y.
1896— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Edinb.R.S.;
Edinb.U.; Glasg.U.; Oxon.R.; P.O.; R.S.i.; S.K.
- J. Sav.** Journal des Savants. Paris.
1816— B.M.; Camb.U.; Dub.N.L.I.; Dub.T.C.; Edinb.R.S.i.;
Glasg.U.; Oxon.B.; Oxon.R.; P.O.i.; R.S.
- J. Sc.** The Journal of Science and Annals of Astronomy, Biology, Geology,
Industrial Arts, Manufactures and Technology. London.
1879—85. [Continuation of: The Quarterly Journal of Science,
1864—78.] B.M.; Camb.U.; Chem.S.; Dub.N.L.I.i.; Edinb.R.S.;
Edinb.U.i.; Glasg.U.i.; I.CE.; Linn.S.i.; N.H.M.; Oxon.R.;
Pharm.S.i.; P.O.; R.A.S.i.; R.C.Surg.i.; R.S.; S.K.
- J. Tél.** Journal Télégraphique publié par le Bureau International des
Administrations Télégraphiques. Berne.
1869— P.O.
- Kan. Ac. Sc. T.** Transactions of the Kansas Academy of Science. Topeka, Kansas.

List of Serial Publications

- 1872— Camb.P.S.i.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.i.;
Glasg.P.S.i.; Linn.S.i.; N.H.M.; Oxon.B.i.; R.S.i.; U.C.L.i.
- Kan. Un. Q.** The Kansas University Quarterly. Lawrence, Kansas.
- 1893— B.M.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.
S.i.; Glasg.P.S.i.; Math.S.i.; N.H.M.; R.S.
- Karlsruhe Nt. Vr. Vh.** ... Verhandlungen des Naturwissenschaftlichen Vereins in Karlsruhe.
Karlsruhe.
- 1864— B.M.i.; Dub.R.I.A.; Geol.S.i.; N.H.M.
See **Karlsruhe Vh. Nw. Vr.**
- Kärnten Landms. Jb.** ... Jahrbuch des Naturhistorischen Landesmuseums von Kärnten.
Klagenfurt.
- 1852— Camb.U.; Geol.S.i.; Glasg.P.S.i.; N.H.M.; R.S.i.
- Karsten Arch.**..... Archiv für Mineralogie, Geognosie, Bergbau, und Hüttenkunde;
Karsten. Berlin.
- 1829—55. B.M.; Edinb.R.S.i.; Geol.M.; Geol.S.; N.H.M.; P.O.;
R.S.
- Karsten Arch. Bergbau**... Archiv für Bergbau und Hüttenwesen; Karsten. Berlin, Breslau.
- 1818—31. N.H.M.; P.O.; R.S.; S.K.
- Kassel Vr. Nt. Ab. u. B.** Abhandlungen u. Bericht...des Vereins für Naturkunde zu Kassel.
Kassel.
- 1894—98. [Continuation of: Bericht, etc., 1837—94.] Edinb.R.S.i.;
Glasg.P.S.i.; N.H.M.
- Kassel Vr. Nt. B.** Bericht des Vereines für Naturkunde zu Kassel. Kassel.
- 1837—94. [Continued as: Abhandlungen u. Bericht, etc. 1894—98.]
Edinb.R.S.i.; Glasg.P.S.i.; N.H.M.; R.S.i.
- Kassel Vr. Nt. Festschr.** Festschrift des Vereins für Naturkunde zu Cassel zur Feier seines
fünfzigjährigen Bestehens. Cassel.
1886. N.H.M.
- Kastner Arch. C.** Archiv für Chemie und Meteorologie; Kastner. Nürnberg.
- 1830—35. Edinb.R.S.; M.O.i.; N.H.M.; P.O.; R.S.
- Kastner Arch. Ntl.** Archiv für die gesammte Naturlehre; Kastner. Nürnberg.
- 1824—35. B.M.; N.H.M.; P.O.; R.C.Surg.i.; S.K.
- Kazan Mm. Un.** Scientific Memoirs published by the Imperial University of Kazan.
[In Russian.] Kazan.
- 1834— B.M.i.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.i.;
Glasg.P.S.i.; Linn.S.i.; R.S.i.
- See **Kazan Un. Mm.**
- Kazan S. Nt. (Ps.-Mth.) P.** Proceedings of the Physico-Mathematical Section of the Naturalists'
Society of the Imperial University of Kazan. [In Russian.] Kazan.
- 1883—90. [Continued as: Bulletin de la Société Physico-Mathé-
matique de Kasan, 1891—] R.S.
- Kazan S. Nt. T.** Transactions of the Naturalists' Society of the Imperial University
of Kazan. [In Russian.] Kazan.
- 1871— B.M.; Glasg.P.S.i.; N.H.M.
- Kazan S. Ps.-Mth. Bl.** ... Bulletin de la Société Physico-Mathématique de Kasan. [In Russian.]
Kasan.
- 1891— [Continuation of: Proceedings of the Physico-Mathematical
Section of the Naturalists' Society of the Imperial University of
Kazan, 1883—90.] Dub.R.I.A.i.; Edinb.R.S.i.; R.S.i.
- See **Kazan Mm. Un.**
- Kazan Un. Mm.** Communications and Proceedings of the Mathematical Society of
the Imperial University of Kharkov. [In Russian.] Kharkov.
- 1879— R.S.i.
- Kiel Schr.**..... Schriften der Universität zu Kiel. Kiel.
- 1855—80. B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; N.H.M.i.;
Oxon.B.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.i.
- Kiev S. Nt. Mm.** Memoirs of the Kiev Naturalists' Society. [In Russian.] Kiev.
- 1870— B.M.; Camb.P.S.i.; Dub.R.I.A.i.; Glasg.P.S.i.; N.H.M.;
R.Geogr.S.i.; R.S.i.
- Kjøb. Bt. F. Mdd.** Meddelelser fra den Botaniske Forening i Kjøbenhavn. Kjøbenhavn.
1882—91. Linn.S.
- Kjøb. Carlsb. Lb. Mdd.**... Meddelelser fra Carlsberg Laboratoriet. Kjøbenhavn.
- 1876— B.M.; Chem.S.; Glasg.P.S.i.; N.H.M.; P.O.; R.S.
- Kiøb. Dn. Vd. Selsk. Afh.** (Det Kongelige Danske Videnskabernes Selskabs naturvidenskabelige
og matematiske Afhandlinger. Kiøbenhavn.
- 1824—46. B.M.; Dub.T.C.; Edinb.R.S.; Geol.S.i.; Linn.S.i.;
N.H.M.; R.S.; S.K.

List of Serial Publications

- Kjöb. Dn. Vd. Selsk. Skr.** { Det Kongelige Danske Videnskabernes Selskabs Skrifter. Kjöbenhavn. 1801—18. B.M.; Camb.P.S.i.; Camb.U.; Edinb.R.S.i.; N.H.M.; Oxon.B.; R.S.
See **Dn. Vd. Selsk. Skr.**
- Kjöb. Dn. Vd. Selsk. Skr.** { Det Kongelige Danske Videnskabernes Selskabs Skrifter. Naturvidenskabelig og Matematisk Afdeling. Kjöbenhavn. 1849— B.M.; Camb.U.i.; Edinb.R.S.i.; Linn.S.; N.H.M.; R.A.S.; R.Geogr.S.; R.S.; U.C.L.i.
- Kjöb. Ov.** { Oversigt over det Kongelige Danske Videnskabernes Selskabs Forhandlinger. Kjöbenhavn. 1806— Camb.P.S.; Camb.U.i.; Chem.S.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.i.; Geol.S.i.; Glasg.U.i.; Linn.S.i.; M.O.i.; N.H.M.i.; Oxon.R.; P.O.i.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
- Kolozsvár Orv.-Term. Társ. Éts.** { Értésítő a "Kolozsvári Orvos-Természettudományi Társulat" -nak az...orvosi, természettudományi szaküléseiről... [Proceedings of the medical and natural history sections of the Klausenburg Medical and Natural History Society.] Kolozsvár [Klausenburg]. 1876—79. N.H.M.
- Königsb. Nw. Unterh.** ... Königsberger Naturwissenschaftliche Unterhaltungen. Königsberg. 1842—46. Camb.U.; Glasg.P.S.i.; R.S.
- Königsb. SB.** ... Schriften der königlichen Physikalisch-Oekonomischen Gesellschaft zu Königsberg. Königsberg. 1860— B.M.; Camb.P.S.; Dub.R.I.A.; Edinb.R.S.i.; Linn.S.; N.H.M.; P.O.i.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.
- Kosmos (Lw.)** ... Kosmos. Czasopismo polskiego Towarzystwa przyrodników imienia Kopernika. [Cosmos. The Journal of the Polish Society of Naturalists founded in honour of Copernicus.] Lwow. 1876— B.M.; N.H.M.
- Krk. Ak. (Mt.-Prz.) Pam.** ... Pamiętnik Akademii Umiejętności w Krakowie. Wydział Matematyczno-Przyrodniczy. [Memoirs of the Academy of Science in Cracow. Section of Mathematics and Natural Science.] Kraków. 1874— B.M.; Edinb.R.S.i.; Glasg.U.i.; N.H.M.
- Krk. Ak. (Mt.-Prz.) Rz...** ... Rozprawy... Wydziału Matematyczno-Przyrodniczego Akademii Umiejętności. [Proceedings of the Section of Mathematics and Natural Science of the Academy of Science.] Kraków. 1874— B.M.; Camb.U.i.; Edinb.R.S.i.; Geol.S.i.; Glasg.U.i.; N.H.M.
- Krk. Roczn. Tow. Nauk.** ... Rocznik Towarzystwa Naukowego z Uniwersytetem Krakowskim Połączonem. Krakowie. [Annals of the Scientific Society of the Polish University of Krakow. Krakow.] 1817—72. B.M.; Glasg.U.i.
- Lamont A. Met.** ... Annalen für Meteorologie, Erdmagnetismus, und verwandte Gegenstände; Lamont. München. 1842—44. Camb.U.; Glasg.P.S.i.; M.O.; R.S.; S.K.
- Lamont Jb. Sternw. Münch.** ... Jahrbuch der K. Sternwarte bei München; Lamont. München. 1838—41. B.M.; Camb.U.; R.A.S.; R.S.
- Lanc. Hist. S. T.** ... Proceedings and Papers of the Lancashire and Cheshire Historic Society. Liverpool. 1849—54. [Continued as: Transactions, etc., 1855—] B.M.; Camb.U.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; Oxon.B.i.; R.Geogr.S.i.; R.S.
- Laus. Bil. S. Vd.** ... Bulletin des Séances de la Société Vaudoise des Sciences Naturelles. Lausanne. 1842— Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.; Linn.S.; N.H.M.; Oxon.B.i.; R.C.Surg.i.; R.S.; S.K.i.
See **Laus. S. Vd. Bil.**
- Laus. C. R. S. Suisse** ... Comptes Rendus de la Société Suisse. Lausanne. 1861. Glasg.P.S.i.; N.H.M.; R.S.
- Lausitz. Mschr.** ... Lausitzische [und neue Lausitzische] Monatsschrift. Organ der Oberlausitzischen Gesellschaft der Wissenschaften. Görlitz. 1800—08. B.M.
- Laus. S. Vd. Bil.** ... See **Laus. Bil. S. Vd.**
- Lb.** ... The Laboratory, a Weekly Record of Scientific Research. London. 1867. B.M.; Chem.S.; Oxon.R.; Pharm.S.; P.O.; R.S.

List of Serial Publications

- Leic. S. T.** The Transactions of the Leicester Literary and Philosophical Society. Leicester.
1835— Camb.U.; Dub.R.D.S.; Geol.S.; Glasg.P.S.; Linn.S.i.; M.O.i.; N.H.M.i.; Oxon.B.; P.O.; S.K.; U.C.L.
- Leijd. A. Ac.** Annales Academiæ Lugduno-Batavæ. Leijden.
1815—75. B.M.; Camb.U.; Dub.T.C.i.; N.H.M.; Oxon.B.; R.C.Surg.i.; R.S.i.; U.C.L.i.
- Leip. Ab. Jablon. Gs.** Abhandlungen bei Begründung der k. Sächsischen Gesellschaft der Wissenschaften am Tage der zweihundertjährigen Geburtsfeier Leibnizens; herausg. v. d. Jablonowski'schen Gesellschaft zu Leipzig. Leipzig.
1846. Camb.U.; Dub.R.I.A.; Edinb.R.S.; N.H.M.; R.A.S.; R.S.; S.K.
- Leip. Ab. Mth. Ps.** Abhandlungen der Mathematisch-Physischen Classe der Königlich Sächsischen Gesellschaft der Wissenschaften. Leipzig.
1852— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Glasg.U.; Math.S.i.; N.H.M.; Oxon.B.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.i.
See Leip. Mth. Ps. Ab.
- Leip. Arb. Fl. Anat.** Arbeiten aus der Physiologischen Anstalt zu Leipzig. Leipzig.
1866—76. Camb.U.; Glasg.P.S.i.; Oxon.R.; R.C.Surg.; R.S.
- Leip. As. Gs. Vjschr.** Vierteljahrsschrift der Astronomischen Gesellschaft. Leipzig.
1866— B.M.; Camb.P.S.i.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Oxon.R.; R.A.S.; R.S.; S.K.
- Leip. B.** Berichte über die Verhandlungen (Math.-Phys. Classe) der Königlich Sächsischen Gesellschaft der Wissenschaften zu Leipzig. Leipzig.
1846— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Glasg.U.; Math.S.i.; N.H.M.; Oxon.B.; Oxon.R.; R.A.S.; R.S.; S.K.i.; U.C.L.i.
See Leip. Mth. Ps. B.
- Leip. Jablon. Preisschr.** Preisschriften gekrönt und herausgegeben von der Fürstlich Jablonowski'schen Gesellschaft zu Leipzig. Leipzig.
1847— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; N.H.M.; Oxon.B.; R.A.S.i.; R.S.i.; U.C.L.i.
- Leip. Mth. Ps. Ab.** *See Leip. Ab. Mth. Ps.*
- Leip. Mth. Ps. B.** *See Leip. B.*
- Leip. Nf. Gs. Sb.** Sitzungsberichte der Naturforschenden Gesellschaft zu Leipzig. Leipzig.
1875— B.M.; Camb.U.; Edinb.R.S.i.; N.H.M.; R.C.Surg.; R.S.i.; S.K.
- L. Electr. S. P.** Proceedings of the London Electrical Society. London.
1841—43. [*Continuation of:* Transactions and Proceedings, 1837—40.] B.M.; Camb.U.; Chem.S.; Geol.S.; Glasg.P.S.i.; I.CE.; Oxon.B.; P.O.; R.S.; S.K.
- Leoben Berg-Hm. Jb.** ... Berg- und Hüttenmännisches Jahrbuch der k.k. Schemnitzer Bergakademie und der k. k. Montan-Lehranstalten zu Leoben und Pibram. Wien.
1851— B.M.i.; Geol.S.i.; I.CE.i.; P.O.i.; S.K.
See Berg-Hm. Jb., Jb. Berg-Hm., and Wien Berg-Hm. Jb.
- Leonhard u. Bronn N. Jb.** Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrofaktenkunde; Leonhard und Bronn. Stuttgart.
1833—62. [*Continuation of:* Jahrbuch für Mineralogie, etc., 1830—32.] [*Continued as:* Neues Jahrbuch für Mineralogie, Geologie und Paläontologie, 1863—] B.M.; Camb.U.; Dub.N.L.I.i.; Dub.R.D.S.i.; Geol.M.; Geol.S.; Glasg.U.; I.CE.i.; N.H.M.; Oxon.R.; R.S.; S.K.i.
- Le Puy A. S. Ag.** (Annales de la Société d'Agriculture, Sciences, etc., du Puy. Le Puy.
Le Puy S. Ag. A. [1826— Geol.S.i.; N.H.M.]
- Les Mondes** Les Mondes, Revue hebdomadaire des Sciences et de leurs Applications aux Arts et à l'Industrie; l'Abbé F. Moigno. Paris.
1863—84. B.M.; Camb.U.i.; Dub.N.L.I.i.; Glasg.P.S.i.; I.CE.i.; M.O.i.; Oxon.R.; P.O.; R.S.i.; S.K.i.
- L'I** L'Institut, Journal des Académies et Sociétés Scientifiques de la France et de l'Étranger. Paris.
1833—76. B.M.i.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; Geol.S.i;

List of Serial Publications

- Glasg.P.S.i.; N.H.M.i.; Oxon.B.(R.); P.O.i.; R.C.Surg.i.; R.S.i.; S.K.i.
- Lick Obs. Ct.** Contributions from the Lick Observatory. Sacramento. 1889—95. B.M.i.; Edinb.R.S.; R.A.S.
- Lieb. A.** Annalen der Chemie und Pharmacie; Liebig, etc. Lemgo, Leipzig, Heidelberg. 1832— B.M.; Camb.U.; Chem.S.; Dub.N.L.I.i.; Dub.R.C.S.i.; Edinb.R.S.i.; Edinb.U.; Glasg.P.S.; Glasg.U.i.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.; R.C.Surg.i.; R.S.; S.K.; U.C.L.i.
- See **A. C. Phm.**
- Liège A. Ac.** Annales Academiæ Leodiensis. Liège. 1817—27. B.M.; Camb.U.; Dub.T.C.; N.H.M.; Oxon.B.; R.S.
- Liège Lb. Fred. Tr.** Université de Liège. Institut de Physiologie. Travaux du Laboratoire de Léon Fredericq. Paris, Liège. 1886— Edinb.R.i.; Glasg.P.S.i.; R.S.
- Liège Mm. S. Sc.** Mémoires de la Société [Royale] des Sciences, de l'Agriculture, et des Arts à Liège. Liège. 1843— B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.i.; N.H.M.; Oxon.B.; P.O.; R.S.; S.K.
- See **Liège S. Sc. Mm.**
- Liège S. Gl. Blg. A.** Annales de la Société Géologique de Belgique. Liège. 1874— Camb.P.S.; Geol.M.; Geol.S.; I.CE.i.; N.H.M.; R.S.; S.K.i.
- See **Liège Mm. S. Sc.**
- Liège S. Sc. Mm.** Mémoires de la Société [Royale] des Sciences, etc. à Lille. Lille. 1827—96. B.M.; Camb.U.; Dub.T.C.; N.H.M.; Oxon.B.; Oxon.R.; R.S.i.
- Lille Mm.** See **Lille S. Mm.**
- Lille Mm. S.** Séances Publiques de la Société des Amateurs. Lille. 1806—19. [Continued as: Recueil des Travaux, etc., 1819—27.] B.M.; Glasg.P.S.i.; N.H.M.; Oxon.R.
- Lille Sé. Pbl.** See **Lille Mm.**
- Lille S. Mm.** Recueil des Travaux de la Société d'Amateurs des Sciences, de l'Agriculture, et des Arts à Lille. Lille. 1819—27. [Continuation of: Séances Publiques, etc., 1806—19.] B.M.; Camb.U.; Dub.T.C.; N.H.M.; Oxon.B.; Oxon.R.; R.S.
- Lille Tr.** Travaux et Mémoires de l'Université de Lille. Lille. 1889— Camb.P.S.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; N.H.M.; R.S.; S.K.i.
- Lindenau Z.** Zeitschrift für Astronomie und verwandte Wissenschaften; Lindenau. Tübingen. 1816—18. B.M.; Camb.U.; R.A.S.; R.S.
- Linnæa** Linnæa; ein Journal für die Botanik in ihrem ganzen Umfange. Berlin. 1826—82. B.M.; Camb.U.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.; N.H.M.; R.S.
- Liouv. J.** Journal de Mathématiques pures et appliquées, fondé par Joseph Liouville. Paris. 1836— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; I.CE.i.; Oxon.B.(R.); R.S.; S.K.; U.C.L.
- Liouv. J. Mth.** Historia e Memorias da Academia Real das Sciencias de Lisboa. Lisboa. 1797— B.M.; Camb.U.; Edinb.R.S.; Geol.S.i.; N.H.M.; Oxon.B.; R.A.S.; R.C.Surg.i.; R.Geogr.S.i.; R.S.i.; S.K.i.
- See **Lisb. Mm. Ac. Sc.**
- Lisb. Ac. Sc. Mm.** Actas das Sessões da Academia Real das Sciencias de Lisboa. Lisboa. 1849—51. B.M.; Dub.R.I.A.; Dub.T.C.; Glasg.P.S.i.; N.H.M.; R.S.
- Lisb. Act.** Annaes maritimos e coloniaes. Lisboa. 1840—45. N.H.M.; Oxon.B.i.; R.Geogr.S.i.
- Lisb. A. Mar.** Jornal de Sciencias mathematicas, physicas e naturaes. Publicado sob os auspicios da Academia R. das Sciencias de Lisboa. Lisboa. 1868— B.M.; Camb.U.; Dub.R.D.S.i.; Edinb.R.S.i.; Geol.S.; Linn.S.; Math.S.i.; N.H.M.; Oxon.B.; R.A.S.; R.Geogr.S.; R.S.; U.C.L.i.

List of Serial Publications

- Lisb. Mm. Ac. Sc.** See **Lisb. Ac. Sc. Mm.**
L. Md. Ps. J. The Medical and Physical Journal. London.
 1799—1833. B.M.; Camb.U.i.; Chem.S.i.; Edinb.U.; Oxon.B.;
 Oxon.R.; Pharm.S.i.; R.C.Surg.
- L. Mth. S. P.** Proceedings of the London Mathematical Society. London.
 1865— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.;
 Edinb.R.S.; Edinb.U.; Glasg.U.; Math.S.; Oxon.B.i.; Oxon.R.;
 R.S.; S.K.; U.C.L.
- Lndw. Jb.** Landwirtschaftliche Jahrbücher. Berlin.
 1872— [Continuation of: Annalen der Landwirtschaft, 1843—71.]
 B.M.; Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Linn.S.i.; Oxon.B.;
 P.O.; R.S.; S.K.
- Lndw. V.-St.** Die landwirthschaftlichen Versuchs-Stationen. Organ für wissen-
 schaftliche Forschungen auf dem Gebiete der Landwirtschaft.
 Dresden, Chemnitz.
 1859— B.M.i.; Camb.U.; Chem.S.i.; Glasg.U.i.; Oxon.B.; P.O.i.;
 R.S.i.
- See **Dresden Lndw. V.-St.**
 Transactions of the Odontological Society. London.
 1856— B.M.; Camb.U.; Geol.S.i.; Glasg.P.S.i.; Oxon.B.;
 Pharm.S.i.; R.C.Surg.; R.S.; U.C.L.i.
- Lotos** Lotos. Zeitschrift für Naturwissenschaften. Prag.
 1851—95. B.M.; Camb.U.; Dub.R.I.A.i.; N.H.M.
- Louvain A. Ac.** Annales Academiæ Lovaniensis. Bruxelles, Louvain.
 1821—27. B.M.; Camb.U.; Dub.T.C.; Oxon.B.; R.S.
- Lpldina.** Leopoldina: amtliches Organ der Kaiserlichen Leopoldino-
 Carolinischen Deutschen Akademie der Naturforscher. Dres-
 den, Halle.
 1859— B.M.; Camb.P.S.; Camb.U.i.; Edinb.R.S.i.; Linn.S.;
 M.O.i.; N.H.M.; R.A.S.i.; R.S.
- L. Pol. Mg.** Polytechnic Magazine and Journal of Science, Literature and the
 Fine Arts. London.
 1844. [Continued as: The London Polytechnic Review and Maga-
 zine, 1845.] B.M.; Camb.U.; Edinb.U.
- Lpool. Bl. S. P. & T.** Proceedings and Transactions of the Liverpool Biological Society.
 Liverpool.
 1890— [Continuation of: Proceedings, 1887—89.] Camb.U.i.;
 Dub.R.D.S.; Edinb.R.S.; Linn.S.; N.H.M.; Oxon.B.i.; S.K.
- Lpool. Lt. Ph. S. P.** Proceedings of the Literary and Philosophical Society of Liverpool.
 London, Liverpool.
 1844— B.M.; Camb.U.i.; Chem.S.i.; Dub.R.I.A.; Edinb.R.S.i.;
 Geol.S.; Glasg.P.S.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.i.;
 P.O.i.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.
- Lpool. Md. Chir. J.** Liverpool Medico-Chirurgical Journal. Liverpool.
 1857—59. B.M.; Camb.U.; Dub.T.C.; Oxon.B.; R.C.Surg.
- L. Ps. S. P.** Proceedings of the Physical Society of London. London.
 1874— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.C.S.; Dub.
 R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.i.; Geol.S.i.;
 Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Math.S.; Oxon.B.; Oxon.R.;
 P.O.; R.A.S.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- Lucca At. Ac.** Atti della R. Accademia Lucchese di Scienze, Lettere ed Arti. Lucca.
 1821— B.M.; Camb.U.; Dub.T.C.i.; Oxon.B.i.
- Lum. Élect.** La Lumière Electrique. Journal universel d'Électricité. Paris.
 1879—94. B.M.; Glasg.U.i.; I.CE.; P.O.; S.K.i.
- Lund. Acta Un.** Acta Universitatis Lundensis. Lunds Universitets Års-skrift.
 Afdelningarna för Matematik och Naturvetenskap. Lund.
 1864— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.;
 Geol.S.i.; Glasg.U.i.; Linn.S.i.; N.H.M.; Oxon.B.; R.S.; S.K.i.
- See **Lund. Un. Acta.**
Lund Phys. Sällsk. Årsb. Physiographiska Sällskapets Årsberättelse. Lund.
 1823—24. R.S.i.
- Lund Phys. Sällsk. Ts.** Physiografiska Sällskapets Tidskrift. Lund.
 1837—38. Camb.U.; N.H.M.; R.S.
- Lund. Un. Acta** See **Lund. Acta Un.**
- Lüneb. Nt. Vr. Jh.** Jahreshefte des Naturwissenschaftlichen Vereins für das Fürstenthum
 Lüneberg. Lüneberg.
 1865— N.H.M.

List of Serial Publications

- Lux. I. Pb.** Publications de l'Institut Royal Grand-Ducal de Luxembourg.
Lux. Pb. I. Section des Sciences Naturelles et Mathématiques: ci-devant
 "Société des Sciences Naturelles." Luxembourg.
 1870— Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.i.; N.H.M.;
 R.S.i.
- Lux. S. Sc. Mm.** Société des Sciences Naturelles du Grand-Duché de Luxembourg.
Lux. S. Sc. Nt. Luxembourg.
 1853—69. Dub.R.I.A.; R.S.
- Lyon Ac. Mm.** Mémoires de l'Académie des Sciences, Belles-Lettres et Arts de
Lyon Ac. Mm. (Sc.) Lyon. Classe des Sciences. Lyon, Paris.
Lyon Ac. Sc. Mm. 1845— B.M.; Camb.U.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; Oxon.B.;
 R.S.i.; S.K.i.
See Lyon Mm. Ac.
- Lyon A. S. L.** Annales de la Société Linnéenne de Lyon. Lyon.
 1836— B.M.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.; Linn.S.i.;
 N.H.M.; Oxon.B.i.(R.); R.S.i.; S.K.i.
- Lyon Mm. Ac.**
Lyon Mm. Ac. Sc. *See Lyon Ac. Mm.*
Lyon S. Ag. A. Annales des Sciences physiques et naturelles, d'Agriculture et
 d'Industrie, publiées par la Société d'Agriculture, etc.
 1838—67.
 Annales de la Société d'Agriculture, Histoire Naturelle et Arts
 Utiles de Lyon. Lyon.
 1868— B.M.; Camb.U.; Dub.R.I.A.; Linn.S.; N.H.M.; Oxon.B.;
 P.O.; R.S.; S.K.i.
- Lyon S. Sc. Md. Mm.** ... Mémoires et Comptes-Rendus de la Société des Sciences Médicales
 de Lyon. Lyon, Paris.
 1862— Glasg.P.S.i.; R.C.Surg.i.
- Lyon Un. A.** Annales de l'Université de Lyon. Paris, Lyon.
 1891— B.M.; Edinb.R.S.; N.H.M.i.; R.S.i.
- Mâcon Ac. A.** Annales de l'Académie de Mâcon, Société des Arts, Sciences, Belles-
 Lettres et d'Agriculture. Mâcon.
 1851— B.M.; R.S.i.
- Mâcon S. Ag. C. R.**
Mâcon S. C. R. (Compte Rendu des Travaux de la Société (d'Agriculture), des
 Sciences, Arts et Belles-Lettres de Mâcon. Mâcon.
 1807—52. B.M.i.; R.S.i.
- Madras Eng. Rp.** Reports, etc. on various professional subjects connected with the
 duties of the Corps of Engineers of the Madras Presidency;
 Capt. J. T. Smith, F.R.S. Madras.
 1839—46. I.C.E.; P.O.; R.S.
- Madras J.** The Madras Journal of Literature and Science. Madras.
 1833— B.M.i.; Camb.U.; Dub.N.L.I.i.; Geol.S.i.; Linn.S.i.;
 N.H.M.; Oxon.B.i.; P.O.; R.A.S.i.; R.Geogr.S.i.; R.S.i.;
 S.K.i.; U.C.L.i.
- Madrid Ac. Ci. Mm.** Memorias de la Real Academia de Ciencias. Madrid.
 1850— B.M.; Camb.U.i.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.;
 Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.B.; R.A.S.i.; R.C.Surg.i.;
 R.Geogr.S.i.; R.S.i.; S.K.i.; U.C.L.i.
- See Madrid Mm.*
- Madrid A. H. Nt.** Anales de Historia Natural. Madrid.
 1799—1804. B.M.; N.H.M.; R.S.
- Madrid Mm.** *See Madrid Ac. Ci. Mm.*
- Madrid Rv.** Revista de los Progresos de las Ciencias exactas, físicas, y naturales.
 Madrid.
 1850—86. B.M.; Dub.R.D.S.i.; Edinb.R.S.i.; Geol.S.i.; N.H.M.;
 Oxon.R.i.; R.A.S.i.; R.S.i.
- Madrid S. H. Nt. A.** Anales de la Sociedad Española de Historia Natural. Madrid.
 1872— Camb.U.; Glasg.P.S.i.; N.H.M.; R.S.
- Mag. Ak. Éts.** Magyar Akadémiai Értesítő. [Report of the Hungarian Academy.]
 Pest.
 1840—59. B.M.
- Mag. Ak. Éts. (Mth. Term.)** Magyar Akadémiai Értesítő. A matematikai és természettudomá-
 nyi osztályok közlönye. [Report of the Hungarian Academy.
 Communications of the Mathematical and Natural Science
 sections.] Pest.
 1860—65. B.M.; Camb.P.S.i.; Geol.S.i.; R.Geogr.S.i.; R.S.; S.K.i.

List of Serial Publications

- Magdeb. Nt. Vr. Jbr. u. Ab.** Jahresbericht und Abhandlungen des Naturwissenschaftlichen Vereins zu Magdeburg. Magdeburg. 1869— B.M.; R.S.i.
- Magendie J. de Pl.** Journal de Physiologie, expérimentale et pathologique; Magendie. Paris. 1821—31. Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.i.; R.C.Surg.; R.S.; U.C.L.
- Mag. Tud. Ak. Étk. (Mth.)** Értékezések a Matematikai Osztály köréből. Kiadja a Magyar Tudományos Akadémia. [Memoirs on Mathematical subjects. Published by the Hungarian Academy of Science.] Pest. 1867—94. B.M.; Edinb.R.S.i.; Geol.S.i.; R.S.; S.K.i.
- Mag. Tud. Ak. Étk. (Termt.)** Értékezések a Természettudományok köréből. Kiadja a Magyar Tudományos Akadémia. [Memoirs on Natural Science subjects. Published by the Hungarian Academy of Science.] Pest. 1867—94. B.M.; Edinb.R.S.i.; Geol.S.i.; Glasg.P.S.i.; N.H.M.; R.Geogr.S.i.; R.S.; S.K.i.
- Mag. Tud. Ak. Éts.** A Magyar Tudományos Akadémia Értesítője. [Report of the Hungarian Academy of Science.] Pest. 1867— B.M.; R.Geogr.S.i.; R.S.i.; S.K.i.
- Mag. Tud. Ak. Évk.** A Magyar Tudós Társaság' Evkönyvei. Pest. 1833—46.
A Magyar Tudományos Akadémia Évkönyvei. Budá. 1860—89. B.M.; Edinb.R.S.i.; Geol.S.i.; N.H.M.; Oxon.B.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
See Évk.
- Majocchi A. Fis. C.** Annali di Fisica, Chimica, e Matematiche, col Bulletino dell' Industria meccanica e chimica; Majocchi. Milano. 1841—50. B.M.; R.S.
- Malpighia** Malpighia. Rassegna mensile di Botanica. Messina, Genova. 1886— B.M.; Camb.U.; Linn.S.; N.H.M.
- Manch. Gl. S. T.** Transactions of the Manchester Geological Society. London. 1841— B.M.; Camb.U.i.; Dub.T.C.; Edinb.R.S.i.; Geol.M.; Geol.S.; I.CE.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.i.; R.S.; U.C.L.
- Manch. Lt. Ph. S. Mm.** Memoirs of the Literary and Philosophical Society of Manchester. London, Manchester. 1785—1887. [Continued as: Memoirs and Proceedings, etc., 1888—] B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.; Dub.R.I.A.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.; Linn.S.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.
See Manch. Mm. Ph. S. and Manch. S. Mm.
- Manch. Lt. Ph. S. Mm. & P.** Memoirs and Proceedings of the Manchester Literary and Philosophical Society. Manchester. 1888— [Continuation of: Memoirs, etc., 1785—1887, and Proceedings, etc., 1857—87.] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.i.; Edinb.R.S.; Glasg.P.S.; Glasg.U.; I.CE.; Linn.S.; Math.S.; M.O.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.; P.O.; R.A.S.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Manch. Lt. Ph. S. P.** Proceedings of the Literary and Philosophical Society of Manchester. Manchester. 1857—87. [Continued as: Memoirs and Proceedings, etc., 1888—] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.; Linn.S.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.; Pharm.S.; P.O.; R.A.S.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
See Manch. Ph. S. P. and Manch. S. P.
- Manch. Mcr. S. Rp.** Manchester Microscopical Society. Annual Report. Manchester. 1880—84. [Continued as: Transactions, etc., 1884—] Edinb.R.S.i.; Glasg.P.S.i.; N.H.M.i.; P.O.; S.K.i.
- Manch. Mcr. S. T.** Manchester Microscopical Society. Transactions and Annual Report. Manchester. 1884— [Continuation of: Reports, 1880—84.] B.M.i.; Camb.U.i.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; P.O.; S.K.i.
- Manch. Mm. Ph. S.** } *See Manch. Lt. Ph. S. Mm.*
- Manch. Ph. S. Mm.** }
- Manch. Ph. S. P.** } *See Manch. Lt. Ph. S. P.*
- Manch. S. Mm.** } *See Manch. Lt. Ph. S. Mm.*

List of Serial Publications

- Manch. S. P.** See **Manch. Lt. Ph. S. P.**
Marb. Schr. Schriften der Gesellschaft zur Beförderung der gesammten Naturwissenschaften zu Marburg. Marburg.
 1823— B.M.i.; Camb.U.; N.H.M.; Oxon.R.; R.S.i.; S.K.i.
Marseille Mm. S. Ém. ... Mémoires de la Société d'Emulation de la Provence. Marseille.
 1861—66. B.M.; Glasg.P.S.i.; N.H.M.
Mars. Fac. Sc. A. Annales de la Faculté des Sciences de Marseille. Marseille, Paris.
 1891— B.M.; Camb.P.S.; Dub.R.I.A.; Edinb.R.S.; Glasg.P.S.; Linn.S.; Math.S.i.; N.H.M.; R.A.S.; R.S.
Maryland Ac. T. Transactions of the Maryland Academy of Sciences and Letters. Baltimore.
 1837. Glasg.P.S.i.; R.S.
Maryland Gl. Sv. Maryland Geological Survey. Baltimore.
 1897— Camb.P.S.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.i.; N.H.M.; P.O.; R.Geogr.S.; R.S.; U.C.L.
Mathesis Mathesis. Recueil Mathématique.... Gand, Paris.
 1881— B.M.; Camb.U.
Mbl. Nt. Maandblad voor Natuurwetenschappen, uitgegeven door de Sectie voor Natuurwetenschappen van het Genootschap ter Bevordering van Natuur-, Genees- en Heelkunde. Amsterdam.
 1871— N.H.M.
Mcr. J. Quarterly Journal of Microscopical Science; Lankester and Busk. London.
 1853— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.; Dub.R.C.S.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; Pharm.S.; P.O.; R.C.Surg.; R.S.; S.K.; U.C.L.
 See **J. Mcr. Sc. and QJ. Mcr. Sc.**
Mcr. S. J. Journal of the Royal Microscopical Society. London.
 1878— [Continuation of: The Monthly Microscopical Journal, 1869—77.] B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.N.L.I.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.C.Surg.; R.S.i.; S.K.; U.C.L.
Mcr. S. T. Transactions of the Microscopical Society of London. London.
 1844—68. [Continued as: The Monthly Microscopical Journal, 1869—77.] B.M.; Camb.U.i.; Edinb.R.S.i.; Geol.S.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.i.; Pharm.S.i.; P.O.; R.C.Surg.; R.S.; S.K.; U.C.L.
Md. Chir. S. P. Proceedings of the Royal Medical and Chirurgical Society of London. London.
 1857— B.M.; Camb.U.; Edinb.R.S.; Glasg.P.S.i.; Oxon.B.i.; Oxon.R.; Pharm.S.i.; R.C.Surg.; R.S.; U.C.L.
Md. Chir. T. Medico-Chirurgical Transactions, published by the [Royal] Medical and Chirurgical Society of London. London.
 1809— B.M.; Camb.U.; Dub.R.D.S.; Edinb.R.S.i.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.; Oxon.B.; Oxon.R.; Pharm.S.i.; R.C.Surg.; R.S.; U.C.L.
Md. C. Us. Medicinisch-chemische Untersuchungen: aus dem Laboratorium für angewandte Chemie zu Tübingen; Hoppe-Seyler. Berlin.
 1866—71. B.M.; Camb.U.; Chem.S.; Edinb.U.; R.C.Surg.; R.S.
Md. Jb. Medizinische Jahrbücher. Herausg. von der K. K. Gesellschaft der Aerzte in Wien. Wien.
 1861— [Continuation of: Zeitschrift der K. K. Gesellschaft, etc., 1844—60.] Camb.U.i.; Glasg.P.S.i.; Pharm.S.i.; R.C.Surg.
Meckel Arch. Archiv für Anatomie und Physiologie; Meckel. Leipzig.
 1826—32. [Continued as: Archiv für Anatomie, Physiologie, und Wissenschaftliche Medizin, 1834—76.] B.M.; Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.; N.H.M.; Oxon.R.; R.C.Surg.; R.S.; U.C.L.i.
Meckl. Vr. Nt. Arch. ... Archiv des Vereins der Freunde der Naturgeschichte in Mecklenburg. Neubrandenburg.
 1847— Camb.U.; Linn.S.i.; N.H.M.; R.S.i.
 See **Mekl. Arch.**
Medley I. Eng. Professional Papers on Indian Engineering; Major J. G. Medley.
Medley Prof. Pp. I. Eng. { Roorkee.
 1864—86. I.CE.; P.O.i.; R.S.i.

List of Serial Publications

- ME. I. P.** Institution of Mechanical Engineers. Proceedings. Birmingham, London.
1847— B.M.; Camb.P.S.i.; Camb.U.; Dub.R.D.S.; Glasg.P.S.; Glasg.U.; I.CE.; Oxon.R.i.; P.O.; R.S.; S.K.i.; U.C.L.
- Meisner A.** Annalen der allgemeinen Schweizerischen Gesellschaft für die gesammten Naturwissenschaften; Meisner. Bern.
1824—25. B.M.; Linn.S.; N.H.M.; R.S.
- Meisner Az.** Naturwissenschaftlicher Anzeiger der allgemeinen Schweizerischen Gesellschaft für die gesammten Naturwissenschaften; Meisner. Aarau, Bern.
1818—23. B.M.; Glasg.P.S.i.; N.H.M.
- Mekl. Arch.** See **Meckl. Vr. Nt. Arch.**
- Mess. Mth.** The Messenger of Mathematics. Cambridge, London.
1862— B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.i.; Dub.R.C.S.i.; Dub.R.D.S.i.; Edinb.R.S.i.; Edinb.U.; Glasg.U.; Math.S.i.; Oxon.B.; Oxon.R.; R.S.; S.K.; U.C.L.
- Metaxà A. Md. Chir.** ... Annali Medico-Chirurgici; Metaxà. Roma.
1839—46. B.M.; Glasg.P.S.i.; Oxon.B.
- M.-et-L. Mm. S. Ac.** Mémoires de la Société Académique de Maine et Loire. Angers.
M.-et-L. S. Ac. Mm. 1857—83. [*Continued as*: Mémoires de l'Académie des Sciences et Belles-Lettres d'Angers, 1890—95.] B.M.; Camb.U.; N.H.M.; R.S.i.
- Met. S. QJ.** Quarterly Journal of the [Royal] Meteorological Society. London.
1873— [*Continuation of*: Proceedings of the British Meteorological Society, 1861—71.] Camb.U.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb. R.S.; Geol.S.; Glasg.U.; I.CE.; Linn.S.i.; M.O.; Oxon.R.; P.O.; R.A.S.; R.Geogr.S.i.; R.S.
- Met. Z.** Meteorologische Zeitschrift. Berlin.
1884— Camb.U.; Edinb.R.S.; M.O.; P.O.; R.Geogr.S.; R.S.; S.K.
- Metz Ac. Mm.** Mémoires de l'Académie Royale, Impériale de Metz. Metz.
Metz Mm. Ac. 1821— B.M.; Camb.U.; Dub.T.C.; N.H.M.; Oxon.B.; R.S.i.; S.K.
- Méx. Bl. Gg.** Boletín del Instituto Nacional [de la Sociedad Mexicana] de Geografía y Estadística de la Republica Mexicana. México.
Méx. Gg. Bl. 1850—66. B.M.; Oxon.B.i.; R.Geogr.S.i.
Boletín de la Sociedad de Geografía y Estadística de la Republica Mexicana. México.
1869— B.M.; Edinb.R.S.i.; R.Geogr.S.i.
- Méx. Obs. Bl.** Ministerio de Fomento de la República Mexicana. Boletín mensual del Observatorio Meteorológico-Magnético central de México. México.
1888— Edinb.R.S.; Glasg.P.S.i.; M.O.
- Méx. S. "Alzate" Mm.** Memorias de la Sociedad Científica "Antonio Alzate." México.
1887— B.M.i.; Camb.P.S.; Dub.R.I.A.; Edinb.R.S.; Glasg.U.i.; Linn.S.i.; Math.S.i.; M.O.; N.H.M.i.; R.A.S.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
- Mg. NH.** The Magazine of Natural History, and Journal of Zoology, Botany, Mineralogy, Geology, and Meteorology. London.
1829—40. [*Continued as*: Annals and Magazine of Natural History, 1841—] B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.i.; R.S.; U.C.L.i.
- Mg. Ntvd.** Magazin für Naturvidenskaberne; Lundh, etc. Christiania.
1823—36. [*Continued as*: NytMagazin, etc., 1838—] B.M.; N.H.M.i.; R.S.
- Mg. Phm.** Magazin für die neuesten Erfahrungen, Entdeckungen und Berichtigungen im Gebiete der Pharmacie, etc. Karlsruhe, Heidelberg.
1823—24. [*Continued as*: Magazin für Pharmacie und die dahin einschlagenden Wissenschaften, 1824—31.] Glasg.P.S.i.; R.C. Surg.; R.S.
- Mh. C.** Monatshefte für Chemie und verwandte Theile anderer Wissenschaften. Gesammelte Abhandlungen aus den Sitzungsberichten der K. Akademie der Wissenschaften. Wien.
1880— Camb.U.i.; Chem.S.; Glasg.P.S.i.; Glasg.U.i.; Pharm.S.; P.O.

List of Serial Publications

- Mh. Mth. Ps.** Monatshefte für Mathematik und Physik. Wien.
1890— B.M.; Camb.U.; Edinb.U.; Math.S.i.; N.H.M.
- Midl. Ntlist.** The Midland Naturalist. London, Birmingham.
1878—93. Camb.U.; Geol.M.; Geol.S.i.; Linn.S.; N.H.M.; P.O.; S.K.
- Mil. At. Aten.** Atti dell' Ateneo, già Accademia fisico-medico-statistica di Milano.
Milano.
1859—67. Glasg.P.S.i.
- Mil. At. Cagnola** Atti della Fondazione Scientifica Cagnola dalla sua Istituzione in
poi. Milano.
1856— B.M.; Glasg.P.S.i.; N.H.M.i.; R.S.i.; S.K.i.
- Mil. At. I. Lomb.** Atti dell' I. R. Istituto Lombardo di Scienze, Lettere ed Arti.
Milano.
1858—64. [Continuation of: Giornale, etc., 1841—56.] [Continued
as: Rendiconti, etc., 1864—] B.M.; Camb.U.; Dub.R.I.A.;
Edinb.R.S.; I.CE.i.; N.H.M.; Oxon.B.; R.Geogr.S.i.; R.S.
- Mil. At. S. It.** Atti della Società Italiana di Scienze Naturali. Milano.
1855— B.M.; Camb.U.; Edinb.R.S.i.; N.H.M.; P.O.i.; R.S.; S.K.i.
See **Mil. S. It. At.**
- Mil. Effem.** Effemeridi Astronomiche di Milano. Con Appendice di Osservazioni
e Memorie Astronomiche. Milano.
- Mil. Effem. As.** 1806— Camb.U.; Oxon.B.; R.A.S.i.
- Mil. G. I. Lomb.** Giornale dell' I. R. Istituto Lombardo di Scienze, Lettere ed Arti
e Biblioteca Italiana; compilata da varj dotti nazionali e stranieri.
Milano.
1841—56. [Continued as: Atti, etc., 1858—64.] B.M.; Geol.S.i.;
I.CE.; N.H.M.; Oxon.B.; R.Geogr.S.; R.S.
See **Mil. I. Lomb. G.**
- Mil. G. S. Inc.** Giornale della Società d' Incoraggiamento delle Scienze, etc. stabilità
in Milano. Milano.
1808—65. B.M.; Camb.U.
See **Mil. G. I. Lomb.**
- Mil. I. Lomb. G.** Memorie dell' I. R. Istituto Lombardo di Scienze, etc. Milano.
1843— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.;
Edinb.R.S.i.; Geol.S.; I.CE.i.; Math.S.i.; N.H.M.; Oxon.B.;
R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.
- Mil. I. Lomb. Mm.** See **Mil. Mm. I. Lomb.**
- Mil. I. Lomb. Rd.** Reale Istituto Lombardo di Scienze e Lettere. Rendiconti. Milano.
1864— [Continuation: of Atti, etc., 1858—64.] B.M.; Camb.P.S.;
Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.; Glasg.P.S.;
Glasg.U.i.; I.CE.i.; Math.S.i.; N.H.M.; Oxon.B.i.; R.A.S.i.;
R.Geogr.S.; R.S.; S.K.i.; U.C.L.i.
- Mil. Mm. I. Lomb.** See **Mil. I. Lomb. Mm.**
- Mil. Mm. I. Lomb. Ven.** Memorie dell' I. R. Istituto del regno Lombardo-Veneto. Milano.
1819—38. B.M.; Camb.U.; I.CE.; N.H.M.; Oxon.B.i.; R.C.Surg.i.;
R.Geogr.S.; R.S.; S.K.
- Mil. S. It. At.** See **Mil. At. S. It.**
- Minn. Ac. Sc. Bll.** Bulletin of the Minnesota Academy of Natural Sciences. Minneapolis,
Minn.
1874— B.M.; Geol.S.i.; N.H.M.; S.K.i.
- Miquel Bll.** Bulletin des Sciences Physiques et Naturelles en Néerlande; Miquel,
Mulder, Wenckebach. Leyden, Rotterdam.
1838—40. B.M.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; R.S.
- Mitau Arb. Kurländ. Gs.** Arbeiten der Kurländischen Gesellschaft für Literatur und Kunst.
Mitau.
1847—51. B.M.; Camb.U.
- M. Mcr. J.** The Monthly Microscopical Journal. London.
1869—77. [Continuation of: Transactions of the Microscopical
Society of London, 1844—68.] [Continued as: Journal of the
Royal Microscopical Society, 1878—] B.M.; Camb.U.; Edinb.
R.S.; Edinb.U.; Geol.S.i.; Glasg.U.; N.H.M.; Oxon.R.; P.O.;
R.C.Surg.; R.S.; U.C.L.
- Mm. Fis. Sperim.** Memorie di Fisica sperimentale. Modena.
1837—38. Glasg.P.S.i.
- Mm. Gl. Sv.** Memoirs of the Geological Survey of Great Britain and of the
Museum of Economic Geology in London. London.
1846— Camb.U.; Dub.R.C.S.; Dub.T.C.; Edinb.R.S.; Edinb.U.;

List of Serial Publications

- Geol.M.; Geol.S.; Glasg.U.i.; I.CE.; N.H.M.; Oxon.B.; Oxon.R.;
P.O.; R.S.; S.K.; U.C.L.
- See* **Gl. Sv. Mm.**
- Mm. Md. Mil.** Recueil de Mémoires de Médecine, de Chirurgie, et de Pharmacie Militaires, rédigé sous la surveillance du Conseil de Santé. Paris.
1815—82. [*Continued as:* Archives de Médecine et de Pharmacie Militaires, 1883—] B.M.; Glasg.U.i.; R.C.Surg.
- Mn. Mg.** The Mineralogical Magazine and Journal of the Mineralogical Society of Great Britain and Ireland. Truro, London.
1876— B.M.; Camb.U.; Chem.S.i.; Dub.N.L.I.; Geol.M.; Geol.S.; Glasg.U.; N.H.M.; Oxon.B.(R.); P.O.; R.S.; S.K.
- Mntp. A. Clin.** Annales Cliniques de la Société Médicale Pratique de Montpellier. Montpellier.
1818—20. B.M.; Glasg.P.S.i.; R.C.Surg.
- Mntp. Ac. Mm.** Académie des Sciences et Lettres de Montpellier. Mémoires de la Section des Sciences. Montpellier.
- Mntp. Ac. Sc. Mm.** 1847— B.M.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; Oxon.B.; R.A.S.; R.S.; U.C.L.i.
- Mntp. Mm. Ac.** Recueil des Bulletins publiés par la Société Libre des Sciences, etc. de Montpellier. Montpellier.
1803—14. B.M.; Camb.U.; Oxon.B.i.
- Mntp. Mm. Ac. Sect. Sc.** Société Languedocienne de Géographie. Bulletin. Montpellier.
1878— B.M.; R.Geogr.S.
- Mntp. Rec. Bl.** Memorie della Regia Accademia di Scienze, Lettere ed Arti di Modena. Modena.
1833— B.M.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Math.S.i.; N.H.M.; Oxon.B.i.; S.K.i.; U.C.L.i.
- Mntp. S. Lang. Gg. Bl.** *See* **Mod. Mm. Ac. Sc.**
- Mod. Ac. Sc. Mm.** Annuario della Società dei Naturalisti in Modena. Modena.
1866—82. [*Continued as:* Atti della Società, etc., 1883—] Camb.U.; Dub.R.I.A.i.; Edinb.R.S.i.; Glasg.P.S.i.; N.H.M.; R.S.
- Mod. An. S. Nt.** *See* **Mod. S. Nt. An.**
- Mod. Mm. Ac. Sc.** *See* **Mod. Ac. Sc. Mm.**
- Mod. Mm. S.** Memorie di Matematica e di Fisica della Società Italiana delle Scienze. Modena.
1782— B.M.i.; Camb.P.S.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.; Glasg.U.i.; Linn.S.i.; Oxon.B.i.; R.A.S.i.; R.C.Surg.i.; R.S.; S.K.i.; U.C.L.i.
- Mod. Mm. S. It.** *See* **Mod. S. It. Mm., Rm. S. It. Mm., and Verona Mm. S. It.**
- Mod. Relazione** Relazione delle Adunanze della R. Accademia di Scienze, Lettere ed Arti di Modena. Modena.
1842—43. Glasg.P.S.i.; R.S.
- Mod. S. It. Mm.** *See* **Mod. Mm. S., Rm. S. It. Mm., and Verona Mm. S. It.**
- Mod. S. Nt. An.** *See* **Mod. An. S. Nt.**
- Mod. S. Nt. At.** Atti della Società dei Naturalisti di Modena. Modena.
1883— [*Continuation of:* Annuario, etc., 1866—82.] Camb.U.; Dub.R.I.A.i.; N.H.M.
- Mod. S. Nt. At. (Rd.)** ... Atti della Società dei Naturalisti di Modena. Rendiconti delle Adunanze. Modena.
1882—86. B.M.; Camb.U.; Glasg.P.S.i.; N.H.M.
- Moigno Cosmos** Cosmos. Revue Encyclopédique Hebdomadaire des Progrès des Sciences; Moigno. Paris.
1852—70. B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; I.CE.i.; N.H.M.; Oxon.B.; P.O.; R.A.S.i.; R.S.; S.K.i.
- Moleschott Us.** *See* **Cosmos.**
Untersuchungen zur Naturlehre des Menschen und der Thiere; Moleschott. Frankfurt-am-Main, Giessen.
1857— B.M.; Camb.U.i.; Glasg.P.S.i.; N.H.M.; Oxon.R.; R.C.Surg.; R.S.i.
- Moncalieri Oss. Bl.** Bulletino Meteorologico dell' Osservatorio del R. Collegio Carlo Alberto in Moncalieri. Torino.
1866— Glasg.P.S.i.; M.O.; R.A.S.i.
- Mondes (les)** *See* **Les Mondes.**
- Mon. Sc.** Le Moniteur Scientifique; Quesneville. Paris.
1857— B.M.; Chem.S.i.; Dub.R.C.S.i.; Oxon.B.; Pharm.S.i.; P.O.; R.A.S.i.

List of Serial Publications

- Mosc. Bil. S. Nt.**..... Bulletin de la Société Impériale des Naturalistes. Moscou.
1829— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.i.;
Dub.R.I.A.; Edinb.R.S.i.; Geol.S.; Glasg.U.i.; Linn.S.; N.H.M.;
Oxon.B.i.; Oxon.R.; P.O.i.; R.A.S.i.; R.C.Surg.i.; R.S.;
S.K.
See Mosc. S. Nt. Bil.
- Mosc. Cm. S. Fs. Md.** ... Commentationes Societatis Physico-Medicæ apud Universitatem
Mosquensem Institutæ. Mosquæ.
1808—21. B.M.; Glasg.P.S.i.; R.S.i.; S.K.i.
- Mosc. N. Mm.**..... Nouveaux Mémoires de la Société Impériale des Naturalistes de
Moscou. Moscou.
1829— B.M.; Camb.U.; Edinb.R.S.i.; Geol.S.i.; Linn.S.i.;
N.H.M.; Oxon.R.i.; R.C.Surg.i.; R.S.i.; S.K.i.
See Mosc. S. Nt. N. Mm.
- Mosc. Obs. A.**..... Annales de l'Observatoire de Moscou; Bredichin. Moscou.
1874— B.M.i.; Camb.U.; R.A.S.; R.S.
- Mosc. S. Nt. Bil.**..... *See Mosc. Bil. S. Nt.*
- Mosc. S. Nt. Mm.**..... Mémoires de la Société Impériale des Naturalistes de Moscou.
Moscou.
1806—23. B.M.; Camb.P.S.i.; Camb.U.; Dub.R.I.A.; Geol.S.;
Glasg.P.S.i.; Linn.S.i.; N.H.M.; R.S.i.; S.K.i.
- Mosc. S. Nt. N. Mm.** ... *See Mosc. N. Mm.*
- Mosc. S. Sc. Bil.**..... Bulletin of the Imperial Society of Lovers of Natural Science,
Anthropology and Ethnography, in connection with the Imperial
University of Moscow. [In Russian.] Moscow.
1865— B.M.i.; Edinb.R.S.i.; N.H.M.i.; R.C.Surg.i.
- Mosc. Un. Mm.**..... Scientific Memoirs of the Imperial University of Moscow. [In
Russian.] Moscow.
1833—36. B.M.i.; N.H.M.i.
- Mosc. Un. Mm. (Ps-
Mth.)**..... Scientific Memoirs of the Imperial University of Moscow. Physico-
Mathematical Section. [In Russian.] Moscow.
1880—96. Chem.S.; Glasg.P.S.i.; N.H.M.
- Mt. Blanc Obs. A.**..... Annales de l'Observatoire Météorologique [Physique et Glaciaire] du
Mont Blanc. Paris.
1893— B.M.; Camb.U.; Dub.R.D.S.i.; Edinb.R.S.; M.O.; Oxon.R.;
R.S.; S.K.
- Mth. A.**..... Mathematische Annalen; Clebsch. Leipzig.
1869— B.M.; Camb.P.S.; Camb.U.; Dub.N.L.L.i.; Dub.R.C.S.i.;
Dub.R.D.S.i.; Dub.T.C.i.; Edinb.U.; Glasg.U.; Math.S.; Oxon.R.;
R.S.; S.K.; U.C.L.
- Mth. Nt. B. Ung.**..... Mathematische und naturwissenschaftliche Berichte aus Ungarn.
Berlin.
1892— Camb.P.S.; Chem.S.; Edinb.R.S.; Glasg.U.i.; R.A.S.i.;
R.Geogr.S.i.; R.S.; S.K.
- Mth. Term. Étts.**..... {
Mth. Term. Étts...... {
Mathematikai és természettudományi Értesítő. Kiadja a Magyar
Tudományos Akadémia. [Mathematical and Natural Science
Report, published by the Hungarian Academy of Science.]
Budapest.
1883— B.M.i.; Edinb.R.S.; N.H.M.; R.S.
- Mth. Ts.**..... Matematisk Tidsskrift. Kjøbenhavn.
1859—64. [Continued as: Tidsskrift for Matematik, 1865—] B.M.;
Camb.U.; Math.S.i.; Oxon.B.; R.S.i.
- Mt. Ostld.**..... Mittheilungen aus dem Osterlande. Altenburg.
1837— Camb.U.i.; N.H.M.
- Mulder Arch.**..... Natuur- en Scheikundig Archief; Mulder, Wenckebach. Rotterdam,
Leijden.
1833—38. B.M.; Edinb.R.S.; Glasg.P.S.i.; R.S.
- Mulhouse Bil.**..... {
Mulhouse Bil. S. In...... {
Mulhouse S. In. Bil...... {
Bulletin de la Société Industrielle de Mulhouse. Mulhouse.
1828— B.M.i.; Camb.U.i.; Chem.S.i.; Dub.R.C.S.i.; Dub.T.C.i.;
Glasg.P.S.i.; Glasg.U.i.; I.CE.; Oxon.B.i.; P.O.
- Müller Arch.**..... Archiv für Anatomie, Physiologie, und wissenschaftliche Medicin;
Müller, Reichert, Du Bois-Reymond. Berlin.
1834—76. [Continuation of: Archiv für Anatomie und Physiologie,
1826—32.] [Continued as: Archiv für Anatomie und Physiologie,
1877—] B.M.; Camb.U.; Edinb.U.; Glasg.P.S.i.; Glasg.U.;
N.H.M.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.
See Arch. An. Pl. and Reichert Arch.

List of Serial Publications

- Münch. Ab.** (Abhandlungen der mathematisch-physikalischen Classe der Königl. Bayerischen Akademie der Wissenschaften. München.
1829— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.U.; I.CE.i.; Linn.S.; Oxon.B.; Oxon.R.; P.O.; R.A.S.i.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.)
- Münch. Ak. Ab.** (Abhandlungen der mathematisch-physikalischen Classe der Königl. Bayerischen Akademie der Wissenschaften zu München. München.
1860—70. B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Geol.S.; I.CE.; Linn.S.; N.H.M.; Oxon.B.; P.O.i.; R.A.S.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.)
- Münch. Ak. Sb.** (Sitzungsberichte der Mathematisch-Physikalischen Classe der K. B. Akademie der Wissenschaften zu München. München.
1871— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.T.C.; Edinb.R.S.; Glasg.U.i.; I.CE.i.; Linn.S.; Oxon.B.; Oxon.R.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.)
See Münch. Sb.
- Münch. Bil. Ak.** (Bulletin der k. Akademie der Wissenschaften. München.
1843—53. B.M.i.; Edinb.R.S.i.; I.CE.i.; Oxon.B.i.; R.A.S.; R.Geogr.S.i.; R.S.)
- Münch. D.** (Denkschriften der Königl. Bayerischen Akademie der Wissenschaften zu München. München, Salzbach.
1808—24. B.M.; Camb.P.S.; Camb.U.; Geol.S.i.; Glasg.U.; N.H.M.; Oxon.R.; P.O.; R.C.Surg.; R.S.; S.K.)
- Münch. Gelehrte Az.** ... (Gelehrte Anzeigen; herausgegeben von Mitgliedern der Königl. Baierischen Akademie der Wissenschaften. München.
1835—60. B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; Oxon.B.; P.O.; R.S.; S.K.)
- Münch. Gs. Mph. Pl. Sb.** (Sitzungsberichte der Gesellschaft für Morphologie und Physiologie in München. München.
1885— Camb.U.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.)
- Münch. Nt. Tech. Com. Ab.** (Abhandlungen der naturwissenschaftlich-technischen Commission bei der Königl. Baierischen Akademie. München.
1857—58. Camb.U.; R.S.)
- Münch. Sb.** *See Münch. Ak. Sb.*
- Münch. Z. Archt.** (Zeitschrift des Bayerischen Architekten- und Ingenieur-Vereins, München.
1869—77. P.O.)
- N. Al. J. C.** (Neues allgemeines Journal der Chemie. Berlin.
1803—06. [*Continuation of:* Allgemeines Journal, etc., 1798—1802.] [*Continued as:* Journal für die Chemie und Physik, 1806—10.] B.M.; Glasg.P.S.i.; N.H.M.; Oxon.R.; R.S.)
- N. A. Mth.** (Nouvelles Annales de Mathématiques. Paris.
1842— B.M.; Camb.U.; Dub.T.C.; Edinb.U.; Glasg.U.; Math.S.i.; Oxon.B.(R.); R.S.; S.K.; U.C.L.i.)
- Nancy Mm. Ac. Stanislas** (Académie de Stanislas. Mémoires de la Société [Royale] des Sciences, etc. Nancy.
1852— [*Continuation of:* Mémoires de la Société, etc., 1833—51.] B.M.; Camb.U.; Geol.S.i.; Oxon.B.; R.S.i.; S.K.)
- Nancy Mm. S. Sc.** (Mémoires de la Société [Royale] des Sciences, Lettres et Arts de Nancy. Nancy.
1833—51. [*Continuation of:* Précis analytique des Travaux de la Société, etc., 1802—32.] [*Continued as:* Académie de Stanislas. Mémoires, etc., 1852—] B.M.; Camb.U.i.; N.H.M.i.; Oxon.B.; R.S.i.; S.K.)
- Nancy S. Sc. Bil.** (Bulletin de la Société des Sciences de Nancy. Nancy, Paris.
1873— B.M.; Geol.S.i.; N.H.M.; R.Geogr.S.i.; R.S.)
- Nancy Tr. S. Sc.** (Précis analytique des Travaux de la Société [Royale] des Sciences, Arts et Agriculture de Nancy. Nancy.
1802—32. [*Continued as:* Mémoires de la Société, etc., 1833—51.] B.M.; Camb.U.i.; Oxon.B.; R.S.i.)
- Nantes A. S. Ac.** (Annales de la Société Académique de Nantes et du Département de la Loire Inférieure. Nantes.
1830— Camb.U.; Glasg.P.S.i.; Oxon.B.)

List of Serial Publications

- N. Antol. Sc.** Nuova Antologia di Scienze, Lettere ed Arti. Firenze, Roma. 1866— B.M.; Dub.N.L.I.i.; N.H.M.
- Nap. Ac. Asp. A.** Annali dell' Accademia degli Aspiranti Naturalisti. Napoli. 1843—47; 1861—69; 1887. Camb.U.i.; N.H.M.; R.S.i.
- Nap. Ac. At.** Atti della Reale Accademia delle Scienze e Belle Lettere; Sezione della Società R. Barbonica. Napoli. 1819—51. B.M.; Camb.U.; Dub.R.D.S.; Geol.S.i.; N.H.M.; Oxon.B.; R.A.S.i.; R.C.Surg.i.; R.S.
- Atti della R. Accademia delle Scienze Fisiche e Matematiche. Napoli. 1863—82; 1888— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Geol.S.i.; Glasg.U.i.; Linn.S.i.; Math.S.i.; N.H.M.; Oxon.B.i.; Oxon.R.; R.A.S.i.; R.S.; S.K.i.
- See Nap. At. Ac.*
- Nap. Ac. Pont. At.** Atti dell' Accademia Pontaniana di Napoli. Napoli. 1832— B.M.; Camb.U.; Dub.R.D.S.i.; Glasg.U.i.; N.H.M.; R.S.i.; U.C.L.i.
- Nap. Ac. Sc. Mm.** Memorie della R. Accademia delle Scienze, etc. Napoli. 1852—57. B.M.; Camb.U.; Dub.R.D.S.; Edinb.R.S.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.A.S.; R.S.
- Nap. At. Ac.** } *See Nap. Ac. At.*
- Nap. At. Ac. Sc.** }
- Nap. At. I. Inc.** Atti del Real Istituto d' Incoraggiamento alle Scienze Naturali di Napoli. Napoli. 1811— B.M.; Camb.U.; Edinb.R.S.i.; I.CE.i.; N.H.M.; Oxon.B.; P.O.; R.C.Surg.i.; R.S.i.; S.K.i.
- See Nap. I. Inc. At.*
- Nap. Bil. Ac. Asp.** Bollettino dell' Accademia degli Aspiranti Naturalisti. Napoli. 1842; 1861—64. Camb.U.i.; N.H.M.
- Nap. I. Inc. At.** *See Nap. At. I. Inc.*
- Nap. Ms.** Museo di Letteratura e Filosofia; Gatti. Napoli. 1842—62. B.M.; Oxon.B.
- Nap. Rd.** Rendiconto delle adunanze e de' lavori della Reale Accademia delle Scienze [Fis. e Mat.] di Napoli. Napoli. 1842—57. B.M.; Camb.U.; Edinb.R.S.i.; Linn.S.i.; N.H.M.; Oxon.B.i.; Oxon.R.; R.A.S.i.; R.S.i.
- Nap. Rd.** Rendiconto dell' Accademia delle Scienze Fisiche e Matematiche. Napoli. 1862— Camb.U.; Dub.R.I.A.; Edinb.R.S.; Glasg.U.i.; Linn.S.i.; Math.S.; N.H.M.; Oxon.R.i.; P.O.; R.A.S.; R.S.; U.C.L.i.
- Nap. S. Nt. Bil.** Bollettino della Società di Naturalisti in Napoli. Napoli. 1887— B.M.; Camb.P.S.; N.H.M.; R.S.
- N. Arch. Wisk.** Nieuw Archief voor Wiskunde. Amsterdam. 1875— Camb.P.S.i.; Edinb.R.S.i.; Math.S.
- N. A. Sc. Nt.** Nuovi Annali delle Scienze naturali; Alessandrini, Bertolini, Gherardi e Ranzani. Bologna. 1838—54. Camb.U.; Geol.S.i.; N.H.M.; Oxon.B.i.; R.Geogr.S.i.; R.S.
- See Bologna N. A.*
- Nass. Jb.** } Jahrbücher des Vereins für Naturkunde im Herzogthum Nassau.
- Nass. Vr. Jb.** } Wiesbaden. 1844— B.M.; Camb.P.S.i.; Camb.U.; Linn.S.; N.H.M.; R.S.i.; S.K.
- Nauche J. du Galvan.** ... Journal du Galvanisme, de Vaccine, etc.; Nauche. Paris. 1803. B.M.; Glasg.P.S.i.
- N. Bergm. J.** Neues bergmännisches Journal; Kohlen und Hoffmann. Freiberg. 1795—1816. B.M.i.; Geol.S.i.; N.H.M.; R.S.; S.K.i.
- N. Brunsw. NH. S. Bil.** ... Bulletin of the Natural History Society of New Brunswick. St John. 1882— Geol.S.; Glasg.P.S.i.; N.H.M.; R.S.i.
- N. Cim.** Il Nuovo Cimento, Giornale di Fisica, Chimica e Storia Naturale. Pisa. 1855— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Edinb.R.S.i.; I.CE.i.; N.H.M.; Oxon.R.i.; P.O.i.; R.S.
- Ndl. Arch. Ntk.** Nederlansch Archief voor Genees- en Natuurkunde. Utrecht. 1865—70. [*Continuation of: Archiv für die Holländischen Beiträge zur Natur- und Heilkunde, 1858—64.*] B.M.; Glasg.P.S.i.; R.S.i.

List of Serial Publications

- Ndl. Gast. Oogl. Vs.** Nederlandsch Gasthuis voor Behoeftige en Minvermogene Ooglijders te Utrecht. Verslag. Utrecht.
1885— [Continuation of: Jaarlijksch Verslag betrekkelijk de Verpleging en 't Onderwijs in het Nederlandsch Gasthuis voor Ooglijders; Donders, 1860—85.] R.S.
- Ndl. Kruidk. Arch.** Nederlandsch Kruidkundig Archief. [Verslagen en Mededeelingen der Nederlandsche Botanische Vereeniging.] Leiden, Amsterdam, Leeuwarden, Nijmegen.
1846— B.M.i.; Edinb.R.S.i.; Linn.S.; N.H.M.; R.S.
- Ndl. Lancet** Nederlandsch Lancet. Tijdschrift aan de praktische Chirurgie, etc. Utrecht.
1838—56. B.M.; Glasg.P.S.i.; R.C.Surg.i.
- Ndösterr. Gewerb-Vr. Vh.** Verhandlungen des Niederösterreichischen Gewerb-Vereins. Wien.
1840— B.M.i.; P.O.; S.K.i.
- Nebr. Un. Stud.** University Studies. Published by the University of Nebraska. Lincoln, Nebraska.
1838— B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Oxon.B.; R.S.
- N. Eng. I. Mn. E. T.** Transactions of the North of England Institute of Mining Engineers. Newcastle-upon-Tyne.
1852— B.M.; Camb.U.; Edinb.R.S.i.; Geol.S.; Glasg.U.i.; I.CE.; Oxon.B.i.; P.O.i.; R.S.; S.K.; U.C.L.i.
- Neuch. Bil.** Bulletin de la Société des Sciences Naturelles de Neuchâtel.
Neuch. S. Sc. Bil. Neuchâtel.
1844— B.M.i.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.i.; M.O.i.; N.H.M.; Oxon.B.i.; R.A.S.i.; R.S.i.; S.K.i.
- Newcastle C. S. T.** Newcastle-upon-Tyne Chemical Society. Transactions. Newcastle-upon-Tyne.
1868—83. B.M.; Chem.S.; Oxon.B.; Pharm.S.i.; P.O.; R.S.
- NH. Rv.** The Natural History Review and Quarterly Journal of Science. London, Dublin.
1854—60. B.M.; Camb.U.; Dub.R.D.S.; Dub.T.C.; Glasg.P.S.; Linn.S.; N.H.M.; Oxon.R.; P.O.; R.C.Surg.; S.K.; U.C.L.i.
- The Natural History Review; a Quarterly Journal of Biological Science. London.
1861—65. B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.; Dub.T.C.; Edinb.R.S.; Geol.S.; Glasg.P.S.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.; R.C.Surg.; R.S.; S.K.
- Nice Obs. A.** Annales de l'Observatoire de Nice. Paris.
1887— B.M.; Edinb.R.S.i.; Glasg.P.S.i.; Glasg.U.i.; R.A.S.; R.S.; S.K.
- Nicholson J.** Journal of Natural Philosophy, Chemistry, and the Arts; Nicholson. London.
1797—1813. [Continued in: The Philosophical Magazine, 1814—] B.M.; Camb.U.; Chem.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Edinb.U.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.i.; R.S.; S.K.; U.C.L.
- Nim. S. Sc. Bil.** Bulletin de la Société d'Étude des Sciences Naturelles de Nîmes. Nîmes.
1873— N.H.M.i.
- N. Jb. Mn.** Neues Jahrbuch für Mineralogie, Geologie und Paläontologie. Stuttgart.
1863— [Continuation of: Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrefaktenkunde, 1833—62.] B.M.; Camb.U.; Chem.S.i.; Dub.N.L.I.i.; Dub.R.D.S.i.; Geol.M.; Geol.S.; Glasg.U.; I.CE.i.; N.H.M.; Oxon.R.; R.S.; S.K.i.
- N. Mg. Ntvd.** Nyt Magazin for Naturvidenskaberne. Christiania.
1838— [Continuation of: Magazin for Naturvidenskaberne, 1823—36.] Camb.U.i.; Edinb.R.S.i.; Geol.S.i.; Linn.S.i.; N.H.M.; R.S.; S.K.
- Nord. Arch.** Nordisches Archiv für Naturkunde und Arzneiwissenschaft. Kopenhagen, Frankfurt an der Oder.
1799—1801. B.M.; Glasg.P.S.i.; R.C.Surg.
- Norm. S. L. Bil.** Bulletin de la Société Linnéenne de Normandie. Caen.
1855— B.M.; Camb.U.; Geol.S.i.; Glasg.P.S.i.; Linn.S.; N.H.M.; R.S.i.; U.C.L.i.
- See **Caen S. L. Bil.**

List of Serial Publications

- N. Rs. S. Nt. Mm.** Mémoires de la Société des Naturalistes de la Nouvelle-Russie. [In Russian.] Odessa.
1872— B.M.; Camb.P.S.i.; Edinb.R.S.i.; Geol.S.i.; Linn.S.i.; N.H.M.; R.S.i.
- N. Rs. S. Nt. Mm. (Mth.)** Memoirs of the Mathematical Section of the New Russian Society of Naturalists. [In Russian.] Odessa. ...
1878— Dub.R.I.A.; Math.S.i.; R.S.i.
- N. Scotia I. Sc. P. & T....** Proceedings and Transactions of the Nova Scotian Institute of Natural Science. Halifax, Nova Scotia.
1863— Camb.P.S.i.; Chem.S.i.; Edinb.R.S.i.; Geol.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.; Pharm.S.i.; P.O.i.; R.A.S.i.; R.Geogr.S.i.; R.S.i.; U.C.L.i.
- N. S. W. R. S. J.** Journal and Proceedings of the Royal Society of New South Wales. Sydney.
1876— [Continuation of: Transactions, etc., 1867—75.] B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.T.C.; Edinb.R.S.i.; Geol.M.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; I.CE.; Linn.S.i.; M.O.; N.H.M.; Oxon.B.; Oxon.R.i.; Pharm.S.i.; P.O.i.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.
- N. S. W. R. S. T.** Transactions of the Royal Society of New South Wales. Sydney.
1867—75. [Continued as: Journal and Proceedings, etc., 1876—] B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.i.; Geol.M.i.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.; R.Geogr.S.i.; R.S.; S.K.i.
- Nt.** Nature: a weekly illustrated Journal of Science. London.
1870— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.; Dub.R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.; Linn.S.; M.O.; Oxon.B.; Oxon.R.; Pharm.S.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- Ntleza.** La Naturaleza. Periódico científico de la Sociedad Mexicana de Historia Natural. México.
1870— B.M.i.; Edinb.R.S.i.; Geol.S.i.; N.H.M.i.
- N. Ts. Fs. K.** Nyt Tidsskrift for Fysik og Kemi. Kjøbenhavn.
1896—98. [Continuation of: Tidsskrift for Fysik og Kemi, 1862—94.] B.M.; Glasg.P.S.i.
- N. Ts. Mth.** Nyt Tidsskrift for Matematik. Kjøbenhavn.
1890— [Continuation of: Tidsskrift for Matematik, 1865—89.] B.M.; Math.S.i.
- Nürnb. Ab.** Abhandlungen der Naturhistorischen Gesellschaft zu Nürnberg. Nürnberg.
1852— B.M.i.; Camb.U.; Dub.R.I.A.; N.H.M.; R.S.i.; S.K.
- Nv. Archt. T.** Transactions of the Institution of Naval Architects. London.
1860— B.M.; Camb.U.; Dub.R.I.A.; Edinb.U.; Glasg.U.; I.CE.; P.O.; R.S.; S.K.i.; U.C.L.i.
- N.-Vorp. Mt.** Mittheilungen aus dem Naturwissenschaftlichen Vereine von Neu-Vorpommern und Rügen. Berlin.
1869— B.M.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; N.H.M.; R.C.Surg.i.; S.K.
- Nv. Sc.** Naval Science: a Quarterly Magazine for promoting the improvement of Naval Architecture, Marine Engineering, Steam Navigation and Seamanship. London.
1872—76. B.M.i.; Camb.U.i.; Glasg.U.i.; I.CE.i.; M.O.i.; Oxon.B.i.; P.O.; S.K.
- N. Y. Ac. A.** Annals of the New York Academy of Sciences, late Lyceum of Natural History. New York.
1879— [Continuation of: Annals of the Lyceum of Natural History; 1824—77.] B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.; Geol.S.; Linn.S.i.; N.H.M.; Oxon.R.i.; P.O.; R.S.; S.K.; U.C.L.i.
- N. Y. Ac. T.** Transactions of the New York Academy of Sciences, late Lyceum of Natural History. New York.
1881—98. B.M.; Glasg.U.i.; Linn.S.i.; N.H.M.; Oxon.R.i.; P.O.i.; R.S.; S.K.; U.C.L.i.
- N. Y. A. Lyceum** Annals of the Lyceum of Natural History of New York. New York.
1824—77. [Continued as: Annals of the New York Academy of

List of Serial Publications

- Sciences, 1879—] B.M.; Camb.U.; Dub.R.D.S.; Edinb.R.S.i.;
Edinb.U.i.; Geol.S.i.; Linn.S.; N.H.M.; Oxon.R.i.; P.O.; R.S.;
S.K.
- See N. Y. Lyceum A.*
- N. Y. Am. Mth. S. Bil.** ... Bulletin of the American Mathematical Society. New York.
1895— [Continuation of: Bulletin of the New York Mathematical
Society, 1892—94.] B.M.; Camb.P.S.; Camb.U.; Dub.T.C.;
Edinb.R.S.; Edinb.U.; Glasg.P.S.; Glasg.U.; Math.S.; Oxon.B.;
Oxon.R.; R.S.i.
- N. Y. Am. Mth. S. T.** ... Transactions of the American Mathematical Society. Lancaster,
Pa. and New York.
1900— Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.;
Edinb.U.; Glasg.U.; Math.S.; Oxon.B.; Oxon.R.; R.S.; S.K.
- N. Y. Lyceum A.** *See N. Y. A. Lyceum.*
- N. Y. Lyceum P.** Proceedings of the Lyceum of Natural History in the City of New
York. New York.
1870—74. B.M.; Geol.S.; Glasg.P.S.i.; Linn.S.; N.H.M.; R.S.;
S.K.i.
- N. Y. Md. J.** The New York Medical Journal. New York.
1865— Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.; R.C.Surg.; R.S.i.
- N. Y. Md. Rep.** Medical Repository of New York. New York.
1798—1812. B.M.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.i.; U.C.L.i.
- N. Y. Ms. Bil.** University of the State of New York. Bulletin of the New York
State Museum. Albany.
1887— Camb.P.S.i.; Dub.R.I.A.; Edinb.R.S.; Geol.M.; Glasg.
P.S.i.; Glasg.U.i.; N.H.M.; Oxon.B.; R.S.; S.K.i.
- N. Y. Mth. S. Bil.** Bulletin of the New York Mathematical Society. New York.
1892—94. [Continued as: Bulletin of the American Mathematical
Society, 1895—] B.M.; Camb.P.S.; Camb.U.; Edinb.R.S.;
Glasg.P.S.; Glasg.U.; Math.S.; Oxon.B.; Oxon.R.; R.A.S.i.
- N. Z. Col. Ms. Gl. Sv. Rp.** Colonial Museum and Geological Survey of New Zealand. Reports
of Geological Explorations. Wellington.
1870—73. [Continued as: New Zealand. Papers and Reports
relating to Minerals and Mining, 1894—] B.M.; Edinb.R.S.i.;
Edinb.U.i.; Geol.S.i.; I.CE.i.; Linn.S.i.; N.H.M.; P.O.i.;
R.Geogr.S.i.; R.S.i.; U.C.L.i.
- N. Z. I. T.** Transactions and Proceedings of the New Zealand Institute.
Wellington.
1868— B.M.; Camb.P.S.i.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.;
Edinb.R.S.; Edinb.U.; Geol.M.i.; Geol.S.; Glasg.P.S.i.;
Glasg.U.i.; I.CE.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.;
R.Geogr.S.; R.S.; S.K.i.; U.C.L.i.
- N. Z. Pp. & Rp. (Min.)** ... New Zealand. Papers and Reports relating to Minerals and Mining.
Wellington.
1894— [Continuation of: Colonial Museum and Geological Survey
of New Zealand. Reports of Geological Explorations, 1870—93.]
Edinb.R.S.i.; Geol.S.i.; P.O.; R.Geogr.S.i.
- Obs.** The Observatory. A monthly Review of Astronomy. London.
1878— Camb.P.S.; Camb.U.; Dub.T.C.i.; Edinb.R.S.; Oxon.R.;
P.O.; R.A.S.; S.K.
- Oestr. Wschr.** Oesterreichische Wochenschrift für Wissenschaft, Kunst, und
öffentliches Leben. Beilage zur K. Wiener Zeitung. Wien.
1863—64. Glasg.P.S.i.
- Oestr. Z. Brgw.** Oesterreichische Zeitschrift für Berg- und Hüttenwesen; von
Hingenau. Wien.
1853— B.M.; I.CE.; P.O.; S.K.
- Offenb. Vr. Nt. B.** Bericht über die Thätigkeit des Offenbacher Vereins für Naturkunde.
Offenbach a. M.
1860— Edinb.R.S.i.; Geol.S.i.; Linn.S.i.; N.H.M.; R.S.i.; S.K.i.
- Ó-Gyalla Asps. Obs.**
Beob. Beobachtungen angestellt am Astrophysikalischen [und Meteorolo-
gischen] Observatorium in Ó-Gyalla in Ungarn. Halle,
Budapest.
1879— M.O.i.; R.A.S.; R.S.i.; S.K.i.
- Oken Isis** Isis, oder Encyclopädische Zeitung; Oken. Jena.
1817—48. B.M.i.; Camb.U.; Edinb.U.; Glasg.U.; Linn.S.i.;
N.H.M.; Oxon.B.(R.); R.C.Surg.i.; R.S.; S.K.i.

List of Serial Publications

- Omodei A. Un.** Annali Universali di Medicina; Omodei, Calderini. Milano. 1817—88. B.M.i.; Glasg.P.S.i.; R.C.Surg.
- Oph. Bb.** Ophthalmologische Bibliothek. Braunschweig. 1802—05. Glasg.P.S.i.; R.C.Surg.i.
- Opusc. Mt. Fis.** Opuscoli matematici e fisici di diversi Autori. Milano. 1832—34. R.S.
- Orléans Bll.** Bulletin des Sciences Physiques, Médicales et d'Agriculture d'Orléans. Orléans. 1810—13. B.M.; Oxon.B.
- Ørsted Ts.** Tidsskrift for Naturvidenskaberne; Ørsted. Kjöbenhavn. 1822—28. B.M.; Camb.U.; N.H.M.; R.S.
- Orv.-Termt. Éts.** Orvos-Természettudományi Értesítő a Kolozsvári Orvos-Természettudományi Társulat és az Erdélyi Muzeum-Egylet Természettudományi Szakosztályának..... [Medical and Natural History Proceedings of the Sections of the Klausenburg Medical and Natural History Society and of the Natural History Section of the Museum Association of Transylvania.] Kolozsvár [Klausenburg]. 1879— N.H.M.; R.S.i.
- Osnab. Jbr.** Jahresbericht des Naturwissenschaftlichen Vereins zu Osnabrück. Osnabrück. 1870— Edinb.R.S.i.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; R.S.
- Padova Ac. At. e Mm.** ... Atti e Memorie della R. Accademia di Scienze, Lettere ed Arti in Padova. Nuova serie. Padova. 1885— [Continuation of: Nuovi Saggi dell'Accademia, etc. 1817—83.] Edinb.R.S.; Geol.S.i.; N.H.M.
- Padova Mm. Ac.** Memorie dell' Accademia di Scienze, Lettere ed Arti di Padova. Padova. 1809. B.M.; Camb.U.; N.H.M.; Oxon.B.; R.S.; S.K.
- Padova N. Sag.** Nuovi Saggi dell' Accademia di Scienze, Lettere, ed Arti di Padova. Padova. 1817—83. [Continued as: Atti e Memorie della R. Accademia, etc. 1885—] B.M.i.; Camb.U.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; N.H.M.; Oxon.B.i.; R.C.Surg.i.; R.S.i.; S.K.i.
- Padova Rv. Period.** Rivista Periodica dei Lavori della I. R. Accademia di Scienze, Lettere ed Arti di Padova. Padova. 1851—65. B.M.; Edinb.R.S.i.; Geol.S.; N.H.M.; R.S.
- Padova S. Sc. At.** Atti della Società Veneto-Trentina di Scienze Naturali residente in Padova. Padova. 1872— Glasg.P.S.i.; N.H.M.
- Padova S. Sc. Bll.** Bullettino della Società Veneto-Trentina di Scienze Naturali. Padova. 1879— B.M.; N.H.M.
- Palermo Ac. At.** Atti dell' Accademia di Scienze, Lettere ed Arti di Palermo. Palermo.
- Palermo At.** 1845— B.M.; Camb.U.i.; Dub.R.I.A.; Dub.T.C.; Glasg.U.i.; N.H.M.; Oxon.B.i.; R.A.S.i.; R.C.Surg.i.; R.S.i.
- Palermo Cir. Mt. Rd.** ... Rendiconti del Circolo Matematico di Palermo. Palermo. 1887— B.M.i.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.; Math.S.; R.S.
- Palermo Effem.** Effemeridi Scientifiche e Letterarie per la Sicilia; coi Lavori del R. Istituto d' Incoraggiamento per la Sicilia. Palermo. 1832—40. Glasg.P.S.i.; N.H.M.
- Palermo G. I. Inc.** Giornale del R. Istituto d' Incoraggiamento di Agricoltura, Arti, etc. in Sicilia. Parte 3. Scienze Fisico-Matematiche e Naturali. Palermo. 1863. Glasg.P.S.i.
- Palermo G. Sc. Nt.** Giornale di Scienze naturali ed economiche, pubblicato per cura del Consiglio di Perfezionamento annesso al R. Istituto Tecnico di Palermo. Palermo. 1865— B.M.; Camb.U.; Dub.R.D.S.i.; Geol.S.i.; R.S.
- Palermo Mm. Spet. It.** Memorie della Società degli Spettroscopisti Italiani, raccolte e pubblicate per cura del Prof. P. Tacchini. Palermo. 1872— B.M.i.; Camb.U.; Edinb.R.S.i.; P.O.; R.A.S.; R.S. See **Spet. It. Mm.**
- Palomba Rac.** Raccolta di Lettere, etc. intorno alla Fisica ed alle Mathematiche; Palomba. Roma. 1845—48. B.M.i.

List of Serial Publications

- Fander Btr. Ntk.** Beiträge zur Naturkunde aus den Ostseeprovinzen Russlands; Pander. Dorpat. 1820. *Glasg.P.S.i.*; *N.H.M.*; *R.S.*
- Par. A. Cons.** Annales du Conservatoire des Arts et Métiers. Paris. 1861— *B.M.*; *Camb.U.*; *Glasg.P.S.i.*; *I.CE.i.*; *Oxon.B.*; *P.O.*; *R.S.*; *S.K.i.*
See A. Cons. Arts et Mét.
- Par. Ac. Sc. Mm.** Mémoires de l'Académie des Sciences de l'Institut de France. Paris. 1816— *B.M.*; *Camb.U.*; *Dub.N.L.I.i.*; *Dub.R.D.S.i.*; *Dub.T.C.i.*; *Edinb.R.S.i.*; *Edinb.U.*; *Geol.S.i.*; *Glasg.U.*; *I.CE.i.*; *N.H.M.*; *Oxon.B.*; *Oxon.R.*; *P.O.i.*; *R.A.S.i.*; *R.C.Surg.*; *R.S.*; *S.K.*; *U.C.L.*
See Par. Mm. Ac. Sc.
- Par. A. das Sc.** Annaes das Sciencias, etc. por huma Sociedade de Portuguezes residentes em Paris. Paris. 1818—27. *B.M.*; *Camb.U.i.*
See A. das Sc.
- Par. A. Éc. Norm.** Annales scientifiques de l'École Normale Supérieure. Paris. 1864— *B.M.*; *Camb.P.S.i.*; *Camb.U.*; *Dub.N.L.I.i.*; *Dub.R.C.S.i.*; *Dub.R.D.S.i.*; *Edinb.R.S.i.*; *Edinb.U.i.*; *Glasg.U.i.*; *Oxon.B.*; *R.S.*; *S.K.*
See Par. Éc. Norm. A.
- Par. A. Obs.** Annales de l'Observatoire de Paris. Mémoires. Paris. 1855— *B.M.*; *Camb.U.*; *Dub.N.L.I.*; *Dub.T.C.*; *Edinb.R.S.*; *Glasg.U.i.*; *Oxon.B.*; *R.A.S.*; *R.S.*
See Par. Obs. A.
- Par. A. Pon. Chauss.** Annales des Ponts et Chaussées. Mémoires et documents relatifs à l'Art des Constructions et au Service de l'Ingénieur. Paris. 1831— *B.M.*; *Camb.U.*; *Edinb.U.i.*; *Glasg.P.S.i.*; *Glasg.U.i.*; *I.CE.*; *P.O.*; *R.S.i.*
See A. Pon. Chauss.
- Par. Bil. S. Bt.** Bulletin de la Société Botanique de France. Paris. 1854— *B.M.*; *Camb.U.*; *Dub.N.L.I.i.*; *Dub.R.D.S.*; *Dub.R.I.A.*; *Dub.T.C.i.*; *Glasg.P.S.i.*; *Glasg.U.*; *Linn.S.*; *N.H.M.*; *Pharm.S.i.*; *S.K.*
See Fr. S. Bt. Bil.
- Par. Bil. S. C.** Bulletin de la Société Chimique de Paris. Paris. 1858— *B.M.*; *Camb.U.i.*; *Chem.S.*; *Dub.N.L.I.i.*; *Dub.R.C.S.i.*; *Dub.R.D.S.i.*; *Edinb.U.i.*; *Glasg.U.i.*; *N.H.M.*; *Oxon.R.*; *Pharm.S.i.*; *P.O.*; *R.S.*; *S.K.*
See Par. S. C. Bil.
- Par. Bil. S. Encour.** Bulletin de la Société d'Encouragement pour l'Industrie Nationale. Paris. 1802— *Camb.U.*; *Dub.R.C.S.i.*; *Dub.T.C.i.*; *Edinb.R.S.i.*; *Glasg.P.S.i.*; *Glasg.U.i.*; *I.CE.i.*; *Oxon.B.*; *P.O.*; *R.S.*; *S.K.i.*
- Par. Bil. S. Gg.** Bulletin de la Société de Géographie. Paris. 1822— *B.M.*; *Camb.U.*; *Dub.R.I.A.*; *Edinb.R.S.i.*; *N.H.M.*; *Oxon.B.*; *R.Geogr.S.*; *R.S.*; *U.C.L.i.*
See Par. Gg. S. Bil. and Par. S. Gg. Bil.
- Par. Bil. S. Phlm.** Bulletin des Sciences de la Société Philomathique de Paris. Paris. 1791—1805; 1814—24; 1864— *B.M.i.*; *Camb.U.*; *Dub.T.C.i.*; *Edinb.R.S.i.*; *Glasg.U.i.*; *Math.S.i.*; *N.H.M.*; *Oxon.R.i.*; *P.O.i.*; *R.A.S.i.*; *R.C.Surg.i.*; *R.S.*; *U.C.L.*
See Par. S. Phlm. Bil.
- Par. Bur. Long. An.** Annuaire publié par le Bureau des Longitudes. Paris. 1799— *B.M.*; *Camb.U.i.*; *Edinb.U.i.*; *Glasg.U.i.*; *R.A.S.i.*; *R.Geogr.S.i.*; *R.S.*; *S.K.*
- Par. Cl. Alp. Fr. An.** Annuaire du Club Alpin Français. Paris. 1875— *B.M.*; *Geol.S.i.*; *R.Geogr.S.*
- Par. Éc. Norm. A.** *See Par. A. Éc. Norm.*
- Par. Éc. Pol. Cor.** Correspondance sur l'École Polytechnique, à l'usage des Élèves de cette École; Hachette. Paris. 1808—16. *B.M.i.*; *Oxon.B.*; *R.S.*; *U.C.L.*
- Par. Éc. Pol. J.** Journal de l'École Polytechnique. Paris. 1795— *B.M.*; *Camb.P.S.*; *Camb.U.*; *Dub.R.I.A.*; *Dub.T.C.*; *Edinb.R.S.*; *Edinb.U.*; *Glasg.P.S.i.*; *Glasg.U.*; *I.CE.i.*; *Linn.*

List of Serial Publications

- S.i.; Math.S.i.; Oxon.B.(R.); P.O.; R.A.S.i.; R.S.; S.K.; U.C.L.i.
 See **Par. J. Éc. Pol.**
- Par. Gg. S. Bil.**
Par. Ing. Civ. Mm.
 See **Par. Bil. S. Gg. and Par. S. Gg. Bil.**
 Mémoires et Comptes Rendus des Travaux de la Société des Ingénieurs Civils. Paris.
 1848— B.M.; Glasg.U.i.; I.CE.; P.O.
 See **Par. Mm. Ing. Civ.**
- Par. J. Éc. Pol.**
Par. Lb. Hl. Tr.
 See **Par. Éc. Pol. J.**
 Ecole Pratique des Hautes Études. Laboratoire d'Histologie du Collège de France. Travaux. Paris.
 1877— B.M.; Camb.U.; Oxon.R.; R.C.Surg.i.; R.S.; U.C.L.i.
- Parma G. S. Md. Chir.** ...
 Giornale della Società Medico-Chirurgica di Parma. Parma.
 1806—13. B.M.; Glasg.P.S.i.
- Par. Mm. Ac. Sc.**
Par. Mm. de l'I.
 See **Par. Ac. Sc. Mm.**
 Mémoires de la Classe des Sciences mathématiques et physiques de l'Institut. Paris.
 1798—1815. B.M.; Edinb.R.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.i.; R.C.Surg.; S.K.; U.C.L.
- Par. Mm. Ing. Civ.**
Par. Mm. Sav. Étr.
 See **Par. Ing. Civ. Mm.**
 Mémoires présentés à l'Institut des Sciences, Lettres et Arts par divers Savans, et lus dans ses Assemblées: Sciences Mathématiques et Physiques. Paris.
 1806—11. B.M.; Camb.U.; Dub.R.D.S.; Dub.T.C.; Edinb.R.S.; Glasg.U.; I.CE.; N.H.M.; Oxon.R.; P.O.; R.A.S.; R.C.Surg.; R.S.; S.K.; U.C.L.
 Mémoires présentés par divers Savans à l'Académie des Sciences de l'Institut de France. Paris.
 1827— B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; Geol.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.i.; R.A.S.i.; R.C.Surg.; R.S.; S.K.
- Par. Mm. S. L.**
 Mémoires de la Société Linnéenne de Paris. Paris.
 1822—27. B.M.; Camb.U.; Glasg.P.S.i.; Linn.S.i.; N.H.M.; Oxon.R.i.; R.S.i.
- Par. Mm. S. Sav.**
 Mémoires des Sociétés Savantes et Littéraires de la République Française. Recueillis et rédigés par les Citoyens Prony, etc. Paris.
 1801—02. B.M.; Oxon.B.; R.S.
- Par. Ms. H. Nt. Bil.**
 Bulletin du Muséum d'Histoire Naturelle. Paris.
 1895— B.M.; Camb.U.; Edinb.R.S.; Geol.S.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.R.; R.S.; S.K.
- Par. Ms. H. Nt. Cent.** ...
 Centenaire de la Fondation du Muséum d'Histoire Naturelle. Paris.
 1893. B.M.; Edinb.R.S.; Geol.S.; Glasg.P.S.i.; N.H.M.; R.S.
- Par. Ms. H. Nt. Mm.** ...
 Mémoires du Muséum d'Histoire Naturelle. Paris.
 1815—32. B.M.; Camb.P.S.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Par. Ms. H. Nt. N. Arch.**
 Nouvelles Archives du Muséum d'Histoire Naturelle. Paris.
 1865— [Continuation of: Archives, etc., 1839—61.] B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.C.Surg.; R.S.; S.K.i.
- Par. Obs. A.**
Par. Obs. A. (Mm.)
 See **Par. A. Obs.**
- Par. Poids et Mes. FV.** ...
 Comité International des Poids et Mesures. Procès-Verbaux des Séances. Paris.
 1875— Camb.P.S.; Camb.U.i.; Dub.R.D.S.; Glasg.U.i.; M.O.i.; Oxon.R.; P.O.; R.A.S.; R.S.; S.K.i.
- Par. Poids et Mes. Tr. Mm.**
 Travaux et Mémoires du Bureau International des Poids et Mesures. Paris.
 1881— Camb.P.S.; Camb.U.; Chem.S.; Glasg.U.i.; I.CE.i.; Oxon.B.; Oxon.R.; R.A.S.; R.S.; S.K.; U.C.L.
- Par. S. Bl. Mm.**
 Comptes Rendus des Séances et Mémoires de la Société de Biologie. Paris.
 1849— B.M.i.; Camb.P.S.i.; Camb.U.; Chem.S.i.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.U.i.; Glasg.U.i.; N.H.M.; Oxon.R.; R.C.Surg.; R.S.i.; S.K.i.

List of Serial Publications

- Par. S. Bl. (Vol. Jubil.)...** Cinquantenaire de la Société de Biologie. .Volume Jubilaire. Paris. 1899. Edinb.R.S.; R.C.Surg.; R.S.
- Par. S. C. Bl.** See **Par. Bl. S. C.**
- Par. S. Chir. Bl. et Mm.** Bulletins et Mémoires de la Société de Chirurgie de Paris. Paris. 1875— [Continuation of: Bulletins, 1851—74, and Mémoires, 1847—74.] Camb.U.; Glasg.P.S.i.; Oxon.B.(R.); R.C.Surg.
- Par. Sé. Éc. Norm.** Séances des Ecoles Normales. Paris. 1800—01. R.S.; U.C.L.
- Par. Sé. S. Ps.** Séances de la Société Française de Physique. Paris. 1873— B.M.i.; Camb.P.S.i.; Glasg.U.i.; P.O.; R.S.; S.K.
See **Par. S. Ps. Sé.**
- Par. S. Gg. Bl.** See **Par. Bl. S. Gg. and Par. Gg. S. Bl.**
- Par. S. Gg. C. R.**..... Compte Rendu des Séances de la Société de Géographie et de la Commission Centrale. Paris. 1882— B.M.; Camb.U.; N.H.M.i.; Oxon.B.; R.Geogr.S.; R.S.i.; U.C.L.i.
- Par. S. Gl. Bl.**..... Bulletin de la Société Géologique de France. Paris. 1830— B.M.; Camb.U.i.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.; N.H.M.; Oxon.B.; Oxon.R.; R.S.; S.K.i.; U.C.L.i.
- Par. S. Md. Ém. Mm.** ... Mémoires de la Société Médicale d'Émulation. Paris. 1797—1826. B.M.i.; Camb.U.; Glasg.P.S.i.; Glasg.U.i.; Oxon.B.; R.C.Surg.
- Par. S. Mth. Bl.**..... Bulletin de la Société Mathématique de France. Paris. 1873— B.M.; Camb.P.S.; Camb.U.; Edinb.R.S.; Math.S.; Oxon.R.; R.A.S.; R.S.
- Par. S. Phlm. Bl.** See **Par. Bl. S. Phlm.**
- Par. S. Phlm. Mm. Cent.** Mémoires publiés par la Société Philomathique à l'occasion du Centenaire de sa Fondation. Paris. 1888. B.M.; Edinb.R.S.; N.H.M.; R.A.S.; R.S.
- Par. S. Phlm. N. Bl.** Nouveau Bulletin des Sciences de la Société Philomathique de Paris. Paris. 1807—1813; 1825—26; 1832—33. B.M.i.; Camb.U.; Dub.T.C.; N.H.M.; P.O.i.; R.C.Surg.; R.S.; U.C.L.
- Par. S. Phlm. FV.** Extraits des Procès-Verbaux des Séances de la Société Philomathique. Paris. 1836—63. N.H.M.; R.S.
See **Par. Sé. S. Ps.**
- Par. S. Ps. Sé.**..... See **Par. Sé. S. Ps.**
- Par. T. Nauk Śc. Pam.** ... Pamiętnik Towarzystwa Nauk Ścisłych w Paryżu. Paris. 1871—82. B.M.; N.H.M.
- Par. Tr. S. Amat.** Notices des Travaux de la Société des Amateurs des Sciences physiques et naturelles de Paris. Paris. 1807—08.
- Perpignan Mm. S. Ag. Pyr. Orient.**..... Société Agricole, Scientifique, et Littéraire des Pyrénées-Orientales. [Mémoires.] Perpignan. 1863. Glasg.P.S.i.
- Peterm. Mt.** Mittheilungen aus Justus Perthes' Geographischer Anstalt über wichtige neue Erforschungen auf dem Gesamtgebiete der Geographie; Petermann. Gotha. 1855— B.M.; Camb.U.; Dub.E.C.S.; Geol.M.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.; M.O.i.; N.H.M.i.; Oxon.B.; Oxon.R.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Pfaff Mt.** Mittheilungen [Practische und kritische Mittheilungen] aus dem Gebiete der Medicin, Chirurgie, und Pharmacie; Pfaff. Kiel, Altona. 1832—41. Glasg.P.S.i.; R.C.Surg.; R.S.
- Pfüg. Arch. Pl.** Archiv für die gesammte Physiologie des Menschen und der Thierte; Pfüger. Bonn. 1868— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Edinb.U.; Glasg.U.i.; N.H.M.i.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Philad. Ac. Nt. Sc. J.** ... Journal of the Academy of Natural Sciences of Philadelphia. Philadelphia. 1817— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; Edinb.U.i.; Geol.S.i.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.i.; R.C.Surg.i.; R.S.i.; S.K.i.
See **Philad. J. Ac. Nt. Sc.**

List of Serial Publications

- Philad. Ac. Nt. Sc. P.** ... Proceedings of the Academy of Natural Sciences of Philadelphia. Philadelphia.
1841— B.M.i.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.i.; Edinb.R.S.; Geol.S.; Glasg.P.S.; Linn.S.i.; N.H.M.; Oxon.R.; P.O.i.; R.A.S.i.; R.C.Surg.; B.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
- Philad. Coll. Phm. J.** Journal of the Philadelphia College of Pharmacy. Philadelphia.
1830—35. [Continued as: American Journal of Pharmacy, 1836—]
Glasg.P.S.; Pharm.S.; R.C.Surg.
See **Philad. J. Coll. Phm.**
- Philad. J. Ac. Nt. Sc.** ... See **Philad. Ac. Nt. Sc. J.**
- Philad. J. Coll. Phm.** See **Philad. Coll. Phm. J.**
- Philad. Md. Ps. J.** The Philadelphia Medical and Physical Journal. Philadelphia.
1804—08. B.M.; Edinb.U.i.; Glasg.P.S.i.; N.H.M.; R.S.i.
- Philad. T.** Transactions of the American Philosophical Society. Philadelphia.
1771— B.M.i.; Camb.P.S.; Camb.U.i.; Chem.S.i.; Dub.R.I.A.i.; Edinb.R.S.; Geol.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; N.H.M.i.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
See **Am. Ph. S. T.**
- Phil. Trans.** Philosophical Transactions of the Royal Society of London. London.
1665— B.M.; Camb.P.S.i.; Camb.U.; Chem.S.i.; Dub.R.C.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.i.; Glasg.P.S.; Glasg.U.i.; I.CE.i.; Linn.S.i.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.i.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.
- Phm. CB.** Pharmaceutisches Central-Blatt. Leipzig.
1830—49. [Continued as: Chemisch-pharmaceutisches Central-Blatt, 1850—55.] B.M.; Chem.S.i.; Glasg.P.S.i.; Pharm.S.i.; P.O.; R.S.; U.C.L.i.
- Ph. Mg.** The Philosophical Magazine, or Annals of Chemistry, Mathematics, Astronomy, Natural History and General Science. London.
1827—32. [Continuation of: The Philosophical Magazine...; Tilloch, 1798—1826.]
The London, Edinburgh [and Dublin] Philosophical Magazine and Journal of Science. London.
1832— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.M.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.; Linn.S.i.; Math.S.i.; M.O.i.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Phm. J.** The Pharmaceutical Journal and Transactions. London.
1841— B.M.; Camb.U.; Chem.S.; Dub.N.L.I.i.; Dub.T.C.i.; Glasg.P.S.; Glasg.U.i.; I.CE.i.; N.H.M.; Oxon.B.; Oxon.B.(R.); Pharm.S.; R.C.Surg.; R.S.i.; S.K.i.; U.C.L.
- Phm. Z. Russl.** Pharmaceutische Zeitschrift für Russland. St Petersburg.
1862— B.M.; P.O.
See **Russl. Phm. Z.**
- Phot. J.** The Photographic Journal, including the Transactions of the Photographic Society of Great Britain. London.
1877— [Continuation of: The Journal of the Photographic Society of London, 1854—76.] B.M.; Camb.U.i.; Chem.S.; Dub.T.C.i.; Edinb.R.S.i.; Geol.S.; Glasg.P.S.; I.CE.i.; Oxon.B.; Pharm.S.i.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.i.
- Ph. Stud.** Philosophische Studien herausgegeben von Wilhelm Wundt. Leipzig.
1883— Camb.U.; Dub.T.C.; Edinb.U.; Glasg.U.; Oxon.B.; R.S.; U.C.L.
- Pht. Arch.** Photographisches Archiv; Journal des allg. Deutschen Photographen-Vereins. Elberfeld.
1860—97. B.M.; Glasg.P.S.i.; P.O.
- Pht. Mh.** Photographische Monatshefte. Braunschweig.
1862—64. B.M.; Glasg.P.S.i.
- Pht. S. J.** Journal of the Photographic Society of London. London.
1853—76. [Continued as: The Photographic Journal, 1877—] B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.i.; Geol.S.; Glasg.P.S.i.; I.CE.i.; Oxon.B.; Pharm.S.; P.O.; R.A.S.; R.S.; S.K.

List of Serial Publications

- Pisa A. Un. Tosc.** (Annali delle Università Toscane. (Parte 2da.) Scienze Cosmo-
logiche. Pisa.
1846— Camb.U.i.; N.H.M.; R.S.i.; S.K.i.
Pisa A. Un. Tosc. Sc. Cosm...... Miscellanea medico-chirurgico-farmaceutiche raccolte in Pisa. Pisa.
1843—44. Glasg.P.S.i.; Oxon.B.
Pisa N. G...... Nuovo Giornale de' Letterati. Pisa.
1822—39. B.M.; Camb.U.; Oxon.B.
Pisa S. Tosc. At. (Mm.)... Atti della Società Toscana di Scienze Naturali residente in Pisa.
Memorie. Pisa.
1875— B.M.; Camb.P.S.i.; Dub.R.I.A.; Geol.S.; N.H.M.; R.S.
Pisa S. Tosc. At. (PV.)... Atti della Società Toscana di Scienze Naturali residente in Pisa.
Processi Verbali. Pisa.
1875— B.M.; Camb.P.S.i.; Dub.T.C.; Geol.S.i.; N.H.M.; R.S.
Pistoja At. Ac. Atti della R. Accademia Pistoiese di Scienze, Lettere ed Arti:
Memorie di Matematica e Fisica, per l' anno 1816. Pistoja.
1816. B.M.; Camb.U.; N.H.M.; Oxon.B.; R.S.
Pliste. Rs. Le Physiologiste Russe. Moscou.
1898— Glasg.P.S.i.; R.S.; U.C.L.i.
Plym. I. T. Annual Reports and Transactions of the Plymouth Institution and
Devon and Cornwall Natural History Society. Plymouth.
1855— Camb.U.i.; Dub.N.L.I.i.; Edinb.R.S.i.; Linn.S.i.; N.H.M.;
Oxon.B.i.; R.S.; S.K.; U.C.L.i.
Pogg. A. Annalen der Physik und Chemie; Poggendorff, Wiedemann.
Leipzig.
1824—99. [Continuation of: Annalen der Physik; Gilbert, 1799—
1824.] [Continued as: Annalen der Physik; Drude, 1900—]
B.M.; Camb.P.S.i.; Camb.U.; Chem.S.; Dub.R.I.A.; Dub.T.C.;
Edinb.R.S.; Edinb.U.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; N.H.M.;
Oxon.B.(R.); Pharm.S.i.; P.O.; R.C.Surg.i.; R.S.; S.K.; U.C.L.i.
See A. Ps. C.
Poligrafo Il Poligrafo: Giornale di Scienze, Lettere ed Arti; Orti. Verona.
1830—45. B.M.; Oxon.B.
Polli A. Annali di Chimica; Polli. Milano.
1845—97. [Continued as: Annali di Farmacoterapia e Chimica,
1898—] B.M.; Camb.U.i.; Chem.S.i.; Pharm.S.i.; P.O.i.
See A. di C.
Pollich. Jahresbericht der Pollichia, eines Naturwissenschaftlichen Vereins
der Rheinpfalz. Dürkheim a. d. Haardt.
1843— Camb.U.; Linn.S.; N.H.M.; R.S.i.
Pol. Mt. Polytechnische Mittheilungen, unter Mitwirkung von Professoren
höherer technischer Lehranstalten. Tübingen.
1844—46. B.M.; R.S.
Pop. As...... Popular Astronomy. Northfield, Minnesota.
1894— B.M.; Glasg.U.; R.A.S.; S.K.
Pop. Sc. Rv. The Popular Science Review: a Quarterly Miscellany of enter-
taining and instructive articles on Scientific Subjects; Samuelson.
London.
1861—81. B.M.; Camb.U.; Dub.R.D.S.; Dub.T.C.; Edinb.U.i.;
Geol.M.; Geol.S.i.; Glasg.U.i.; I.CE.; Linn.S.; N.H.M.;
Oxon.B.; Oxon.R.i.; Pharm.S.i.; P.O.; R.C.Surg.; R.S.i.; S.K.
Portugal Trab. Gl. Com. Communicações da Commissão dos Trabalhos Geologicos de Portugal.
Lisboa.
1883—92. [Continued as: Communicações da Direcção, etc., 1895—]
B.M.; Camb.P.S.; Geol.M.; Geol.S.; Glasg.P.S.i.; N.H.M.;
Oxon.R.i.; R.S.
Prace Mt.-Fiz...... Prace Matematyczno-Fizyczne. Warsaw.
1888— Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.i.; Math.S.;
R.S.i.
Practit. The Practitioner. London, Paris, New York, Melbourne.
1868— B.M.; Camb.U.; Edinb.U.; Glasg.U.i.; Oxon.B.; Pharm.S.i.;
R.C.Surg.
Frag Ab. Abhandlungen der k. Böhmischen Gesellschaft der Wissenschaften.
Prag.
1785—1892. B.M.i.; Camb.P.S.; Camb.U.i.; Dub.R.I.A.i.; Edinb.
R.S.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.; R.C.Surg.i.;
R.S.i.; S.K.i.
See Böh. Gs. Ab.

List of Serial Publications

- Frag České Ak. Fr. Jos. Pam.** Památník na oslavu padesátiletého panovnického jubilea jeho veličenstva císaře a krále Františka Josefa I. Vydala Česká Akademie Císaře Františka Josefa pro Vědy, Slovesnost a Umění. [Memoirs in honour of the jubilee of his Imperial and Royal Majesty Franz Joseph I. Edited by the Imperial Bohemian Franz-Joseph Academy of Sciences, Literature and Art.] Praha (Prag).
1898. Camb.P.S.; N.H.M.
- Frag České Ak. Fr. Jos. Rz.** Rozprawy České Akademie Císaře Františka Josefa pro Vědy, Slovesnost a Umění. [Memoirs of the Imperial Bohemian Franz-Joseph Academy of Sciences, Literature and Art.] Prag.
1891— B.M.; Edinb.R.S.; N.H.M.; U.C.L.
- Frag Fr. Jos. Ac. Sc. Bll.** Académie des Sciences de l'Empereur François Joseph I (Česká Akademie Císaře Františka Josefa I). Bulletin International. Résumé des Travaux présentés. Sciences Mathématiques et Naturelles. Prag.
1897— Edinb.R.S.; N.H.M.
- Frag Sb.** Sitzungsberichte der k. Böhmisches Gesellschaft der Wissenschaften in Prag. Prag.
1859— Camb.P.S.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Linn.S.; N.H.M.; R.S.; S.K.; U.C.L.
- Frag Vjschr.** Vierteljahrsschrift für die praktische Heilkunde; herausg. von der Medicinischen Facultät in Prag. Prag.
1844—79. [Continued as: Zeitschrift für Heilkunde, 1880—] B.M.; Camb.U.; Glasg.P.S.; R.C.Surg.
- Fresburg Vh.** Verhandlungen des Vereins für Naturkunde zu Presburg. Presburg.
1856— B.M.; Camb.U.; Geol.S.; Glasg.P.S.; Linn.S.; N.H.M.; R.S.
- Presse Sc.** Presse Scientifique des Deux Mondes. Paris.
1860—66. B.M.; R.S.
- Fs. Mdd.** Physikaliske Meddelelser; Arndtsen. Christiania.
1858.
- Fs. Ev.** The Physical Review. New York, London, Berlin.
1894— B.M.; Camb.P.S.; Camb.U.; Dub.R.C.S.; Edinb.R.S.; Edinb.U.; Glasg.U.; Oxon.R.; P.O.; R.S.; S.K.
- Fs. Z.** Physikalische Zeitschrift. Leipzig.
1899— Camb.P.S.; Edinb.U.; Glasg.U.; Oxon.R.; P.O.; R.S.; S.K.; U.C.L.
- Ptsd. Asps. Obs. Pb.** Publicationen des Astrophysikalischen Observatoriums zu Potsdam. Potsdam.
1878— B.M.; Camb.U.; Dub.R.D.S.; Oxon.R.; R.A.S.; R.S.
- Fulk. Obs. Pb.** Publications de l'Observatoire Central Nicolas. St.-Petersbourg.
1893— [Continuation of: Observations de Poulkova, 1869—91.] Camb.P.S.; Dub.R.I.A.; Edinb.R.S.; Glasg.P.S.; R.A.S.; R.S.
- QJ. Mcr. Sc.** Quarterly Journal of Microscopical Science; Lankester and Busk. London.
1853— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.; Dub.R.C.S.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.; Glasg.U.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.; P.O.; R.C.Surg.; R.S.; S.K.; U.C.L.
See J. Mcr. Sc. and Mcr. J.
- QJ. Mth.** The Quarterly Journal of Pure and Applied Mathematics. London.
1855— B.M.; Camb.P.S.; Camb.U.; Dub.N.L.I.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Glasg.P.S.; Glasg.U.; I.CE.; Math.S.; Oxon.B.; Oxon.R.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.
- QJ. Sc.** The Journal of Science and the Arts; edited at the Royal Institution of Great Britain. London.
1816—19.
Quarterly Journal of Science, Literature and Arts. London.
1819—30. B.M.; Camb.U.; Chem.S.; Dub.T.C.; Edinb.R.S.; Glasg.U.; I.CE.; Oxon.B.; Oxon.R.; Pharm.S.; R.C.Surg.; R.S.; S.K.; U.C.L.
- QJ. Sc.** The Quarterly Journal of Science [and Annals of Mining...]. London.
1864—78. [Continued as: The Journal of Science, etc., 1879—85.] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.; Edinb.R.S.;

List of Serial Publications

- Edinb.U.; Glasg.U.; I.CE.i.; Linn.S.i.; M.O.i.; N.H.M.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.; R.C.Surg.; R.S.; S.K.
- Queensl. R. S. P.**..... The Proceedings of the Royal Society of Queensland. Brisbane. 1884— B.M.; Camb.P.S.; Dub.R.I.A.; Edinb.R.S.; Geol.S.; Glasg.P.S.i.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.; P.O.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.
- Quek. Mcr. Cl. J.** Journal of the Quekett Microscopical Club. London. 1868— B.M.; Camb.U.; Dub.R.D.S.; Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.B.(R.); P.O.; R.S.; S.K.; U.C.L.
- Quetelet Cor. Mth.**..... Correspondance Mathématique et Physique; publiée par MM. Garnier et Quetelet. Gand, Bruxelles. 1825—39. B.M.; Camb.U.; R.A.S.i.; R.S.; U.C.L.
- Railroad & Eng. J.**..... The Railroad and Engineering Journal. New York. 1887—92. [*Continuation of*: Van Nostrand's Engineering Magazine, 1869—85.] [*Continued as*: American Engineer and Railroad Journal, 1893—] B.M.; I.CE.; P.O.
- Ranuzzi An. Gg.** Annuario geografico Italiano; Ranuzzi. Bologna. 1844—45. B.M.; Camb.U.; R.Geogr.S.
- Rass. Sc. Gl. It.** Rassegna delle Scienze Geologiche in Italia. Roma. 1892. B.M.i.; Camb.U.; Geol.M.i.; N.H.M.i.; R.S.i.; U.C.L.
- Rch. Chron.**..... Recherches Chronométriques; publiées sous la direction du Ministre de la Marine. Paris. 1854— R.S.i.
- Reclam Kosmos**..... Kosmos: Zeitschrift für angewandte Naturwissenschaften; Reclam. Leipzig. 1857—60. B.M.; R.A.S.i.
- Rec. Mth. (Moscou)** Recueil mathématique. Publié par la Société Mathématique de Moscou. [In Russian.] Moscou. 1866— R.S.
- Rec. Tr. C. P.-Bas** Recueil des Travaux Chimiques des Pays-Bas [et de la Belgique]. Leide. 1882— Camb.P.S.; Chem.S.; P.O.; S.K.
- Reichert Arch.** Archiv für Anatomie, Physiologie, und Wissenschaftliche Medicin; Müller, Reichert, Du Bois-Reymond. Berlin. 1834—76. [*Continuation of*: Archiv für Anatomie und Physiologie, 1826—32.] [*Continued as*: Archiv für Anatomie und Physiologie, 1877—] B.M.; Camb.U.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; N.H.M.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Reims A. Ac.** See **Arch. An. Fl. and Müller Arch.**
Annales de l'Académie de Reims. Reims. 1842—43. [*Continued as*: Séances etc., 1844—] B.M.; Glasg.P.S.i.; N.H.M.; Oxon.B.; R.S.
- Reims Sé. Ac.** Séances et Travaux de l'Académie de Reims. Reims. 1844— [*Continuation of*: Annales, etc., 1842—43.] B.M.i.; N.H.M.i.; Oxon.B.
- Rép. C. Appl.** Répertoire de Chimie appliqué. Paris. 1859—63. Camb.U.; Chem.S.; Glasg.P.S.i.; N.H.M.; Pharm.S.i.; R.S.
- R. E. Fp.** Papers on subjects connected with the duties of the Corps of Royal Engineers. London. 1843— Camb.U.; Geol.M.i.; I.CE.; P.O.i.; S.K.i.
- Rheinl. Westphal. Sb.** ... Sitzungsberichte der Niederrheinischen Gesellschaft für Natur- und Heilkunde zu Bonn. Bonn. 1854— B.M.i.; Camb.U.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb. R.S.i.; Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.R.; R.S.i.; S.K.
See **Bonn Niedr. Gs. Sb.**
- Rheinl. Westphal. Vh.** Verhandlungen des Naturhistorischen Vereins der Preussischen Rheinlande, Westfalens und des Reg.-Bezirks Osnabrück. Bonn. 1844— B.M.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.R.; R.C.Surg.i.; R.S.i.; S.K.
See **Bonn NH. Vr. Vh. and Bonn Vh. NH. Vr.**
- Riga Arb. Nf. Vr.** Arbeiten des Naturforschenden Vereins in Riga. Rudolstadt. 1848. Camb. U.; Glasg.P.S.i.; N.H.M.; R.S.
- Riga Cor.-Bl.** Correspondenzblatt des Naturforscher-Vereins zu Riga. Riga. 1846— B.M.; Dub.R.I.A.i.; N.H.M.; R.S.i.
- R. I. J.** Journal of the Royal Institution of Great Britain. London.

List of Serial Publications

- 1802—03; 1830—31. *Camb.U.i.; Chem.S.i.; Dub.R.D.S.; Edinb.R.S.i.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.i.; Oxon.R.; Pharm.S.i.; P.O.i.; R.A.S.i.; R.C.Surg.; R.S.; S.K.i.; U.C.L.i.*
- Rio Obs. Rv.** Revista do Observatorio. Publicação Mensal do Imperial Observatorio do Rio de Janeiro. Rio de Janeiro.
- 1886—91. *Dub.R.D.S.i.; Edinb.R.S.i.; M.O.; R.A.S.; R.S.*
- R. I. P.** Notice of the Proceedings at the meetings of the members of the Royal Institution, with Abstracts of the Discourses delivered at the Evening Meetings. London.
- 1851— B.M.; *Camb.U.; Chem.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.i.; Linn.S.; M.O.; N.H.M.; Oxon.R.; Pharm.S.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.*
- Rm. At.** Atti dell' Accademia Pontificia de' Nuovi Lincei. Roma.
- Rm. At. N. Linc.** 1847— B.M.; *Dub.R.I.A.; Edinb.R.S.; Glasg.U.i.; I.CE.i.; N.H.M.; Oxon.B.i.; R.A.S.i.; R.Geogr.S.i.; R.S.*
- See **Rm. N. Linc. At.**
- Rm. At. R. Ac.** Atti della Reale Accademia dei Lincei. Roma.
- 1870—83. *B.M.; Camb.P.S.; Camb.U.i.; Chem.S.i.; Dub.R.D.S.; Dub.R.I.A.; Glasg.U.i.; Linn.S.; Math.S.i.; N.H.M.; Oxon.B.; Oxon.R.i.; R.A.S.i.; R.Geogr.S.; R.S.; S.K.i.; U.C.L.i.*
- See **Rm. R. Ac. Linc. At.**
- Rm. Bil. Met.** *Bullettino Meteorologico dell' Osservatorio del Collegio Romano. Roma.*
- 1862—78. [*Continued as: Pontificia Università Gregoriana, 1879—*]
Edinb.R.S.i.; Glasg.P.S.i.; M.O.; R.A.S.; R.S.; U.C.L.i.
- Rm. Cor. Sc.** *Corrispondenza Scientifica in Roma per l'avanzamento delle Scienze, etc. Roma.*
- 1848—69.
- See **Rm. Sc. Cor.**
- Rm. N. Linc. At.** See **Rm. At.**
- Rm. N. Linc. Mm.** *Memorie della Pontificia Accademia dei Nuovi Lincei. Roma.*
- 1887— *Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; N.H.M.; R.S.*
- See **Rm. At. R. Ac.**
- Rm. R. Ac. Linc. At.** Atti della R. Accademia dei Lincei. *Memorie della Classe di Scienze fisiche, matematiche e naturali. Roma.*
- 1877— *B.M.i.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.i.; Edinb.R.S.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.i.; Linn.S.; Math.S.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.i.; R.A.S.; R.Geogr.S.; R.S.; S.K.; U.C.L.*
- Rm. R. Ac. Linc. Rd.** *Atti della R. Accademia dei Lincei. Rendiconti. Roma.*
- 1885— [*Continuation of: Transunti, 1877—84.*] *B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.T.C.; Edinb.R.S.; Geol.S.; Glasg.U.; I.CE.i.; Linn.S.; Math.S.; N.H.M.; Oxon.B.; Oxon.R.; R.A.S.; R.Geogr.S.; R.S.; S.K.; U.C.L.*
- Rm. R. Ac. Linc. T.** *Atti della R. Accademia dei Lincei. Transunti. Roma.*
- 1877—84. [*Continued as: Rendiconti, 1885—*] *B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.; Edinb.R.S.; Geol.S.; Glasg.P.S.i.; Glasg.U.; I.CE.i.; Linn.S.; Math.S.; N.H.M.; Oxon.B.; Oxon.R.; R.A.S.; R.Geogr.S.; R.S.; S.K.i.; U.C.L.*
- Rm. Sc. Cor.** See **Rm. Cor. Sc.**
- Rm. S. It. Mm.** *Memorie di Matematica e di Fisica della Società Italiana delle Scienze. Napoli, Roma.*
- 1782— *B.M.i.; Camb.P.S.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.; Glasg.U.i.; Linn.S.i.; Oxon.B.i.; R.A.S.i.; R.C.Surg.i.; R.S.; S.K.i.; U.C.L.i.*
- See **Mod. Mm. S., Mod. S. It. Mm., and Verona Mm. S. It.**
- Rm. Spec. Vat. Pb.** *Publicazioni della Specola Vaticana. Roma, Torino.*
- 1891— *Glasg.U.i.; M.O.; R.A.S.; R.S.*
- Rm. Off. Centr. Met. A.** *Annali dell' Ufficio Centrale di Meteorologia Italiana [Ufficio Centrale Meteorologico e Geodinamico Italiano]. Roma.*
- 1880— *M.O.; R.A.S.i.*
- Rob. J. An.** *Journal de l'Anatomie et de la Physiologie normales et pathologiques de l'Homme et des Animaux; Robin. Paris.*
- 1864— *B.M.; Camb.P.S.i.; Camb.U.; Edinb.U.; Glasg.U.i.; N.H.M.i.; Oxon.B.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.i.*

List of Serial Publications

- Rochester (N. Y.) Ac. Sc. P.**..... Proceedings of the Rochester Academy of Sciences. Rochester, N.Y. 1890— B.M.; Camb.P.S.; Edinb.R.S.i.; Linn.S.; N.H.M.; R.S.; U.C.L.i.
- Roser u. Wunderlich Arch.**..... Archiv für Physiologische Heilkunde; Roser, Wunderlich, Griesinger. Stuttgart. 1842—59. [*Continued as*: Archiv der Heilkunde, 1860—78.] B.M.; Camb.U.; Glasg.P.S.i.; Oxon.R.i.; R.C.Surg.; R.S.; U.C.L.
- Rot. N. Vh.**..... Nieuwe Verhandelingen van het Bataafsche Genootschap der Proefondervindelijke Wijsbegeerte te Rotterdam. Rotterdam. 1800— B.M.i.; Camb.U.i.; Chem.S.i.; Dub.R.D.S.; Edinb.R.S.i.; Glasg.U.i.; I.CE.i.; Oxon.B.; R.C.Surg.i.; R.S.
- Rouen Ac. Tr.**..... Précis analytique des Travaux de l'Académie des Sciences, Belles-Lettres, et Arts de Rouen. Rouen. 1804— B.M.; Camb.U.; Dub.R.I.A.; Dub.T.C.; N.H.M.i.; Oxon.B.; R.S.i.
See Rouen Tr. Ac.
- Rouen Bll. S. Ém.**..... Bulletins [des travaux] de la Société Libre d'Émulation de Rouen. Rouen. 1837— B.M.; Oxon.B.
- Rouen S. Sc. Bll.**..... Bulletin de la Société des Amis des Sciences Naturelles de Rouen. Rouen. 1875— B.M.; Glasg.P.S.i.; N.H.M.
See Rouen Ac. Tr.
- Rouen Tr. Ac.**..... Annales de l'Institut Météorologique de Roumanie. Bucarest, Paris. 1886— B.M.i.; Edinb.R.S.; M.O.; R.Geogr.S.i.; R.S.i.
- Rpm. I. Mét. A.**..... Repertorium der Analytischen Chemie für Handel, Gewerbe und Öffentliche Gesundheitspflege. Hamburg, Leipzig. 1881—87. [*Continued as*: Zeitschrift für die Chemische Industrie, 1887.] Chem.S.; P.O.
- Rpm. Mth.**..... Repertorium der literarischen Arbeiten aus dem Gebiete der reinen und angewandten Mathematik. Leipzig. 1877—79. Camb.U.; R.S.
- Rpm. Phm.**..... Repertorium für die Pharmacie; Gehlen. Nürnberg. 1815—51. B.M.; Camb.U.; Edinb.U.; Pharm.S.; R.C.Surg.; R.S.
- Rpm. Ps.**..... Repertorium der Physik. Enthaltend eine vollständige Zusammenstellung der neuern Fortschritte dieser Wissenschaft. Berlin. 1837—49. Chem.S.; Glasg.P.S.i.; P.O.; R.S.; S.K.; U.C.L.
- Rs. C. Ps. S. J.**..... Journal of the Russian Chemical Society and of the Physical Society of the Imperial University of St. Petersburg. [In Russian.] St. Petersburg. 1873—78. [*Continuation of*: Journal of the Russian Chemical Society, 1869—72.] [*Continued as*: Journal of the Russian Physico-Chemical Society, etc., 1879—] Camb.P.S.i.; Chem.S.; Edinb.R.S.i.; N.H.M.
- Rs. C. S. J.**..... Journal of the Russian Chemical Society. [In Russian.] St. Petersburg. 1869—72. [*Continued as*: Journal of the Russian Chemical Society and of the Physical Society of the Imperial University of St. Petersburg, 1873—78.] Camb.P.S.i.; Chem.S.; Edinb.R.S.i.; Glasg.P.S.i.; N.H.M.
- R. S. P.**..... Abstracts of the papers printed in the Philosophical Transactions of the Royal Society of London from 1800 to 1843. London. 1832—43.
Abstracts of the papers communicated to the Royal Society of London from 1843 to 1854. London. 1851—54.
Proceedings of the Royal Society of London. London. 1856— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.i.; Dub.R.C.S.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.; Linn.S.i.; Math.S.i.; M.O.; N.H.M.; Oxon.B.i.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- Rs. Ps.-C. S. J.**..... Journal of the Russian Physico-Chemical Society of the Imperial University of St Petersburg. [In Russian.] St Petersburg. 1879— [*Continuation of*: Journal of the Russian Chemical Society, etc., 1869—78.] Camb.P.S.i.; Chem.S.; Edinb.R.S.i.; N.H.M.
- R. S. Yearbook**..... Yearbook of the Royal Society of London. (Biography 1900.)

List of Serial Publications

- Rugby NH. S. Ep.** Reports of the Rugby School Natural History Society. Rugby.
1867— Geol.S.i.; M.O.; N.H.M.; R.A.S.; S.K.i.
- Russl. Phm. Z.** Pharmaceutische Zeitschrift für Russland. St. Petersburg.
1862— B.M.; P.O.
See Phm. Z. Russl.
- Rv. Artl.** Revue d'Artillerie. Paris, Nancy.
1872— B.M.; I.CE.i.; P.O.
- Rv. Brazil.** Revista Brasileira, Jornal de Ciencias, Letras e Artes; Oliveira.
Rio de Janeiro.
1857—61. B.M.; N.H.M.; R.S.i.
- Rv. Bt.** Revue de Botanique. Bulletin Mensuel de la Société Française de
Botanique. Courrensan, Toulouse.
1882—95. Glasg.P.S.i.; N.H.M.; Pharm.S.i.
- Rv. Cours Sc.** Revue des Cours Scientifiques de la France et de l'Étranger; Eug.
Yung et Em. Alglave. Paris.
1863—70. [*Continued as: Revue Scientifique, etc., 1871—*] B.M.;
Edinb.R.S.i.; Edinb.U.; N.H.M.; Oxon.R.; P.O.; R.C.Surg.;
R.S.; S.K.
- Rv. Gén. Bt.** Revue Générale de Botanique. Paris.
1889— B.M.; Camb.U.; Glasg.P.S.i.; Glasg.U.; Linn.S.; N.H.M.;
S.K.; U.C.L.
- Rv. Gg. It.** Rivista Geografica Italiana. Roma.
1893— B.M.; Glasg.P.S.i.; R.Geogr.S.
- Rv. It. Sc. Nt. Siena** Rivista Italiana di Scienze Naturali. Siena.
1889— [*Continuation of: Bollettino del Naturalista, 1881—88.*]
Glasg.P.S.i.; N.H.M.
- Rv. Mar.** (Revue maritime et coloniale. Paris.
Rv. Mar. et Col. 1861— B.M.; I.CE.i.; M.O.i.; Oxon.B.; P.O.; R.Geogr.S.i.
- Rv. Mn. Cr.** Rivista di Mineralogia e Cristallografia Italiana. Padova.
1887— B.M.; Camb.U.; Geol.M.; Geol.S.; N.H.M.; S.K.
- Rv. Mt.** Rivista di Matematica. Torino.
1891—95. [*Continued as: Revue de Mathématiques, 1896—*]
Camb.U.; Oxon.B.; R.S.
- Rv. Mth.** Revue de Mathématiques. Turin.
1896— [*Continuation of: Rivista di Matematica, 1891—95.*]
Camb.U.; Oxon.B.; R.S.
- Rv. Quest. Sc.** Revue des Questions Scientifiques, publiée par la Société Scientifique
de Bruxelles. Louvain, Paris.
1877— B.M.; N.H.M.; S.K.i.
- Rv. Sc.** Revue scientifique et Industrielle; Quesneville. Paris.
1840—52. B.M.; Camb.U.; Chem.S.i.; Oxon.B.i.; S.K.
- Rv. Sc.** La Revue Scientifique de la France et de l'Étranger. Paris.
1871— [*Continuation of: Revue des Cours Scientifiques, etc.,*
1863—70.] B.M.; Camb.U.; Edinb.R.S.; Edinb.U.; Geol.S.;
N.H.M.; Oxon.R.; P.O.; R.A.S.i.; R.C.Surg.; R.S.; S.K.
- Rv. Sc.-Ind.** Rivista Scientifico-Industriale delle principali scoperte ed invenzioni
fatte nelle scienze e nelle industrie. Firenze.
1869— P.O.
- Rv. Sper. Freniatr.** Rivista Sperimentale di Freniatria e di Medicina legale. Reggio-
Emilia.
1875— R.C.Surg.
- Rv. Trim. Mcgr.** Revista Trimestral Micrográfica. Organó del Laboratorio Histológico
de la Facultad de Medicina de Madrid. Madrid.
1896— R.S.
- Rv. Un. Mines** Revue Universelle des Mines, de la Métallurgie, etc.; de Cuyper.
Paris, Liège.
1857— B.M.; Camb.U.; Dub.R.I.A.i.; Glasg.P.S.i.; Glasg.U.i.;
I.CE.i.; N.H.M.; P.O.; S.K.
See Cuyper Rv. Un.
- S. Afr. C. Mtl. S. J.** The Journal of the Chemical and Metallurgical Society of South
Africa. Johannesburg.
1898— Camb.P.S.; Chem.S.; Glasg.P.S.i.; P.O.; S.K.i.
- S. Afr. C. Mtl. S. P.** The Proceedings of the Chemical and Metallurgical Society of South
Africa. Johannesburg, Edinburgh, New York.
1894— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Glasg.P.S.i.; P.O.;
S.K.

List of Serial Publications

- S. Afr. Ph. S. T.** The Transactions of the South African Philosophical Society. Cape Town.
1878— B.M.; Camb.P.S.; Camb.U.i.; Chem.S.; Edinb.R.S.; Edinb.U.; Glasg.P.S.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.; R.Geogr.S.i.; R.S.; S.K.
- S. Afr. QJ.** The South African Quarterly Journal; edited at the African Institution. Cape Town.
1830—35. B.M.i.; Edinb.R.S.i.; N.H.M.; R.Geogr.S.i.
- Santiago de Chile Un. A.** Anales de la Universidad de Chile. Santiago de Chile.
1843— B.M.i.; Dub.T.C.; Glasg.U.i.; N.H.M.i.; Oxon.B.i.; R.Geogr.S.i.
- Sarthe S. Bll.** Bulletin de la Société d'Agriculture, etc., de la Sarthe. Le Mans.
1833— R.S.i.
- S. Aust. R. S. T.** Transactions and Proceedings and Report of the Royal Society of South Australia. Adelaide.
1879— Camb.P.S.i.; Camb.U.i.; Chem.S.i.; Dub.R.I.A.i.; Edinb.R.S.; Geol.S.; I.CE.i.; Linn.S.i.; N.H.M.; P.O.; R.A.S.; R.C.Surg.i.; R.Geogr.S.i.; R.S.i.
- Sav. Ac. Mm.** Mémoires de la Société Académique de Savoie. Chambéry.
Sav. Mm. Ac. 1825— Camb.U.; Dub.R.I.A.; Dub.T.C.; N.H.M.; Oxon.B.; R.S.i. (See **Chambéry Mm. Ac. Sav.**)
- Sav. S. H. Nt. Bll.** Bulletin de la Société d'Histoire Naturelle de Savoie. Chambéry.
1850—53; 1887— Geol.S.i.; N.H.M.
- Sc. Abs.** Science Abstracts. Physics and Electrical Engineering. London.
1898— Camb.P.S.; Camb.U.; Chem.S.; Edinb.R.S.i.; Edinb.U.; Glasg.P.S.; I.CE.; Oxon.R.; P.O.; R.A.S.i.; R.S.; S.K.; U.C.L.
- Sc. Gg. Mg.** The Scottish Geographical Magazine. Edinburgh.
1885— B.M.; Camb.U.; Dub.T.C.i.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.i.; M.O.; N.H.M.; Oxon.B.; R.Geogr.S.; U.C.L.
- Schelling N. Z. Spec. Ps.** Neue Zeitschrift für speculative Physik; Schelling. Tübingen.
1802. [Continuation of: Zeitschrift, 1800—01.] B.M.; Glasg.P.S.i.; R.S.
- Schelling Z. Spec. Ps. ...** Zeitschrift für speculative Physik; Schelling. Jena, Leipzig.
1800—01. [Continued as: Neue Zeitschrift, 1802.] B.M.; Camb.U.; Oxon.B.; R.S.
- Scherer J. C.** Allgemeines Journal der Chemie; Scherer. Leipzig.
1798—1802. [Continued as: Neues Allgemeines Journal etc., 1803—06.] B.M.; Glasg.P.S.i.; N.H.M.; R.S.
- Sch. Gs. N. D.** Neue Denkschriften der allgemeinen Schweizerischen Gesellschaft für die gesammten Naturwissenschaften. Neuchâtel, Zürich, etc.
1837— B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.; Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.B.; R.C.Surg.i.; R.S.; S.K.
See **Zür. N. D. Sch. Gs.**
- Sch. Gs. Vh.** Verhandlungen der Schweizerischen Gesellschaft für die gesammten Naturwissenschaften. Aarau, etc.
1823— B.M.i.; Edinb.R.S.i.; Geol.S.i.; Glasg.U.i.; Linn.S.i.; N.H.M.; R.C.Surg.i.; R.S.; S.K.
See **Act. S. Helv., At. S. Elvet. and Sch. Nf. Gs. Vh.**
- Schl.-Holst. Nt. Vr. Schr.** Schriften des Naturwissenschaftlichen Vereins für Schleswig-Holstein. Kiel.
1873— B.M.; Camb.U.; Edinb.R.S.i.; Linn.S.; N.H.M.; R.S.i.
- Schlömilch Z.** Zeitschrift für Mathematik und Physik; Schlömilch. Leipzig.
1856— B.M.; Camb.U.; Dub.N.L.I.i.; Dub.R.D.S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.U.; Glasg.U.i.; Math.S.i.; Oxon.B.(R.); R.S.; S.K.; U.C.L.i.
See **Z. Mth. Ps.**
- Sch. Mines Q. N. Y.** The School of Mines Quarterly. New York.
1879— B.M.i.; Glasg.P.S.; I.CE.i.; N.H.M.; P.O.; S.K.i.
- Sch. Nf. Gs. Vh.** See **Act. S. Helv., At. S. Elvet. and Sch. Gs. Vh.**
- Sch. Pol. Z.** Schweizerische polytechnische Zeitschrift; Bolley. Winterthur.
1856—70. B.M.; I.CE.; P.O.; R.Geogr.S.i.
- Schröder B. Zeev.** Berigten en Verhandelingen over eenige onderwerpen des Zeevaarts; Schröder. Amsterdam.
1823—25. B.M.; Glasg.P.S.i.

List of Serial Publications

- Schumacher As. Ab.**..... Astronomische Abhandlungen; Schumacher. Altona.
1823—25. B.M.; Camb.U.; Dub.R.D.S.; Edinb.R.S.; R.A.S.; R.S.
- Schumacher Jb.**..... Jahrbuch (astronomisches); Schumacher. Stuttgart, Tübingen.
1836—44. Camb.U.; Edinb.R.S.i.; Oxon.R.i.; R.A.S.; R.S.i.; U.C.L.
- Schwäb. Ga. D.**..... Denkschriften der Schwäbischen Gesellschaft der Aerzte und Naturforscher. Tübingen.
1805. N.H.M.; R.S.; S.K.
- Schweigger J.**..... Journal für Chemie und Physik; Schweigger. Nürnberg.
1811—33. B.M.; Chem.S.i.; Edinb.R.S.; N.H.M.; Oxon.R.; P.O.; R.C.Surg.; R.S.i.; S.K.
- Science**..... Science. Cambridge, Mass., and New York.
1883— B.M.; Camb.P.S.i.; Dub.N.L.I.i.; Dub.R.C.S.i.; Edinb.R.S.; Edinb.U.i.; Geol.S.i.; Glasg.P.S.i.; I.CE.i.; N.H.M.; Oxon.R.i.; P.O.; R.A.S.i.; R.Geogr.S.; S.K.
- S. C. In. J.**..... The Journal of the Society of Chemical Industry. Manchester, London.
1882— Camb.U.; Chem.S.; Dub.N.L.I.; Dub.R.C.S.; Dub.R.D.S.; Edinb.R.S.i.; Edinb.U.i.; Geol.M.i.; Glasg.U.i.; I.CE.; Oxon.R.i.; Pharm.S.; P.O.; R.S.; S.K.; U.C.L.
- Sc. Mcr. S. P. & T.**..... Proceedings and Transactions of the Scottish Microscopical Society. Edinburgh.
1889— Camb.P.S.; Dub.R.D.S.; Edinb.U.; Glasg.P.S.i.; Linn.S.; R.S.i.
- Sc. Met. S. J.**..... Journal of the Scottish Meteorological Society. Edinburgh, London.
1864— B.M.; Camb.U.; Dub.T.C.; Edinb.R.S.; Edinb.U.i.; Glasg.P.S.; Glasg.U.i.; M.O.; Oxon.B.; Oxon.R.i.; R.Geogr.S.i.; R.S.i.; S.K.i.
- Sc. S. Arts T.**..... Transactions of the Royal Scottish Society of Arts. Edinburgh.
1841— B.M.i.; Camb.U.; Dub.R.D.S.; Edinb.R.S.; Edinb.U.; Glasg.P.S.; Glasg.U.; I.CE.; P.O.; R.S.; S.K.
See Edinb. Sc. S. Arts P. and Edinb. T. Sc. S. Arts.
- S. Dyers Col. J.**..... The Journal of the Society of Dyers and Colourists. Bradford, Yorks.
1884— Chem.S.i.; Glasg.P.S.i.; P.O.; S.K.
- Seine-et-Oise Mm.**..... Mémoires de la Société des Sciences Naturelles de Seine et Oise. Versailles.
1835— B.M.; Camb.U.i.; N.H.M.; S.K.
- Seism. J. Jap.**..... Seismological Journal of Japan. Yokohama.
1893—95. [*Continuation of*: Transactions of the Seismological Society of Japan, 1880—92.] B.M.; Camb.U.i.; Dub.R.I.A.; Geol.M.; Geol.S.; I.CE.; R.A.S.i.; R.Geogr.S.; R.S.
- Senckb. Nf. Ga. B.**..... Bericht über die Senckenbergische Naturforschende Gesellschaft in Frankfurt am Main. Frankfurt a. M.
1868— B.M.; Camb.U.i.; Geol.S.i.; Linn.S.; N.H.M.; Oxon.R.; R.C.Surg.i.; R.S.
- S. Fernando Obs. Mar. A.**..... Anales del Instituto y Observatorio de Marina de San Fernando. San Fernando.
1883— Camb.P.S.i.; M.O.; R.A.S.; R.S.i.
- Sid. Mess.**..... The Sidereal Messenger. Northfield, Minn.
1883—91. [*Continued as*: Astronomy and Astrophysics, 1892—94.] B.M.; R.A.S.; S.K.i.
- Siena At. Ac.**..... Atti dell' Accademia delle Scienze di Siena detta de' Fisiso-critici. Siena.
1761— B.M.; Camb.U.i.; Dub.R.I.A.i.; Dub.T.C.i.; N.H.M.i.; Oxon.B.; R.C.Surg.i.; R.S.i.
- Silliman J.**..... The American Journal of Science and Arts; Silliman. New Haven.
1818— B.M.; Camb.P.S.i.; Camb.U.; Chem.S.i.; Dub.N.L.I.i.; Dub.R.C.S.i.; Dub.T.C.i.; Edinb.R.S.; Edinb.U.; Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.A.S.i.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.
See Am. J. Sc.
- Sk. Nf. F.**..... Förhandlingar vid det af Skandinaviska Naturforskare och Läkare hållna Môte..... Götheborg, etc.
- Sk. Nt. Möt. F.**..... Forhandlingerne ved de Skandinaviske Naturfokeres...Møde... Götheborg, etc.
- Sk. Nt. Möt. F.**..... 1839— B.M.; N.H.M.; Oxon.B.i.; R.C.Surg.i.; R.S.i.

List of Serial Publications

- Smiths. Ct.** Smithsonian Contributions to Knowledge. Washington.
1848— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.T.C.; Edinb.
R.S.; Edinb.U.; Geol.M.i.; Geol.S.i.; Glasg.P.S.; Glasg.U.i.;
I.CE.; Linn.S.; M.O.i.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.i.;
R.A.S.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.
- Smiths. I. Asps. Obs. A.** Annals of the Astrophysical Observatory of the Smithsonian Institution. Washington.
1900— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Edinb.R.S.;
Glasg.P.S.i.; I.CE.; M.O.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.
- Smiths. Misc. Col.** Smithsonian Miscellaneous Collections. Washington.
1862— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.T.C.; Edinb.
R.S.; Edinb.U.; Geol.M.; Geol.S.i.; Glasg.P.S.; Glasg.U.;
I.CE.; Linn.S.; M.O.i.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.i.;
R.A.S.; R.C.Surg.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Smiths. Rp.** Annual Report of the Board of Regents of the Smithsonian Institution. Washington.
1846— B.M.i.; Camb.P.S.; Camb.U.; Dub.T.C.; Edinb.R.S.i.;
Geol.M.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.i.; Math.S.i.;
M.O.i.; N.H.M.i.; Oxon.B.; Oxon.R.i.; Pharm.S.i.; P.O.i.;
R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.i.; S.K.i.; U.C.L.i.
- Som. S. P.** Somersetshire Archaeological and Natural History Society's Proceedings. Taunton.
1849— B.M.; Camb.U.; Dub.R.I.A.; Geol.S.i.; Glasg.P.S.i.;
Linn.S.i.; N.H.M.; Oxon.B.i.; R.S.i.; S.K.i.; U.C.L.i.
- Sperim.** Lo Sperimentale. Giornale critico di Medicina e Chirurgia. Firenze.
1858—79.
Lo Sperimentale. Giornale Italiano di Scienze Mediche. Firenze,
Siena.
1879— Edinb.U.i.; R.C.Surg.; R.S.i.
- Spet. It. Mm.** Memorie della Società degli Spettroscopisti Italiani, raccolte e
pubblicate per cura del Prof. P. Tacchini. Palermo.
1872— B.M.i.; Camb.U.; Edinb.R.S.i.; P.O.; R.A.S.; R.S.
See **Palermo Mm. Spet. It.**
- Spongia Cm. Md.** Commentarii di Medicina; Spongia. Padova.
1836—37. Glasg.P.S.i.
- Steierm. Ggn. Mont.
Vr. B.** Bericht des Geognostisch-Montanistischen Vereines für Steiermark.
Graz.
1852—63. Geol.S.i.; Glasg.P.S.i.; N.H.M.; R.S.; S.K.
- Steierm. Mt.** Mittheilungen des Naturwissenschaftlichen Vereines für Steiermark.
Graz.
1863— B.M.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.; Geol.S.;
Linn.S.i.; M.O.i.; N.H.M.; R.S.; U.C.L.i.
See **Graz Mt. NW. Vr. Steierm.**
- St. Ét. Bil. S. In. Mn.** ... { Bulletin de la Société de l'Industrie minière. St. Étienne.
St. Ét. S. In. Mn. Bil. ... { 1855— I.CE.; P.O.i.; S.K.i.
- Stett. E. Ztg.** Entomologische Zeitung; herausg. v. d. Entomologischen Vereine
zu Stettin. Stettin.
1840—B.M.; Camb.U.; Linn.S.; N.H.M.
- St. Gal. B.** Bericht über die Thätigkeit der St. Gallischen Naturwissenschaftlichen
Gesellschaft. St. Gallen.
1860— N.H.M.; R.S.i.
- St. Louis Ac. T.** The Transactions of the Academy of Science of St. Louis. St. Louis.
St. Louis T. Ac. 1856— B.M.; Dub.R.I.A.; Edinb.R.S.; Geol.S.i.; Glasg.P.S.;
Linn.S.i.; N.H.M.; Oxon.B.; P.O.i.; R.Geogr.S.; R.S.; S.K.
- Stockh. Ac. Hndl.** Kongliga Svenska Vetenskaps-Akademiens Handlingar. Stockholm.
Stockh. Ak. Hndl. 1739— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.;
Edinb.R.S.i.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.i.;
N.H.M.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.
- Stockh. Ak. Hndl. Bh.** ... Bihang till Kongl. Svenska Vetenskaps-Akademiens Handlingar.
Stockh. Bh. Ak. Hndl. ... { Stockholm.
1872— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.R.I.A.;
Edinb.R.S.; Geol.S.; Glasg.P.S.; Linn.S.; N.H.M.; R.A.S.;
R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Stockh. Gl. För. F.** Geologiska Föreningens i Stockholm Förhandlingar. Stockholm.
1872— B.M.; Geol.M.; Geol.S.; U.C.L.i.
- Stockh. Öfv.** Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar. Stock-
holm.

List of Serial Publications

- 1844— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.;
Edinb.R.S.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; Linn.S.i.;
N.H.M.; Oxon.R.; R.A.S.; R.Geogr.S.; R.S.; U.C.L.i.
- Stockh. Vt. Ak. Lefn.** ... Lefnadsteckningar öfver Kongl. Svenska Vetenskaps Akademien...
ledamöter. Stockholm.
- 1869— Chem.S.i.; Dub.R.I.A.; Edinb.R.S.; Geol.S.; Glasg.P.S.;
Linn.S.i.; R.A.S.; R.Geogr.S.; R.S.
- St. Pét. Ac. Mm.** Mémoires de l'Académie Impériale des Sciences de St. Pétersbourg.
St. Pétersbourg.
- 1803— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.;
Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.M.i.;
Geol.S.i.; Glasg.U.i.; Linn.S.i.; M.O.i.; N.H.M.; Oxon.B.;
Oxon.R.; P.O.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.; S.K.i.;
U.C.L.i.
- See **St. Pét. Ac. Sc. Mm. and St. Pét. Mm.**
- St. Pét. Ac. Sc. Bil.**..... Bulletin Scientifique publié par l'Académie Impériale des Sciences
de St. Pétersbourg. St. Pétersbourg.
- 1836—42.
Bulletin de la Classe Physico-mathématique de l'Académie Impériale
des Sciences de St. Pétersbourg. St. Pétersbourg, Leipzig.
- 1843—59.
Bulletin de l'Académie des Sciences de St. Pétersbourg. St. Péters-
bourg.
- 1860— B.M.i.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.;
Edinb.R.S.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.; Linn.S.i.; N.H.M.;
Oxon.B.; Oxon.R.i.; P.O.i.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.;
R.S.; S.K.
- See **St. Pét. Bil. Ac. Sc.**
- St. Pét. Ac. Sc. Mm.** See **St. Pét. Ac. Mm. and St. Pét. Mm.**
- St. Pet. Ac. Sc. Mm. (Rs.)** Memoirs of the Imperial Academy of Science. [In Russian.]
St. Petersburg. [Not the same as **St. Pét. Ac. Mm.**]
- 1862—94. B.M.; Dub.R.I.A.
- St. Pet. Ac. Sc. N. Acta.**... Nova Acta Academiae Scientiarum Imperialis Petropolitanae. Petropoli.
1783—1802. B.M.; Camb.U.; Edinb.R.S.; Linn.S.i.; N.H.M.;
Oxon.B.; Oxon.R.; P.O.; R.A.S.i.; R.C.Surg.; R.S.; U.C.L.
- St. Pét. Bil. Ac. Sc.** } See **St. Pét. Ac. Sc. Bil.**
- St. Pét. Bil. Sc.** }
- St. Pét. Com. Gl. Bil.** ... Bulletins du Comité Géologique. St. Pétersbourg.
- 1883— Dub.R.I.A.; Edinb.R.S.; Geol.M.; Geol.S.; Glasg.P.S.i.;
R.S.; S.K.i.; U.C.L.
- St. Pet. Md. Wschr.** St. Petersburg Medicinische Wochenschrift. St. Petersburg.
- 1876— B.M.; Camb.U.i.; Glasg.P.S.i.; R.C.Surg.
- St. Pét. Mm.** } See **St. Pét. Ac. Mm. and St. Pét. Ac. Sc. Mm.**
- St. Pét. Mm. Ac. Sc.** }
- St. Pét. Mm. Sav. Étr.** ... Mémoires présentés à l'Académie Impériale des Sciences de St. Péters-
bourg par divers Savans. St. Pétersbourg.
- 1831—59. B.M.; Camb.U.; Edinb.R.S.; Glasg.U.; Linn.S.;
N.H.M.; R.A.S.; R.C.Surg.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
- St. Pet. Mn. Gs. Vh.**..... Verhandlungen der Russisch-Kaiserlichen Mineralogischen Gesell-
schaft zu St. Petersburg. St. Petersburg.
- 1842— B.M.; Camb.U.i.; Dub.T.C.; Edinb.R.S.i.; Geol.M.i.;
Geol.S.; N.H.M.; R.Geogr.S.i.; R.S.i.; U.C.L.i.
- St. Quent. A.** Annales Agricoles du département de l'Aisne, publiées par la Société
des Sciences, Arts, Belles-Lettres et Agriculture de St. Quentin.
St. Quentin.
- 1831—42.
Annales Scientifiques, Agricoles et Industrielles du département de
l'Aisne (Société Académique de Saint Quentin). St. Quentin.
- 1844—55? B.M.; Oxon.B.i.; R.S.i.
- St. Quent. Mm.** Mémoires de la Société des Sciences, Arts, Belles-Lettres et Agriculture
de la ville de St. Quentin. St. Quentin.
- 1831— B.M.; R.S.i.
- Strasb. J. S. Sc.** Journal de la Société des Sciences, Agriculture et Arts, du départe-
ment de Bas-Rhin. Strasbourg.
- 1824—28. [Continuation of: Mémoires, etc., 1811—23.] B.M.;
Camb.U.; N.H.M.; Oxon.B.; R.S.
- See **Strasb. S. Sc. J.**

List of Serial Publications

- Strasb. Mm. S. H. Nt. ...** { Mémoires de la Société des Sciences Naturelles de Strasbourg, Strasbourg.
- Strasb. Mm. S. Sc.** { 1830—70. B.M.; Camb.U.; Dub.R.I.A.i.; Dub.T.C.i.; Geol.S.i.; N.H.M.; R.S.; S.K.i.
- Strasb. S. H. Nt. Mm. ...** { Bulletin de la Société des Sciences Naturelles de Strasbourg, Strasbourg.
- Strasb. S. Sc. Bll.** { 1868—70. B.M.; Geol.S.; N.H.M.i.
- Strasb. S. Sc. J.** { See **Strasb. J. S. Sc.**
- Strasb. S. Sc. Mm.** { Mémoires de la Société des Sciences, Agriculture et Arts de Strasbourg, Strasbourg.
- St. Sp. Ag. It.** { Le Stazioni Sperimentali Agrarie Italiane. Torino, Roma, Firenze, Asti, Modena.
- St. Thom. Hosp. Rp.** { 1872— B.M.i.; Chem.S.i.; R.S.i.
- St. Thom. Hosp. Rp.** { St. Thomas's Hospital Reports. London.
- St. Thom. Hosp. Rp.** { 1836; 1870— Camb.U.; Edinb.U.i.; Glasg.P.S.i.; Glasg.U.i.; Oxon.B.; Oxon.R.; R.C.Surg.; R.S.i.; U.C.L.i.
- Stud.** { The Student and Intellectual Observer of Science, Literature, and Art. London.
- Sturgeon A. Electr.** { 1868—71. [Continuation of: The Intellectual Observer, 1862—68.] B.M.; Camb.U.; Geol.S.; Glasg.P.S.i.; Linn.S.; N.H.M.; Oxon.R.; Pharm.S.; P.O.; R.A.S.; S.K.
- Sturgeon A. Electr.** { Annals of Electricity, Magnetism, and Chemistry; and Guardian of Experimental Science; Sturgeon. London.
- Sturgeon A. Electr.** { 1836—43. B.M.; Camb.U.; Chem.S.; Edinb.U.i.; Glasg.U.i.; I.CE.i.; Oxon.B.i.; Oxon.R.; Pharm.S.; P.O.; R.S.; S.K.
- S. W. I. E. P.** { Proceedings and Transactions of the South Wales Institute of Engineers. Merthyr Tydfil, Swansea, Cardiff.
- S. W. I. E. P.** { 1857— B.M.i.; Camb.U.i.; Geol.S.; Glasg.U.i.; I.CE.; P.O.; S.K.; U.C.L.i.
- S. W. R. I. Rp.** { The Annual Report of the Council of the Royal Institution of South Wales, with Appendix of Original Papers on Scientific Subjects. Swansea.
- S. W. R. I. Rp.** { 1839— B.M.i.; Dub.R.D.S.; R.S.i.
- Sym. Met. Mg.** { Symons's Monthly Meteorological Magazine. London.
- Sym. Met. Mg.** { 1866— Camb.U.; I.CE.; M.O.; P.O.; R.Geogr.S.i.; R.S.
- Tasm. R. S. M. Not.** { Monthly Notices of Papers and Proceedings of the Royal Society of Tasmania. Hobart.
- Tasm. R. S. F.** { 1863— B.M.i.; Camb.P.S.i.; Dub.R.D.S.; Edinb.R.S.i.; Geol.S.; Linn.S.i.; M.O.i.; N.H.M.; R.A.S.; R.C.Surg.i.; R.Geogr.S.i.; R.S.; S.K.i.
- Taylor Sc. Mm.** { Scientific Memoirs, selected from the Transactions of Foreign Academies and Learned Societies and from Foreign Journals; Taylor. London.
- Taylor Sc. Mm.** { 1837—52. B.M.; Camb.U.; Chem.S.i.; Edinb.R.S.; Geol.S.; Glasg.U.; I.CE.; Linn.S.i.; M.O.; N.H.M.; Oxon.B.(R.); P.O.; R.A.S.i.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Tel. E. J.** { Journal of the Society of Telegraph Engineers. London.
- Tel. E. J.** { 1872—89. [Continued as: Journal of the Institution of Electrical Engineers, 1890—] B.M.; Camb.P.S.; Camb.U.i.; Dub.T.C.i.; I.CE.; Oxon.B.; Oxon.R.; P.O.; R.S.; S.K.; U.C.L.
- Tel. J.** { The Telegraphic Journal and Electrical Review. London.
- Tel. J.** { 1872—91. [Continued as: The Electrical Review, 1892—] B.M.; Edinb.U.i.; Glasg.P.S.; I.CE.; Oxon.B.; P.O.; R.A.S.i.; R.S.; S.K.
- Tel. Vr. Z.** { Zeitschrift des Deutsch-Oesterreichischen Telegraphen-Vereins. Herausg. in dessen Auftrage von der K. Preuss. Telegraphen-Direction. Berlin.
- Tel. Vr. Z.** { 1854—69. I.CE.; P.O.
- Tel. Vr. Z.** { See **Berl. Tel. Vr. Z.** and **Berl. Z. Tel.**
- Termt. Közl.** { Természettudományi Közöny. Havi folyóirat közérdekű ismeretek terjesztésére. Kiadja a K. M. Természettudományi Társulat. Budapest.
- Termt. Közl.** { 1869— B.M.; Camb.P.S.i.; N.H.M.

List of Serial Publications

- Terr. Mag.** Terrestrial Magnetism [and Atmospheric Electricity]. An International Quarterly Journal. Chicago, Cincinnati, Baltimore. 1896— Camb.U.i.; R.Geogr.S.; R.S.; S.K.
- Texas Ac. Sc. T.** Transactions of the Texas Academy of Science. Austin. 1892— Camb.P.S.; Edinb.R.S.; Glasg.P.S.; Math.S.i.; N.H.M.; R.Geogr.S.; R.S.
- Thomson A. Ph.** Annals of Philosophy; or, Magazine of Chemistry, Mineralogy, Mechanics, Natural History, Agriculture, and the Arts; Thomson. London. 1813—26. [Continued in: The Philosophical Magazine, 1827—] B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Edinb.R.S.i.; Geol.S.; Glasg.U.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.; P.O.; R.A.S.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- Thomson Ec.** Records of General Science; R. D. and Thos. Thomson. London. 1835—36. B.M.; Camb.U.; Glasg.P.S.i.; Glasg.U.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; U.C.L.i. ...
- Tilloch Ph. Mg.** The Philosophical Magazine, comprehending the various branches of Science, the Liberal and Fine Arts, Geology, Agriculture, Manufactures, and Commerce. London. 1798—1826. [Continued as: The Philosophical Magazine, or Annals of Chemistry, etc., 1827—] B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Edinb.R.S.i.; Edinb.U.; Geol.S.; Glasg.P.S.; Glasg.U.i.; I.CE.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.; R.A.S.; R.C.Surg.; R.S.; S.K.; U.C.L.
- Tim.** Timehri: the Journal of the Royal Agricultural and Commercial Society of British Guiana. Demerara. 1882— B.M.; Camb.U.i.; Geol.S.i.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.i.; Pharm.S.i.; R.Geogr.S.; R.S.i.
- Tindal Vh. Zeewezen** ... Verhandelingen en Berigten betrekkelijk het Zeewezen en de Zeewartkunde; Tindal en Swart. Amsterdam. 1852—70. B.M.; P.O.; R.Geogr.S.i.; R.S.i.
- Tōk. Coll. Sc. J.** The Journal of the College of Science, Imperial University, Japan. Tōkio, Japan. 1887— [Continuation of: Memoirs of the Science Department, University of Tokio, Japan, 1879—85.] B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.T.C.; Edinb.R.S.; Edinb.U.i.; Geol.M.i.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; Math.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.Geogr.S.; R.S.; S.K.; U.C.L.
- Tok. Gl. S. Gl. Mg.** The Geological Magazine. Geological Society of Tōkyō. Tōkyō. 1894—98. [Continued as: The Journal of the Geological Society of Tōkyō, 1898—] Geol.M.i.; N.H.M.
- Tōk. Gl. S. J.** The Journal of the Geological Society of Tōkyō. Tōkyō. 1898— [Continuation of: The Geological Magazine, 1894—98.] Glasg.P.S.i.; N.H.M.
- Tok. Un. Mm.** Memoirs of the Science Department, University of Tokio, Japan. Tokio, Japan. 1877—85. [Continued as: The Journal of the College of Science, Imperial University, Japan, 1887—] Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.D.S.; Dub.R.I.A.; Edinb.E.S.i.; Geol.S.; Glasg.P.S.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
- Tor. Ac. Mm.** Memorie della R. Accademia delle Scienze di Torino. Torino. 1818— [Continuation of: Mémoires de l'Académie Royale des Sciences de Turin, 1784—1816.] B.M.i.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Geol.S.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.i.
- Tor. Ac. Sc. At.** See **Tor. Ac. Sc. Mm.** and **Tor. Mm. Ac.**
Atti della R. Accademia delle Scienze di Torino. Torino. 1865— B.M.; Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.; Edinb.R.S.; Geol.S.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.; P.O.i.; R.A.S.; R.S.; S.K.; U.C.L.i.
- See **Tor. At. Ac. Sc.**

[In the references to this serial two sets of paging are sometimes given; the first refers to the volumes containing the Classe di Scienze Fisiche, Matematiche e Naturali only, the second to the

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- volumes containing all the sections. When only one paging is given, it refers to the fuller series.]
- Tor. Ac. Sc. Mm.** See **Tor. Ac. Mm. and Tor. Mm. Ac.**
- Tor. At. Ac. Sc.** See **Tor. Ac. Sc. At.**
- Tor. Lav. Sc. Fis. Mt.** ... Notizia storica dei lavori fatti dalla Classe di Scienze Fisiche e Matematiche della R. Accademia delle Scienze. Torino. 1864—65. [*Continued as*: Atti della R. Accademia, etc., 1865—] Geol.S.; Linn.S.; R.A.S.; R.S.
- Tor. Mm. Ac.** See **Tor. Ac. Mm. and Tor. Ac. Sc. Mm.**
- Tortolini A.** Annali di Scienze Matematiche e Fisiche; Tortolini. Roma. 1850—57.
Annali di Matematica pura ed applicata...; Tortolini. Roma, Milano. 1858— B.M.; Camb.U.i.; Dub.R.D.S.; Dub.T.C.; Edinb.U.; Glasg.U.i.; Oxon.B.(R.); R.S.; U.C.L.
- Toul. Ac. Sc. Bil.** See **A. Mt.**
Bulletin de l'Académie des Sciences, Inscriptions et Belles-Lettres de Toulouse. Toulouse. 1898—99. Dub.R.I.A.; Edinb.R.S.; N.H.M.; R.S.
- Toul. Ac. Sc. Mm.** Mémoires de l'Académie des Sciences, Inscriptions et Belles-Lettres de Toulouse. Toulouse. 1782— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.i.; N.H.M.; Oxon.B.i.; R.A.S.i.; R.C.Surg.i.; R.S.; S.K.i.
- Toul. Fac. Sc. A.** See **Toul. Mm. Ac.**
Annales de la Faculté des Sciences de Toulouse pour les Sciences Mathématiques et les Sciences Physiques. Paris. 1887— Camb.P.S.; Camb.U.; Edinb.R.S.; Math.S.; Oxon.R.; R.S.
- Toul. Mm. Ac.** } See **Toul. Ac. Sc. Mm.**
- Toul. Mm. Ac. Sc.** }
- Toul. S. H. Nt. Bil.** Bulletin de la Société d'Histoire Naturelle de Toulouse. Toulouse. 1867— Geol.S.i.; N.H.M.
- Toul. S. Sc. Bil.** Bulletin de la Société des Sciences Physiques et Naturelles de Toulouse. Toulouse. 1872— B.M.; Glasg.P.S.i.; N.H.M.
- Trieste Bil.** Bollettino della Società Adriatica di Scienze Naturali in Trieste. Trieste. 1875— N.H.M.; R.S.
- Trommsdorff J. Phm.** ... Journal der Pharmacie für Aerzte und Apotheker. Leipzig. 1794—1816. [*Continued as*: Neues Journal, etc., 1817—33.] B.M.; Dub.T.C.i.; R.C.Surg.; R.S.
- Trommsdorff N. J. Phm.** ... Neues Journal der Pharmacie für Aerzte, Apotheker, und Chemisten; Trommsdorff. Leipzig. 1817—33. [*Continuation of*: Journal, etc., 1794—1816.] R.C.Surg.; R.S.
- Ts. Mt. Fys.** Tidsskrift för Matematik och Fysik, tillegnad den Svenska Elementar-Undervisningen. Upsala. 1868—74. B.M.; R.S.i.
- Ts. Mth.** Tidsskrift for Mathematik. Kjøbenhavn. 1865—89. [*Continuation of*: Mathematisk Tidsskrift, 1859—64.] B.M.; [*Continued as*: Nyt Tidsskrift for Mathematik, 1890—] B.M.; Camb.U.; Math.S.i.; Oxon.B.; S.K.i.
- Ts. Ps. C.** Tidsskrift for Fysik og Chemi samt disse Videnskabers Avendelse. Kjøbenhavn. 1862—94. [*Continued as*: Nyt Tidsskrift for Fysik og Kemi, 1896—98.] B.M.; N.H.M.
- Tübinger Bl.** Tübingen Blätter für Naturwissenschaften und Arzneikunde. Tübingen. 1815—17. B.M.; Glasg.P.S.i.; R.C.Surg.; R.S.; U.C.L.i.
- Turin Ac. Mm.** } Mémoires de l'Académie Royale des Sciences de Turin. Turin.
- Turin Mm. Ac.** } 1784—1816. [*Continued as*: Memorie della R. Accademia delle Scienze di Torino, 1818—] B.M.; Dub.R.I.A.i.; Edinb.R.S.; Glasg.U.i.; Linn.S.; Oxon.B.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.
- Ung. NW. Vr. Jb.** Abhandlungen aus dem dritten Bande der Jahrbücher des Ungarischen Naturwissenschaftlichen Vereins zu Pest, in Deutscher Uebersetzung red. von J. Szabó. Pest. 1858. B.M.; Glasg.P.S.i.

List of Serial Publications

- Un. Serv. I. J.** { Journal of the Royal United Service Institution. London.
1858— B.M.; Camb.U.; Dub.N.L.I.i.; Edinb.U.; I.CE.;
Oxon.B.i.; P.O.; R.Geogr.S.; R.S.; S.K.i.; U.C.L.i.
- Ups. Årsk.** Upsala Universitetets Årsskrift. Upsala.
1861— B.M.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.;
Linn.S.i.; Math.S.i.; N.H.M.; Oxon.B.; R.A.S.i.; R.S.
- Ups. Läk. F.** Upsala Läkareförenings Förhandlingar. Upsala.
1865— B.M.i.; Pharm.S.i.; R.C.Surg.i.
- Ups. N. Acta S. Sc.** Nova Acta Regiæ Societatis Upsaliensis. Upsalia.
Ups. S. Sc. N. Acta { 1773— B.M.; Camb.U.; Dub.R.I.A.i.; Edinb.R.S.i.; Glasg.U.i.;
Linn.S.; Math.S.i.; N.H.M.; Oxon.B.i.; Oxon.R.; R.A.S.i.;
R.C.Surg.; R.S.i.; S.K.; U.C.L.i.
- [U.S.] Chief Sig. Off. A.** Annual Report of the Chief Signal Officer [of the Army] to the
Rp. Secretary of War. Washington.
1871—90. [*Continued as:* U.S. Department of Agriculture.
Weather Bureau. Report of the Chief of the Weather Bureau,
1891—] Camb.U.i.; Dub.R.I.A.i.; Edinb.R.S.i.; Edinb.U.i.;
Glasg.U.i.; I.CE.i.; M.O.; Oxon.R.i.; P.O.i.; R.Geogr.S.; R.S.i.;
S.K.i.
- U. S. Coast Geod. Sv. Bil.** United States Coast and Geodetic Survey. Bulletin. Washington.
1888— B.M.i.; Dub.R.I.A.i.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.i.;
I.CE.i.; Oxon.R.i.; R.A.S.; R.Geogr.S.i.; R.S.
- U. S. Coast Sv. Rp.** Reports of the Superintendent of the Coast Survey, showing the
Progress of the Survey from year to year. Washington.
1851— Camb.U.; Dub.R.I.A.i.; Edinb.R.S.; Glasg.U.i.; I.CE.;
M.O.i.; N.H.M.; R.A.S.; R.Geogr.S.i.; R.S.; S.K.i.; U.C.L.i.
- U.S. Dpt. Ag. Yearb.** ... Yearbook of the United States Department of Agriculture.
Washington.
1894— [*Continuation of:* Report of the Commissioner [Secretary]
of Agriculture, 1862—93.] B.M.; Camb.P.S.i.; Camb.U.i.;
Chem.S.i.; Edinb.R.S.i.; Edinb.U.i.; Glasg.U.; M.O.i.; Oxon.
B.i.; Oxon.R.; P.O.; R.C.Surg.i.; R.S.; S.K.; U.C.L.i.
- U. S. Fish Com. Rp.** United States Commission of Fish and Fisheries. Report of the
Commissioner. Washington.
1873— B.M.i.; Camb.P.S.i.; Edinb.R.S.; Edinb.U.i.; Glasg.P.S.i.;
Glasg.U.i.; I.CE.i.; Linn.S.i.; N.H.M.; Oxon.B.; Oxon.R.;
P.O.i.; R.S.; S.K.
- U. S. Gl. Sv. Bil.** Bulletin of the United States Geological Survey. Washington.
1883— Camb.P.S.; Chem.S.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.;
Edinb.U.i.; Geol.M.; Geol.S.; Glasg.U.i.; I.CE.i.; N.H.M.;
Oxon.B.; Oxon.R.i.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.
- U. S. Gl. Sv. Rp.** Annual Report of the United States Geological Survey to the
Secretary of the Interior. Washington.
1880— Camb.P.S.; Camb.U.; Chem.S.i.; Edinb.R.S.; Edinb.U.;
Geol.M.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.i.; Linn.S.i.;
N.H.M.; Oxon.B.; Oxon.R.; P.O.i.; R.Geogr.S.; R.S.; S.K.;
U.C.L.
- U. S. Mly. Weath. Rv.** ... United States of America: Department of Agriculture. Monthly
Weather Review and Annual Summary. Washington, D.C.
1873— B.M.i.; Edinb.R.S.i.; I.CE.i.; M.O.; Oxon.B.; Oxon.R.i.;
R.Geogr.S.i.; R.S.i.; S.K.i.
- U. S. Ms. P.** Department of the Interior...Proceedings of the United States
National Museum. Washington.
1879— Camb.P.S.; Camb.U.; Edinb.R.S.; Edinb.U.i.; Geol.S.;
Glasg.P.S.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.;
R.Geogr.S.; R.S.i.; S.K.i.; U.C.L.i.
- U.S. Sec. Ag. Rp.** Report of the Secretary of Agriculture. Washington.
1889—93. [*Continuation of:* Report of the Commissioner of Agri-
culture, 1862—88.] [*Continued as:* Yearbook of the United
States Department of Agriculture, 1894—] B.M.; Camb.P.S.i.;
Camb.U.i.; Dub.N.L.I.; Dub.R.I.A.; Glasg.P.S.i.; Glasg.U.i.;
I.CE.i.; M.O.i.; N.H.M.; P.O.; R.Geogr.S.i.; R.S.i.; S.K.i.;
U.C.L.i.
- U. S. Sig. Serv. Fp.** United States of America: War Department. Professional Papers
of the Signal Service. Washington.
1881— B.M.i.; Dub.R.I.A.; Edinb.R.S.; Glasg.P.S.i.; M.O.;
R.A.S.i.; R.S.

List of Serial Publications

- U.S. Weath. Bur. Bl.** ... U.S. Department of Agriculture. Weather Bureau. Bulletin. Washington.
1892— Dub.R.I.A.; Edinb.R.S.i.; I.CE.i.; M.O.; Oxon.R.i.; P.O.i.; R.Geogr.S.i.; R.S.i.
- U.S. Weath. Bur. Rp.** ... U.S. Department of Agriculture. Weather Bureau. Report of the Chief of the Weather Bureau. Washington.
1891— [Continuation of: Annual Report of the Chief Signal Officer, 1871—90.] Dub.R.I.A.; Edinb.R.S.; Glasg.U.i.; I.CE.; M.O.; Oxon.R.i.; R.Geogr.S.; R.S.
- Utr. A. Ac.** Annales Academiæ Rheno-Trajectinæ. Trajecti ad Rhenum (Utrecht).
1815—37. B.M.; Camb.U.i.; Glasg.U.i.; N.H.M.; Oxon.B.; Oxon.R.i.; R.C.Surg.; R.S.i.; S.K.i.
- Utr. Aant. Prv. Gn.** Aanteekeningen van het Verhandelde in de Sectie-Vergaderingen van het Provinciaal Utrechtsch Genootschap van Kunsten en Wetenschappen. Utrecht.
1846— Dub.R.D.S.; Edinb.R.S.; R.S.
See **Utr. Prv. Gn. Aant.**
- Utr. Oz.** [Scheikundige] Onderzoekingen, gedaan in het [Physiologisch] Laboratorium der Utrechtsche Hoogeschool. Rotterdam, Utrecht.
Utr. Scheik. Oz. { 1842—56; 1867— Glasg.P.S.i.; R.S.i.
- Utr. Prv. Gn. Aant.** See **Utr. Aant. Prv. Gn.**
- Valenciennes Mm.** { Mémoires de la Société d'Agriculture, des Sciences et des Arts de l'arrondissement de Valenciennes. Valenciennes.
Valenciennes Mm. S. Ag. { 1833—53. B.M.; Oxon.B.i.; R.S.i.
- Vars. S. Nt. Tr. (C. R., Bl.)** Travaux de la Société des Naturalistes de Varsovie. Comptes Rendus de la Section biologique. [In Russian.] Varsovie.
1889— Glasg.P.S.i.; N.H.M.
- Vars. S. Nt. Tr. (C. R., Ps. C.)** Travaux de la Société des Naturalistes de Varsovie. Comptes Rendus de la Section de physique et de chimie. Varsovie. [In Russian.]
1889— Math.S.; N.H.M.
- Vars. S. Nt. Tr. (Mm.)** ... Travaux de la Société des Naturalistes de Varsovie. Mémoires. [In Russian.] Varsovie.
1891—96. Math.S.; N.H.M.
- Vauc. Ac. Mm.** Mémoires de l'Académie de Vaucluse. Avignon.
1882— N.H.M.
- V. Diem. E. S. Fp.** Papers and Proceedings of the Royal Society of Van Diemen's Land. Hobart Town.
1851—59. B.M.i.; Camb.P.S.i.; Dub.R.D.S.; Edinb.R.S.i.; Geol.S.; I.CE.i.; N.H.M.i.; R.A.S.i.; R.Geogr.S.i.; R.S.; S.K.
- Ven. At.** Atti delle Adunanze dell' I. R. Istituto Veneto di Scienze, Lettere ed Arti. Venezia.
1841— B.M.; Dub.R.D.S.i.; Dub.R.I.A.i.; Edinb.R.S.i.; I.CE.i.; Linn.S.i.; Math.S.i.; N.H.M.; R.S.i.
See **Ven. I. At.**
- Ven. At. Aten.** Atti dell' Ateneo Veneto. Venezia.
1864—77. [Continuation of: Esercizioni Scientifiche e Letterarie dell' Ateneo di Venezia, 1837—60.] [Continued as: L' Ateneo Veneto, 1878—] Dub.R.D.S.; R.S.
- Ven. Aten.** L' Ateneo Veneto: Rivista mensile di Scienze, Lettere ed Arti. Venezia.
1878— [Continuation of: Atti dell' Ateneo Veneto, 1864—77.] Dub.R.D.S.i.; R.S.i.
- Ven. Aten. Esercit.** Esercizioni Scientifiche e Letterarie dell' Ateneo di Venezia. Venezia.
Ven. Esercit. Aten. { 1837—60. [Continued as: Atti dell' Ateneo Veneto, 1864—77.] B.M.i.; Dub.T.C.i.; Oxon.B.i.; R.S.i.
- Ven. I. At.** See **Ven. At.**
- Ven. I. Mm.** Memorie del Reale Istituto Veneto di Scienze, Lettere ed Arti. Venezia.
Ven. Mm. I. { 1843— B.M.; Camb.U.; Dub.R.I.A.i.; Linn.S.i.; N.H.M.; Oxon.B.i.; R.C.Surg.i.; R.S.; S.K.
- Verona Mm. Ac. Ag.** ... Memorie dell' Accademia d'Agricoltura, etc., di Verona. Verona.
1807— B.M.i.; Glasg.P.S.i.; Oxon.B.i.

List of Serial Publications

- Verona Mm. S. It.** { Memorie di Matematica e di Fisica della Società Italiana delle Scienze. Modena, Verona.
- Verona S. It. Mm.** { 1782— B.M.i.; Camb.P.S.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.i.;
Glasg.U.i.; Linn.S.i.; Oxon.B.i.; R.A.S.i.; R.C.Surg.i.; R.S.;
S.K.i.; U.C.L.i.
- See **Mod. Mm. S., Mod. S. It. Mm. and Rm. S. It. Mm.**
- Vict. I. J.** Journal of the Transactions of the Victoria Institute, or Philosophical Society of Great Britain. London.
- 1867— B.M.; Camb.U.; Dub.R.D.S.; Dub.T.C.; Geol.M.i.; Geol.S.; N.H.M.; Oxon.B.; P.O.; R.Geogr.S.i.; R.S.i.; S.K.
- Vict. R. S. P.** Proceedings of the Royal Society of Victoria. Melbourne.
- 1889— [Continuation of: Transactions and Proceedings, etc., 1861—88.] B.M.; Camb.P.S.; Camb.U.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.; Glasg.U.; I.CE.i.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.; U.C.L.i.
- Vict. R. S. T.** Transactions and Proceedings of the Royal Society of Victoria. Melbourne.
- 1861—88. [Divided into: Transactions, 1888—, and Proceedings, 1889—] B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.S.; Glasg.P.S.i.; Glasg.U.i.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.i.; P.O.; R.A.S.; R.C.Surg.i.; R.Geogr.S.; R.S.; S.K.
- See **Vict. T. R. S.**
- Vict. T. Ph. S.** Transactions of the Philosophical Society of Victoria. Melbourne.
1855. [Continued as: Transactions of the Philosophical Institute, etc., 1855—60.] B.M.; Edinb.R.S.; Geol.S.; Linn.S.; N.H.M.; R.A.S.; R.Geogr.S.; R.S.; S.K.
- Vict. T. R. S.** See **Vict. R. S. T.**
- Virch. Arch.** Archiv für Pathologische Anatomie und Physiologie und für Klinische Medicin; Virchow und Reinhardt. Berlin.
- 1847— B.M.; Camb.U.; Chem.S.i.; Edinb.U.; Glasg.P.S.i.; Glasg.U.i.; Oxon.B.; R.C.Surg.; R.S.; U.C.L.
- V. Mons J. C.** Journal de Chimie, pour servir de complément aux Annales de Chimie et autres ouvrages périodiques français de cette science; Van Mons. Bruxelles.
- 1792—1804. Glasg.P.S.i.; R.S.i.
- V. Nost. Eng. Mg.** Van Nostrand's Engineering Magazine. New York.
- 1869—85. [Continued as: The Railroad and Engineering Journal, 1887—92.] B.M.; I.CE.i.; P.O.; R.S.i.
- Voigt Mg.** Magazin für den neuesten Zustand der Naturkunden, mit Rücksicht auf die dazu gehörigen Hilfswissenschaften; Voigt. Jena, Weimar.
- 1797—1806. B.M.; Camb.U.; N.H.M.; R.S.
- Walker Electr. Mg.** The Electrical Magazine; Walker. London, Paris.
- 1845—46. B.M.; Camb.U.; Glasg.P.S.i.; I.CE.; Oxon.B.; P.O.; R.S.
- Wash. As. Pp. for Ephem. & Naut. Alm.** Astronomical Papers prepared for the use of the American Ephemeris and Nautical Almanac. Washington.
- 1882— B.M.; Dub.R.I.A.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.i.; Oxon.R.; R.A.S.; R.S.
- Washburn Obs. Pb.** Publications of the Washburn Observatory of the University of Wisconsin, Madison.
- 1882— Camb.P.S.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.; Glasg.U.i.; R.A.S.; R.S.
- Wash. Mm. Nat. Ac.** { Memoirs of the National Academy of Sciences. Washington.
- Wash. Nat. Ac. Mm.** { 1866— B.M.i.; Camb.P.S.; Camb.U.i.; Dub.R.I.A.; Edinb.R.S.;
Glasg.U.i.; Math.S.i.; N.H.M.; Oxon.B.i.; Oxon.R.; P.O.; R.S.;
S.K.; U.C.L.i.
- Wash. Ph. S. Bl.** Bulletin of the Philosophical Society of Washington. Washington.
- 1874— B.M.; Camb.P.S.; Edinb.R.S.; Geol.S.; Glasg.U.i.; Linn.S.; N.H.M.; Oxon.B.; P.O.; R.A.S.; R.S.; S.K.i.
- Weale Q. Pp.** Quarterly Papers on Engineering; Weale. London.
- 1843—49. B.M.; I.CE.; Oxon.B.; P.O.
- W. Eng. J.** The West of England Journal of Science and Literature. Bristol.

List of Serial Publications

- 1835—36. B.M.; Camb.U.; Edinb.R.S.; I.CE.; N.H.M.; Oxon.B.; P.O.; S.K.
- Westf. Vr. Jbr.** Jahres-Bericht des Westfälischen Provinzialvereins für Wissenschaft und Kunst. Münster.
1873— N.H.M.
- Wet. Gs. A.** Annalen der Wetterauischen Gesellschaft für die gesammte Naturkunde. Hanau, Frankfurt-am-Main.
1809—12. [*Continued as: Neue Annalen, etc., 1819.*] B.M.; Camb.U.; Glasg.P.S.i.; N.H.M.; R.C.Surg.; R.S.
- Wet. Gs. Jbr.** Bericht der Wetterauischen Gesellschaft für die gesammte Naturkunde zu Hanau. Hanau.
1843— Dub.R.I.A.i.; Geol.S.i.; R.S.i.
See Wet. Gs. Nt. B.
- Wet. Gs. N. A.** Neue Annalen der Wetterauischen Gesellschaft für die gesammte Naturkunde. Hanau, Frankfurt-am-Main.
1819. [*Continuation of: Annalen, etc., 1809—12.*] B.M.; Camb.U.; Glasg.P.S.i.; N.H.M.; R.C.Surg.
- Wet. Gs. Nt. B.** *See Wet. Gs. Jbr.*
- Wetter** Das Wetter. Meteorologische Monatsschrift für Gebildete aller Stände. Magdeburg, Braunschweig, Berlin.
1885— B.M.; M.O.
- Wiad. Mt.** Wiadomości Matematyczne. Warsaw.
1897— Camb.P.S.; Math.S.
- Wien Ak. D.** Denkschriften der Kaiserlichen Akademie der Wissenschaften. Mathematisch-Naturwissenschaftliche Classe. Wien.
1850— B.M.; Camb.P.S.i.; Camb.U.; Chem.S.i.; Dub.R.I.A.; Edinb.R.S.; Edinb.U.; Geol.M.i.; Geol.S.; Glasg.U.i.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.(R); P.O.i.; R.A.S.; R.C.Surg.i.; R.S.; S.K.; U.C.L.i.
See Wien D.
- Wien Ak. Sb.** Sitzungsberichte der Mathematisch-Naturwissenschaftlichen Classe der Kaiserlichen Akademie der Wissenschaften. Wien.
1848— B.M.; Camb.P.S.i.; Camb.U.; Chem.S.i.; Dub.R.I.A.; Dub.T.C.; Edinb.R.S.i.; Geol.S.; Glasg.U.; I.CE.i.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; Pharm.S.i.; P.O.i.; R.A.S.i.; R.C.Surg.i.; R.Geogr.S.i.; R.S.; S.K.; U.C.L.i.
See Wien SB.
- Wien Alm.** Almanach der Kaiserlichen Akademie der Wissenschaften. Wien.
1851— B.M.; Camb.P.S.i.; Camb.U.; Dub.R.I.A.i.; Edinb.R.S.i.; Glasg.U.i.; Oxon.B.; P.O.i.; R.A.S.i.; R.S.i.; S.K.i.; U.C.L.i.
- Wien Az.** Anzeiger der Kaiserlichen Akademie der Wissenschaften: Math.-Naturwiss. Classe. Wien.
1864— Camb.U.; Geol.S.i.; Linn.S.; N.H.M.; Oxon.B.; Pharm.S.i.; R.S.i.
- Wien Berg-Hm. Jb.** Berg- und Hüttenmännisches Jahrbuch der k. k. Schemnitzer-Bergakademie und der k. k. Montan-Lehranstalten zu Leoben und Příbram. Wien.
1851— B.M.i.; Geol.S.i.; I.CE.i.; P.O.i.; S.K.
See Berg-Hm. Jb., Jb Berg-Hm., and Leoben Berg-Hm. Jb.
- Wien D.** *See Wien Ak. D.*
- Wien Gg. Gs. Mt.** Mittheilungen der k. k. Geographischen Gesellschaft. Wien.
1857— B.M.; Dub.R.I.A.i.; Dub.T.C.i.; M.O.i.; N.H.M.; Oxon.B.; R.Geogr.S.; R.S.; S.K.i.
See Wien Mt. Gg. Gs.
- Wien Gl. Jb.** Jahrbuch der k.k. Geologischen Reichsanstalt. Wien.
1850— Camb.P.S.; Camb.U.; Dub.R.I.A.i.; Dub.T.C.; Edinb.R.S.; Geol.M.; Geol.S.; Linn.S.; N.H.M.; Oxon.B.; Oxon.R.; P.O.; R.Geogr.S.i.; R.S.; U.C.L.i.
- Wien Jb. Gl.** }
Wien Jb. Pol. I. } Jahrbuch des k. k. Polytechnischen Instituts in Wien; Prechtl. Wien.
1819—39. B.M.; Camb.U.; Oxon.B.; P.O.
- Wien Jbr. Ober-Realsch. Inn. Stadt.** Jahresbericht der öffentlichen Ober-Realschule in der innere Stadt. Wien.
1859—63.
- Wien Md. Wechr.** Wiener Medizinische Wochenschrift. Wien.
1851— B.M.; Camb.U.i.; R.C.Surg.i.
- Wien Met. Z.** Zeitschrift der Oesterreichischen Gesellschaft für Meteorologie. Wien.

List of Serial Publications

- 1866—85. [*Continued in:* Meteorologische Zeitschrift, 1886—]
Camb.U.; Dub.R.D.S.; Edinb.R.S.; M.O.; P.O.; R.Geogr.S.; R.S.
See **Wien Z. Met.**
- Wien Mt. Gg. Gs.** *See* **Wien Gg. Gs. Mt.**
- Wien Pht. Cor.** Photographische Correspondenz. Organ der Photograph. Gesellsch.
in Wien. Wien.
1865— P.O.
- Wien SB.** } *See* **Wien Ak. Sb.**
Wien Sb. }
Wien Schr. } (Schriften des Vereins zur Verbreitung Naturwissenschaftlicher
Wien Schr. Vr. Nw. Kennt. } Kenntnisse in Wien. Wien.
Wien Vr. Nw. Kennt. Schr. } 1860— B.M.i.; Camb.U.i.; N.H.M.i.; P.O.; R.S.i.
Wien Z. Gs. Aerzte } Zeitschrift der K. K. Gesellschaft der Aerzte zu Wien. Wien.
1844—60. [*Continued as:* Medizinische Jahrbücher, 1861—]
Glasg.P.S.i.; R.C.Surg.
- Wien Z. Met.** *See* **Wien Met Z.**
- Wild Rpm. Met.** Repertorium für Meteorologie, herausg. von der kaiserlichen Akad.
der Wissenschaften; Wild. St. Petersburg.
1870—94. B.M.; Camb.P.S.; Edinb.R.S.; Glasg.P.S.i.; Glasg.U.i.;
I.CE.i.; M.O.; R.S.
- Wisc. Ac. T.** Transactions of the Wisconsin Academy of Sciences, Arts and
Letters. Madison.
1872— B.M.; Camb.P.S.; Dub.R.I.A.; Edinb.R.S.; Geol.S.i.;
N.H.M.; Oxon.R.i.; P.O.i.; R.S.; S.K.i.; U.C.L.i.
- Wisc. Un. Bll. (Sc.)** Bulletin of the University of Wisconsin. Science Series. Madison.
1894— B.M.; Camb.U.; Dub.R.I.A.; Edinb.R.S.; Glasg.P.S.i.;
P.O.
- Woolh. FC. T.** Transactions of the Woolhope Naturalists' Field Club. Hereford.
1866— B.M.; Camb.U.i.; Dub.T.C.i.; Geol.M.i.; Geol.S.i.; Linn.
S.i.; N.H.M.i.; Oxon.B.; U.C.L.i.
- Woolw. P.** Minutes of Proceedings of the Royal Artillery Institution. Woolwich.
1858— B.M.; Camb.U.i.; I.CE.; P.O.; R.Geogr.S.i.
- Würtb. Jh.** Jahreshefte des Vereins für vaterländische Naturkunde in Württem-
berg. Stuttgart.
1845— B.M.; Camb.U.; Dub.R.D.S.i.; Dub.T.C.i.; Geol.S.;
Linn.S.; N.H.M.; R.S.; S.K.
- Würtb. Bt. I. Arb.** Arbeiten des Botanischen Instituts in Würzburg. Leipzig.
1871—88. B.M.; Camb.U.; Glasg.P.S.i.; Linn.S.; N.H.M.;
Oxon.R.; R.C.Surg.; R.S.
- Würtb. Jb. Ph. Md. Gs.** Jahrbücher der Philosophisch-Medicinischen Gesellschaft zu Würz-
burg. Würzburg.
1828. Dub.R.I.A.; R.S.; U.C.L.
- Würtb. Nw. Z.** Würzburger Naturwissenschaftliche Zeitschrift; herausgegeben von
der Physikalisch-Medicinischen Gesellschaft. Würzburg.
1860—67. [*Continuation of:* Verhandlungen der Physikalisch-
Medicinischen Gesellschaft, 1850—60.] Camb.U.; Geol.S.i.;
Linn.S.; N.H.M.; Oxon.R.; S.K.
- Würtb. Ps. Md. Sb.** Sitzungsberichte der Physikalisch-Medicinischen Gesellschaft zu
Würzburg. Würzburg.
1859—62; 1881— Camb.P.S.; Camb.U.; Chem.S.i.; Dub.R.I.A.;
Linn.S.i.; Oxon.R.i.; R.C.Surg.i.; R.S.
- Würtb. Ps. Md. Vh.** Verhandlungen der Physikalisch-Medicinischen Gesellschaft. Würz-
burg.
Würtb. Vh. } 1850—60. 1868— [*Continued as:* Würzburger Medicinische Zeit-
schrift, and Würzburger Naturwissenschaftliche Zeitschrift,
1860—67.] B.M.i.; Camb.P.S.i.; Camb.U.i.; Chem.S.i.; Dub.
R.I.A.; Linn.S.; N.H.M.; Oxon.R.; R.C.Surg.; R.S.; S.K.i.;
U.C.L.i.
- W. Yorks. Gl. S. P.** Proceedings of the Geological and Polytechnic Society of the West
W. Yorks. P. Gl. S. Riding of Yorkshire. Leeds.
1839— B.M.i.; Camb.U.i.; Dub.R.D.S.; Edinb.R.S.i.; Geol.M.;
Geol.S.i.; N.H.M.i.; Oxon.R.; P.O.i.; R.S.i.; U.C.L.i.
See **Yorks. Gl. S. P.**
- Yn Lloar Manninagh** ... Yn Lloar Manninagh. The Journal of the Isle of Man Natural
History and Antiquarian Society. Douglas.
1894— Geol.M.; Geol.S.i.; N.H.M.

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- Yorks. Gl. S. P.** See **W. Yorks. Gl. S. P.**
- Zach Cor.** Correspondance Astronomique, Géographique, Hydrographique et Statistique; von Zach. Gènes.
1818—26. B.M.; R.A.S.; R.S.
- Zach M. Cor.** Monatliche Correspondenz zur Beförderung der Erd- und Himmels-Kunde; von Zach. Gotha.
1800—13. Oxon.B.; R.A.S.; R.S.; U.C.L.
- Z. Al. Erdk.** Zeitschrift für allgemeine Erdkunde. Berlin.
1853—65. [*Continued as:* Zeitschrift der Gesellschaft für Erdkunde zu Berlin, 1866—] B.M.; Camb.U.; Dub.R.D.S.; Dub.R.I.A.; Dub.T.C.; Geol.S.i.; Glasg.P.S.i.; Glasg.U.i.; N.H.M.; Oxon.B.; R.Geogr.S.; R.S.; S.K.
- Z. Angew. C.** Zeitschrift für Angewandte Chemie. Berlin.
1888— [*Continuation of:* Zeitschrift für die Chemische Industrie, 1887.] B.M.; Chem.S.; Edinb.U.; Glasg.P.S.; Glasg.U.; Oxon.R.i.; P.O.
- Z. Angew. Mkr.** Zeitschrift für Angewandte Mikroskopie. Berlin, Leipzig, Weimar.
1896— Glasg.P.S.i.; N.H.M.; P.O.
- Z. Anorg. C.** Zeitschrift für Anorganische Chemie. Hamburg, Leipzig.
1892— Camb.P.S.; Camb.U.; Chem.S.; Dub.R.C.S.; Edinb.U.; Glasg.U.; N.H.M.; Oxon.R.i.; Pharm.S.; P.O.; S.K.; U.C.L.
- Zantedeschi A. Fis.** Annali di Fisica; Zantedeschi. Padova.
1849—50. B.M.; Glasg.P.S.i.; R.S.
- Z. Az.** Zoologischer Anzeiger; Carus. Leipzig.
1878— B.M.; Camb.U.; Edinb.R.S.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; Linn.S.i.; N.H.M.; Oxon.R.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- Z. Bauw.** Zeitschrift für Bauwesen; herausg. unter Mitwirkung der königl. technischen Bau-Deputation und des Architekten-Vereins zu Berlin. Berlin.
1851— B.M.; Camb.U.i.; I.CE.; P.O.; S.K.i.
- Z. Berg. H.-Salw.** Zeitschrift für das Berg-, Hutten-, und Salinenwesen in dem Preussischen Staate. Berlin.
1854— B.M.; I.CE.; P.O.; S.K.
- Z. Bl.** Zeitschrift für Biologie. München.
1865— B.M.; Camb.U.i.; Chem.S.i.; Edinb.U.i.; Glasg.U.i.; Oxon.R.; R.C.Surg.; R.S.; U.C.L.
- Z. C.** Zeitschrift für Chemie. Leipzig.
1865—71. [*Continuation of:* Zeitschrift für Chemie und Pharmacie, 1860—64.] B.M.; Camb.U.; Chem.S.; Dub.R.D.S.; Glasg.P.S.i.; N.H.M.; Oxon.R.i.; P.O.; R.S.i.; S.K.
- Z. C. In.** Zeitschrift für die Chemische Industrie. Berlin.
1887. [*Continuation of:* Repertorium der Analytischen Chemie, 1881—87.] [*Continued as:* Zeitschrift für Angewandte Chemie, 1888—] B.M.; Chem.S.; Glasg.P.S.i.; P.O.
- Zeew. Gn. N. Vh.** Nieuwe Verhandelingen van het Zeeuwsch Genootschap der Wetenschappen. Middelburg.
1807—35. B.M.; Camb.U.i.; N.H.M.; Oxon.B.; R.S.
- Z. Elektch.** Zeitschrift für Elektrochemie. Halle a. S.
1895— [*Continuation of:* Zeitschrift für Elektrotechnik und Elektrochemie, 1894—95.] Camb.P.S.i.; Camb.U.; Chem.S.; P.S.i.; Glasg.U.i.; Oxon.R.i.; P.O.; S.K.; U.C.L.
- Z. Elekttech. Elektch.** Zeitschrift für Elektrotechnik und Elektrochemie. Halle a. S.
1894—95. [*Continued as:* Zeitschrift für Elektrochemie, 1895—] Camb.U.; Chem.S.; Glasg.P.S.i.; P.O.; S.K.; U.C.L.
- Z. Ethnl.** Zeitschrift für Ethnologie. Berlin.
1869— B.M.; Camb.U.; Dub.N.L.I.; Dub.R.D.S.; Dub.R.I.A.; Edinb.U.; N.H.M.i.; Oxon.B.; Oxon.R.; R.C.Surg.; U.C.L.
- Z. Hyg.** Zeitschrift für Hygiene [und Infectiouskrankheiten]. Leipzig.
1886— B.M.; Camb.U.; Chem.S.i.; Edinb.U.; Glasg.U.i.; I.CE.i.; Oxon.R.; P.O.i.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- Z. Instk.** Zeitschrift für Instrumentenkunde. Organ für Mittheilungen aus dem gesammten Gebiete der wissenschaftlichen Technik. Berlin.
1881— B.M.; Camb.U.; Chem.S.; Edinb.U.; Oxon.R.; P.O.; R.A.S.; R.S.; S.K.; U.C.L.i.

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- Živa** Živa: Časopis přírodnicky. Praze (Prag).
1853—68. B.M.; Linn.S.i.; N.H.M.
- Z. Kr.** Zeitschrift für Krystallographie und Mineralogie. Leipzig.
1877— B.M.; Camb.U.; Chem.S.; Dub.N.L.I.i.; Edinb.R.S.;
Edinb.U.i.; Geol.M.; Geol.S.; N.H.M.; Oxon.R.; P.O.; R.S.;
S.K.
- Z. Mth. Ps.** Zeitschrift für Mathematik und Physik; Schlömilch. Leipzig.
1856— B.M.; Camb.U.; Dub.N.L.I.i.; Dub.R.D.S.i.; Dub.R.I.A.i.;
Dub.T.C.i.; Edinb.U.; Glasg.U.i.; Math.S.i.; Oxon.B.(R.); R.S.;
S.K.; U.C.L.i.
- Z. Nw.** See **Schlömilch Z.**
Zeitschrift für die gesammten Naturwissenschaften; herausgegeben
von dem Naturwissenschaftlichen Vereine für Sachsen
und Thüringen in Halle; Giebel. Berlin.
1853— [Continuation of: Jahresbericht des Naturwissenschaftlichen
Vereins, 1848—52.] B.M.; Camb.U.i.; Dub.N.L.I.i.; Dub.R.D.
S.i.; Dub.R.I.A.i.; Dub.T.C.i.; Edinb.R.S.; Linn.S.; N.H.M.;
Oxon.B.; Oxon.R.; R.S.; S.K.
- Z. Ohrh.** See **Halle Z.**
Zeitschrift für Ohrenheilkunde. Wiesbaden.
1879— [Continuation of: Archiv für Augen- und Ohrenheilkunde,
1869—78.] B.M.; Camb.U.; R.C.Surg.i.
- Z. Pl. C.** Zeitschrift für Physiologische Chemie. Strassburg.
1877— Camb.U.; Chem.S.; Dub.N.L.I.i.; Edinb.U.; Glasg.U.;
Oxon.R.; Pharm.S.; P.O.i.; R.C.Surg.; S.K.; U.C.L.
- Z. Ps. C.** Zeitschrift für Physikalische Chemie, Stöchiometrie und Ver-
wandtschaftlehre. Leipzig.
1887— B.M.; Camb.P.S.; Camb.U.; Chem.S.; Dub.N.L.I.i.;
Dub.R.C.S.i.; Edinb.U.; Glasg.U.; N.H.M.; Oxon.R.i.; P.O.i.;
R.C.Surg.; R.S.; S.K.; U.C.L.
- Z. Psychol.** Zeitschrift für Psychologie und Physiologie der Sinnesorgane.
Hamburg, Leipzig.
1890— B.M.; Camb.U.; Edinb.U.; Glasg.U.; Oxon.B.; Oxon.R.;
R.C.Surg.; R.S.; U.C.L.
- Zür. Mschr.** Monatsschrift des Wissenschaftlichen Vereins in Zürich; Hitzig, etc.
Zürich.
1856—59. B.M.; Camb.U.; N.H.M.; Oxon.B.; R.S.
- Zür. Mt.** Mittheilungen der Naturforschenden Gesellschaft in Zürich. Zürich.
1847—56. Chem.S.i.; Dub.R.I.A.; Edinb.R.S.i.; Linn.S.; N.H.M.;
R.A.S.; R.Geogr.S.i.; R.S.; S.K.
- Zür. N. D. Sch. Gs.** Neue Denkschriften der allgemeinen Schweizerischen Gesellschaft
für die gesammten Naturwissenschaften. Neuchâtel, Zurich, etc.
1837— B.M.; Camb.P.S.; Camb.U.; Dub.R.D.S.i.; Dub.R.I.A.i.;
Edinb.R.S.; Geol.S.i.; Linn.S.i.; N.H.M.; Oxon.B.; R.C.Surg.i.;
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- Zür. Nf. Gs. Njbl.** See **Sch. Gs. N. D.**
An die Zürcherische Jugend.. von der Naturforschenden Gesellschaft.
Zürich.
1799—1870. [Continued as: Neujahrsblatt herausgegeben von der
Naturforschenden Gesellschaft in Zürich, 1871—] Camb.P.S.;
Camb.U.i.; N.H.M.; R.S.
- Zür. Ps. Gs. Jbr.** Jahresbericht der Physikalischen Gesellschaft in Zürich. Uster-
Zürich.
1887— R.S.
- Zür. Vjschr.** Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich.
Zürich.
1856— B.M.; Camb.P.S.; Camb.U.i.; Chem.S.i.; Dub.R.I.A.i.;
Edinb.R.S.; Linn.S.i.; Math.S.i.; N.H.M.; R.A.S.; R.Geogr.S.i.;
R.S.; S.K.
- Z. Vr. D. Zuckin.** Zeitschrift des Vereins der Deutschen Zucker-Industrie. Berlin.
1898— [Continuation of: Zeitschrift des Vereins für die Rüben-
zucker-Industrie, 1851?—97.] Chem.S.; Glasg.P.S.i.; P.O.
- Z. Vr. Rübenzuckin.** Zeitschrift des Vereins für die Rübenzucker-Industrie des Deutschen
Reichs. Berlin.
1851?—97. [Continued as: Zeitschrift des Vereins der Deutschen
Zucker-Industrie, 1898—] Chem.S.i.; P.O.i.

List of Serial Publications

- Zwick. Vr. Nt. Jbr.** Jahresbericht des Vereins für Naturkunde zu Zwickau. Zwickau.
1874— N.H.M.; R.S.i.
- Zwolle Vooruitgang** De Vooruitgang; Tijdschrift voor Wetenschap, etc. Zwolle.
1851—53. B.M.; Glasg.P.S.i.
- Z. Ws. Mkr.** Zeitschrift für Wissenschaftliche Mikroskopie und für Mikro-
skopische Technik. Braunschweig, Leipzig.
1884— B.M.; Edinb.U.; Glasg.P.S.i.; Glasg.U.; N.H.M.; Oxon.R.;
P.O.; R.C.Surg.; R.S.; S.K.; U.C.L.i.
- Z. Zuckin.** Zeitschrift für Zuckerindustrie. Prag.
1872—74. Chem.S.; P.O.
- Z. Zuckin. Böhm.** Zeitschrift für Zuckerindustrie in Böhmen. Prag.
1876— Chem.S.; P.O.i.

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- Bréguet, *Louis François Clément*. Term. Közl. 16 (1884) 507; C. R. 103 (1886) 5-, 226; Lum. Élect. 21 (1886) 137-; Rv. Mar. et Col. 90 (1886) 521-.
- Breton, *Philippe*. Isère S. Bll. 27 (1892) 391-.
- Brett, *Jacob*. Elect. 38 (1897) 368; Elect. Rv. 40 (1897) 75; Elekttech. Z. 13 (1897) 50; J. Tél. 21 (1897) 66-.
- Brett, *John Watkins*. Tel. J. 1 (1864) 6.
- Brevort, *Henry Leferts*. Am. Eng. & Railroad J. 69 (1895) 379.
- Brewster, (*Sir*) *David*. Am. J. Phm. 40 (1868) 287-; R. S. P. 17 (1869) lxix-; Am. Ac. P. 8 (1873) 38-.
- Bright, (*Sir*) *Charles Tilston*. Elect. 21 (1888) 13-; Gg. S. P. 10 (1888) 387; I. CE. P. 93 (1888) 479-; Lum. Élect. 28 (1888) 396; Tel. J. 22 (1888) 508-; As. S. M. Not. 49 (1889) 157-; Gl. S. Q.J. 45 (1889) (*P.*) 39.
- Brisse, *Charles Michel*. J. de Ps. 7 (1898) [637]; Nt. 59 (1898-99) 80; N. Y. Am. Mth. S. Bll. 5 (1899) 211-.
- Brix, *Philipp Wilhelm*. D. Ps. Gs. Vh. (1899) 125-; Elekttech. Z. 20 (1899) 268.
- Broch, *Ole Jacob*. Christiania F. (1889) (*Ov.*) 12-; Nt. 39 (1889) 375; Par. Poids et Mes. P.V. (1889) 3-; Par. S. Gg. C. R. (1889) 81-; Par. S. Ps. Sé. (1889) 37-; Rv. Sc. 43 (1889) 218.
- Brooke, *Charles*. R. S. P. 30 (1880) i-; Mer. S. J. (1895) 17-.
- Brooke, (*Sir*) *William O'Shaughnessy*. R. S. P. 46 (1890) xviii-.
- Brooks, *David*. Elekttech. Z. 12 (1891) 377; Franklin I. J. 132 (1891) 75-.
- Browne, *Walter Raleigh*. I. ME. P. (1884) 472; I. CE. P. 79 (1885) 362-; L. Ps. S. P. 6 (1885) (*Ann. Meet.* 1885) 9-.
- Buccola, *Gabriele*. Rv. Sper. Freniatr. 11 (1885) i-; Sperm. 55 (1885) 344.
- Buckney, *Thomas*. I. Elect. E. J. 29 (1900) 948; I. ME. P. (1900) 326.
- Buff, *Heinrich*. Berl. B. 14 (1881) 2867-.
- Bunsen, *Robert Wilhelm Eberhard*. A. di Fm. e C. (1899) 479-; Am. C. J. 22 (1899) 411-; Am. J. Sc. 8 (1899) 318; Anal. 24 (1899) 226-; Asps. J. 10 (1899) 301-; Berl. B. 32 (1899) 2535-; C. N. 80 (1899) 94-; C. R. 129 (1899) 1061; C. Ztg. 23 (1899) 675; Dingler 313 (1899) 159-; Elekttech. Z. 20 (1899) 626; Frkf. a. M. Ps. Vr. Jbr. (1898-99) 43-; Lpldina. 35 (1899) 158; Mon. Sc. 13 (1899) 770; Nt. 60 (1899) 424-; Ps. Rv. 9 (1899) 310-; Rm. R. Ac. Linc. Rd. 8 (1899) (*Sem.* 2) 329-; Rv. Sc.-Ind. 31 (1899) 184; S. Afr. C. Mtl. S. J. 2 (1899) 178-; S. Afr. C. Mtl. S. P. 2 (1897-99) 832-; Science 10 (1899) 447-; Smiths. Rp. (1899) 605-; Wien. Md. Wschr. 49 (1899) 1596; Wien Pht. Cor. 36 (1899) 550-; Z. Angew. C. (1899) 822, 1241; (1900) 884-; Am. C. S. J. 22 (1900) (*P.*) 89-; C. S. J. 77 (1900) (*Pt.* 1) 513-; Gl. Mg. 7 (1900) 431; Gl. S. Q.J. 56 (1900) (*P.*) li; L. Ps. S. P. 17 (1901) (*Ann. Meet.* 1900) 12-; Manch. Lt. Ph. S. Mm. & P. 44 (1900) xxxii-; R. S. Yearbook (1900) 198-; Term. Közl. 32 (1900) 690-; Wien Alm. 50 (1900) 286-; Z. Anorg. C. 23 (1900) 393-; Z. Elektch. (1899-1900) 205-; Münch. Ak. Sb. 30 (1901) 359-; R. I. P. 16 (1902) 437-.
- Burton, *William Kinninmond*. I. CE. P. 139 (1900) 373-; Phot. J. 24 (1900) 39.
- Buys-Ballot, *Christopher Hendrik Dirk*. Am. Met. J. 6 (1889-90) 583; Berl. Ps. Gs. Vh. (1890) 19-; Brux. Ac. Bll. 19 (1890) 180-; Humb. 9 (1890) 104; Lpldina. 26 (1890) 58; Manch. Lt. Ph. S. Mm. & P. 3 (1890) 167-; Moncalieri Oss. Bll. 10 (1890) 34; Nt. 41 (1890) 371; Ciel et Terre II (1890-91) 21; Met. S. Q.J. 17 (1891) 61-; Met. Z. 8 (1891) 1-; Sym. Met. Mg. 25 (1891) 8; Term. Közl. 23 (1891) 630-; Ts. Ps. C. 30 (1891) 63-; Brux. S. As. Bll. 3 (1898) 204-; Amst. Ak. Jb. (1899) 59-.
- Byrgi, *Jost*. Czgt. Opt. 7 (1886) 121-.
- Cabanellas, *Gustave Eugène*. Lum. Élect. 30 (1888) 98; Par. Ing. Civ. Mm. (1888) (*Pt.* 2) 644-.
- Caligny, *Anatole François Hile (marquis) de*. C. R. 114 (1892) 797-; Gen. S. Ps. Mm. 31 (1890-93) cxxxix-.
- Campbell, *George*. Eng. S. T. (1889) 219.
- Cantoni, *Giovanni*. N. Cim. 6 (1897) 425-; Nap. Rd. 37 (1898) 46-; Mil. I. Lomb. Rd. 32 (1899) 57-.
- Cantzler, *Gustav Hermann*. St. Pet. Md. Wschr. 21 (1896) 68.
- Carl, *Philipp Franz Heinrich*. Elekttech. Z. 12 (1891) 97-; Exner Rpm. 27 (1891) 65-; Lpldina. 27 (1891) 45-; Term. Közl. 24 (1892) 641.
- Carlsund, *Otto Edvard*. Stockh. Vt. Ak. Lefn. 3 (1886-94) 161-.
- Carpenter, *William Lant*. C. S. J. 59 (1891) 461-; Elect. 26 (1891) 266; L. Ps. S. P. 11 (1892) (*Ann. Meet.* 1891) 9; Nt. 43 (1891) 230; S. C. In. J. 10 (1891) 33.
- Carré, *Edmond*. Elekttech. Z. 15 (1894) 370.

- Carstädt, *Friedrich*. Bresl. Schl. Gs. Jbr. (1891) (*Nek.*) 4.
- Casati, *Victor*. Wien Ph. Cor. 31 (1894) 361-.
- Caselli, (*abate*) *Giovanni*. Firenze Ac. Georg. At. 14 (1891) xlvi-; Lpldina. 27 (1891) 204; Lum. Elect. 42 (1891) 196; Rv. Sc.-Ind. 23 (1891) 251-; Termt. Közl. 24 (1892) 641; Ts. Ps. C. 31 (1892) 128.
- Cauchy, (*le baron*) *Augustin Louis*. J. Sav. (1869) 205-; Rv. Sc. 9 (1898) 97-.
- Cecchi, (*padre*) *Filippo*. Moncalieri Oss. Bll. 7 (1887) 81-; Rm. N. Linc. At. 40 (1887) 163-; Rv. Sc.-Ind. 19 (1887) 133-; Ven. Aten. 1 (1888) 3-.
- Cecil, (*Lord*) *Sackville Arthur*. L. Ps. S. P. 16 (1899) (*Ann. Meet.* 1898) 6-; I. Elect. E. J. 28 (1899) [665]-.
- Cellérier, *Charles*. Gen. S. Ps. Mm. 31 (1890-93) xviii-.
- Challis, *James*. As. S. M. Not. 43 (1883) 160-; Obs. 6 (1883) 23.
- Chamontov, *Nikolaj Nikolaevič*. Rs. Ps.-C. S. J. 25 (*Ps.*) (1893) 196-.
- Chamousset, (*le chanoine*) *François Marie*. Sav. Ac. Mm. (1891) 111-.
- Chapman, *Daniel Currier*. Wash. Ph. S. Bll. 13 (1900) 381-.
- Chase, *Pliny Earle*. Am. Ph. S. P. 19 (1882) 184-; 24 (1887) 287-; Franklin I. J. 124 (1887) 229-.
- Chasles, *Michel*. Bologna Rd. (1881) 37-; Khar- kov Mth. S. Com. (1881) 23-; Kosmos (Lw.) 6 (1881) 555-; R. S. P. 32 (1881) i-; Rv. Quest. Sc. 9 (1881) 517-; Rv. Sc. 50 (1892) 801-.
- Christie, *Samuel Hunter*. R. S. P. 15 (1867) xi-.
- Churchod, *Louis*. Lum. Elect. 34 (1889) 296.
- Clark, *Daniel Kinnear*. Am. Eng. & Railroad J. 70 (1896) 44-; I. CE. P. 124 (1896) 409-; I. ME. P. (1896) 92-.
- Clark, *Joseph Warner*. L. Ps. S. P. 7 (1886) (*Ann. Meet.* 1886) 10-.
- Clark, *Josiah Latimer*. Elect. Rv. 43 (1898) 663-; Elekttech. Z. 19 (1898) 777-; J. Tél. 22 (1898) 278; Lpldina. 34 (1898) 170; Science 8 (1898) 704-; As. S. M. Not. 59 (1899) 219-; Elect. 42 (1899) 33; I. CE. P. 137 (1899) 418-; I. Elect. E. J. 27 (1899) 646-, 649-; 28 (1899) 667-; L. Ps. S. P. 16 (1899) (*Ann. Meet.* 1899) 9-; Nt. 59 (1898-99) 38.
- Claudet, *Antoine François Jean*. R. S. P. 17 (1869) lxxxv-.
- Clausius, *Rudolph Julius Emmanuel*. A. Tél. 15 (1888) 478; C. Ztg. 12 (1888) 1141; Elect. 21 (1888) 562; Humb. 7 (1888) 403; Lpldina. 24 (1888) 170; Lum. Elect. 29 (1888) 496-; Nt. 38 (1888) 438-; Rv. Sc. 42 (1888) 424-; Rv. Sc.-Ind. 20 (1888) 259-; Am. Ac. P. 24 (1889) 458-; Berl. Ps. Gs. Vh. (1889) 1-; Glasg. I. Eng. T. 32 (1889) 319-; Gött. Ab. 35 (1889) (*Mth.*) 39 pp.; I. CE. P. 96 (1889) 307-; L. Ps. S. P. 10 (1890) (*Ann. Meet.* 1889) 10-; Manch. Lt. Ph. S. Mm. & P. 2 (1889) 259-; Phm. J. 19 (1889) 243; Termt. Közl. 21 (1889) 600; Tor. Ac. Sc. At. 24 (1889) 3-; Wien Alm. 39 (1889) 203-; Münch. Ak. Sb. 19 (1890) 113-; Rv. Quest. Sc. 27 (1890) 419-; R. S. P. 48 (1891) i-; Zür. Vjschr. 41 (1896) (*Festschr., Th. 1*) 93-.
- Clerc, *Auguste*. Par. Ing. Civ. Mm. (1888) (*Pt. 2*) 530.
- Colladon, *Jean Daniel*. C. R. 117 (1893) 263-; Gén. Civ. 23 (1893) 194; J. Tél. 17 (1893) 182-; Lum. Elect. 49 (1893) 142-; Nt. 48 (1893) 396-; Par. Ing. Civ. Mm. (1893) (*Pt. 2*) 443-; Sch. Nf. Gs. Vh. (1893) 183-; Met. S. QJ. 20 (1894) 106-; Gen. S. Ps. Mm. 32 (1894-97) (*Pt. 1*) xviii-.
- Collette, *Johannes Martinus*. Elekttech. Z. 21 (1900) 104; 's Gravenh. I. Ing. Ts. (1899-1900) (*Verg.*) 61-.
- Colley, *Robert Andrejevč*. Kazan S. Ps.-Mth. Bll. 1 (1891) (*Prot.*) 61-; Rs. Ps.-C. S. J. 23 (*Ps.*) (1891) 443-.
- Commines de Marsilly, (*le gén.*) *Louis Joseph Auguste de*. Bône Ac. Hip. Bll. 24 (1891) (*C. R.* 1890) 1-.
- Conroy, (*Sir*) *John*. Nt. 63 (1900-01) 186.
- Cook, *Edward Rider*. S. C. In. J. 17 (1898) 828.
- Cooper, *Matthew*. I. Elect. E. J. 29 (1900) 948-.
- Copeland, *Charles W.* Am. Eng. & Railroad J. 69 (1895) 140.
- Cordier, *Pierre Louis Antoine*. A. Mines 8 (1895) 599-.
- Cornélis, *Louis*. Anvers J. Phm. 43 (1887) 444-.
- Cornelius, *Karl Sebastian*. Lpldina. 32 (1886) 188.
- Cornut, *Ernest*. Gén. Civ. 20 (1891-92) 203.
- Cowles, *Eugene H.* Elect. 29 (1892) 61; Franklin I. J. 133 (1892) 404-.
- Cowper, *Edward Alfred*. Elect. 31 (1893) 67; I. CE. P. 114 (1893) 369-; I. ME. P. (1893) 203-; I. & S. I. J. (1893) (*No. 1*) 172-; Nv. Archt. T. 34 (1893) 241-; S. C. In. J. 12 (1893) 509.
- Cracknell, *Edward Charles*. I. CE. P. 113 (1893) 343-; N. S. W. R. S. J. 27 (1893) 3.
- Crampton, *Thomas Russell*. I. CE. P. 94 (1888) 295-; I. ME. P. (1888) 437-; I. & S. I. J. (1888) (*No. 1*) 210-; Par. Ing. Civ. Mm. (1888) (*Pt. 1*) 668-; Railroad & Eng. J. 62 (1888) 285.
- Curbillon, *Claudius*. Angers S. Sc. Bll. (1899) 262-.
- Curioni, *Giovanni*. Rv. Sc.-Ind. 19 (1887) 39-.
- Cushman, *Holbrook*. Science 2 (1895) 757-.
- Czögler, *Alajos*. Termt. Közl. 26 (1894) 638.
- Daalen, *Gotfried Coenraad Ernst van*. 's Gravenh. I. Ing. Ts. (1889-90) (*Verg.*) 4.
- Dagron, *Prudent René Patrice*. Aér. (1900) 152-.
- Daguin, *Pierre Adolphe*. Toul. Ac. Sc. Mm. 7 (*Sem. 2*) (1885) 48-.
- Dale, (*Rev.*) *T. Pelham*. L. Ps. S. P. 12 (1894) (*Ann. Meet.* 1893) 8.
- Dalton, *John*. Arch. Phm. 90 (1844) 321-; S. Dyers Col. J. 16 (1900) 74-, 104-.
- Dancer, *John Benjamin*. As. S. M. Not. 48 (1888) 161; Manch. Lt. Ph. S. Mm. & P. 1 (1888) 149-.
- Davies, *John Eugene*. Am. Mcr. S. T. 21 (1900) 249-.
- Davy, *Edward*. Vict. R. S. T. 21 (1885) 150-.
- Decaux, *Charles Auguste*. Gén. Civ. 34 (1898-99) 61.
- Delabar, *Gangolf*. Sch. Nf. Gs. Vh. (1883-84) 148-.

- Delarive [De la Rive], *Auguste Arthur*. Gen. S. Ps. Mm. 23 (1874) 465-; Edinb. R. S. P. 8 (1875) 319-; Rv. Sc. 8 (1875) 648-; R. S. P. 24 (1876) xxxvii-; Arch. Sc. Ps. Nt. 60 (1877) 5-.
- De La Rue, *Warren*. Am. J. Phm. 61 (1889) 319; Berl. B. 22 (1889) 1169-; C. Ztg. 13 (1889) 545; Elect. 22 (1889) 709-; Lpldina. 25 (1889) 113; Lum. Elect. 32 (1889) 241-; Nt. 40 (1889) 26-; Obs. 12 (1889) 244-; Phm. J. 19 (1889) 879; S. C. In. J. 8 (1889) 269; As. S. M. Not. 50 (1890) 155-; C. S. J. 57 (1890) 441-; L. Ps. S. P. 10 (1890) (*Ann. Meet.* 1890) 13-; Met. S. QJ. 16 (1890) 99; Ts. Ps. C. 29 (1890) 61.
- Delezenne, *Charles*. Lille S. Mm. 3 (1867) 493-.
- Della Casa, *Lorenzo*. Bologna Ac. Sc. Mm. 1 (1871) 245-.
- Delsaulx, (*le rév. père*) *Joseph*. Brux. S. Sc. A. 15 (1891) (*Pt.* 1) 86-; Rv. Quest. Sc. 29 (1891) 585-.
- Denier, *Heinrich*. Wien Pht. Cor. 29 (1892) 214-.
- Dent, *Montagu Charles*. I. Elect. E. J. 29 (1900) 949.
- Desains, *Quentin Paul*. C. R. 100 (1885) 1257-.
- Despeyrous, *Théodore*. Toul. Ac. Sc. Mm. 7 (*Sem.* 2) (1885) 100-.
- Despretz, *César*. R. S. P. 13 (1864) viii-.
- Discher, *Heinrich*. J. Tél. 16 (1892) 291.
- Donkin, *William Frederick*. Gg. S. P. 10 (1888) 715-; C. S. J. 55 (1889) 292-; Phot. J. 13 (1889) 44-.
- Donny, *Françoise Marie Louis*. Brux. Ac. Bil. 32 (1896) 496-.
- Doubrava, *Stefan*. Elekttech. Z. 18 (1897) 491.
- Douglass, (*Sir*) *James Nicholas*. Eng. S. T. (1898) 238; I. CE. P. 134 (1898) 403-; I. ME. P. (1898) 531-; Nt. 58 (1898) 177; I. Elect. E. J. 28 (1899) 672-.
- Doyle, *James Drummond*. I. Elect. E. J. 29 (1900) 949-.
- Draper, *Henry*. Am. J. Sc. 25 (1883) 89-; Obs. 6 (1883) 23-; Science 1 (1883) 29-.
- Draper, *John William*. Am. J. Sc. 23 (1882) 163-; L. Ps. S. P. 5 (1884) (*Ann. Meet.* 1882) 8-.
- Dresing, *Peter Christian*. I. Elect. E. J. 28 (1899) 672-.
- Drobisch, *Moritz Wilhelm*. Leip. Mth. Ps. B. 48 (1896) 697-.
- Droop, *Henry Richmond*. L. Ps. S. P. 6 (1885) (*Ann. Meet.* 1885) 8-.
- Drummond, *Richard Oliver Gardner*. I. CE. P. 134 (1898) 414-; I. ME. P. (1898) 533; I. Elect. E. J. 28 (1899) 673.
- Du Bois-Reymond, *Emil*. C. Ztg. 20 (1896) 1035; Am. Ntlist. 31 (1897) 268-; Arch. An. Pl. (*Pl. Ab.*) (1897) vii-; Berl. Ps. Gs. Vh. (1897) 5-; Bl. Cb. 17 (1897) 81-; Elect. 38 (1897) 316-; Elekttech. Z. 18 (1897) 10-; Gen. S. Ps. Mm. 32 (1894-97) *Pt.* 2, lxi-; Lpldina. 33 (1897) 50-; Manch. Lt. Ph. S. Mm. & P. 41 (1897) xlviii-; Nt. 55 (1896-97) 230-; Rv. Sc. 7 (1897) 385-; Rv. Sper. Freniatr. 23 (1897) 255; Science 5 (1897) 217-; St. Pét. Ac. Sc. Bil. 6 (1897) v-; Vars. S. Nt. Tr. (1897) (*Bl.*) No. 3, 2-; Wien Alm. 47 (1897) 318-; Berl. Ak. Ab. (1898) 24 pp.; Lüneb. Nt. Vr. Jh. 14 (1898) xxxi-; Münch. Ak. Sb. 27 (1898) 423-.
- Ducoté, *Jules*. A. Tél. 11 (1884) 538-.
- Dufour, *Louis*. Gen. S. Ps. Mm. 31 (1890-93) cxl-; Laus. S. Vd. Bil. 29 (1893) 211-; Met. Z. 10 (1893) 432.
- Dufourcet, *Eugène*. Dax S. Borda Bil. (1900) 37-.
- Duhamel, *Jean Marie Constant*. Ts. Mth. 2 (1872) 143-.
- Dumas, *Jean Baptiste André*. A. di C. 78 (1884) 269-; Am. Ac. P. 19 (1884) 545-; Am. J. Sc. 28 (1884) 289-; Anvers J. Phm. 40 (1884) 160-; A. Tél. 11 (1884) 181-; Berl. B. 17 (1884) 947- (*Ref.*) 629-; C. N. 49 (1884) 193; C. R. 98 (1884) 933-; 100 (1885) 477-; C. Ztg. 8 (1884) 539, 569-; Frkf. a M. Ps. Vr. Jbr. (1883-84) 30-; Gén. Civ. 4 (1883-84) 397-; 5 (1884) 409-; 434-; J. Phm. 9 (1884) 369-; Les Mondes 7 (1884) 607-; Lpldina. 20 (1884) 114; N. Antol. Sc. 74 (1884) 772; Nt. 30 (1884) 15-; Par. S. C. Bil. 42 (1884) 130-; 549-; 45 (1886) i-, 1-; Phm. J. 14 (1884) 847-; Rm. R. Ac. Linc. T. 8 (1884) 251-; R. S. P. 37 (1884) x-; Sch. Nf. Gs. Vh. (1883-84) 154-; Science 3 (1884) 750-; Tel. J. 14 (1884) 369; Ts. Ps. C. 23 (1884) 218-; Wien Alm. 34 (1884) 200-; Bordeaux S. L. Act. 39 (1885) xiii-; C. S. J. 47 (1885) 310-; Rv. Bt. 3 (1884-85) 288; Termt. Kōzl. 17 (1885) 499; Münch. Ak. Sb. 15 (1886) 136-; Rv. Sc. 44 (1889) 673-.
- Du Moncel, (*le comte*) *Théodore Achille Louis*. A. Tél. 11 (1884) 83-; C. R. 98 (1884) 453-; 100 (1885) 481; Elect. 12 (1884) 373; Les Mondes 7 (1884) 365-; Lum. Elect. 11 (1884) 341, 381-; Nt. 29 (1884) 412-; Tel. J. 14 (1884) 155-.
- Duprez, *François*. Brux. Ac. Bil. 7 (1884) 708-.
- Dutuilleul, *Jules*. Lille S. Mm. 14 (1885) 379-.
- Dyer, *Esra*. Am. Oph. S. T. (1887) 407-.
- Edlund, *Eric*. Elect. 21 (1888) 595-; Lpldina. 24 (1888) 169-; Lum. Elect. 29 (1888) 632-; Helsingf. Öfv. 31 (1889) 247-; Stockh. Vt. Ak. Lefn. 3 (1886-94) 281-.
- Eickemeyer, *Rudolf*. Elekttech. Z. 16 (1895) 117-.
- Einsle, *Anton*. Wien Pht. Cor. 34 (1897) 571-.
- Eisenlohr, *Wilhelm*. Leip. As. Gs. Vjschr. 7 (1872) 263-; Karlsruhe Nt. Vr. Vh. 13 (1900) (*Ab.*) 458-.
- Elliot, (*Sir*) *George*. Elekttech. Z. 15 (1894) 28; I. CE. P. 116 (1894) 355-; I. & S. I. J. (1894) (No. 1) 390-.
- Ellis, *Alexander John*. L. Mth. S. P. 21 (1891) 457-; Nt. 43 (1891) 20; R. S. P. 49 (1891) i-.
- Elsas, *Adolf*. Lpldina. 31 (1895) 109-.
- Emery, *Charles Edouard*. Am. Eng. & Railroad J. 72 (1898) 234; I. CE. P. 133 (1898) 395-; Am. S. CE. T. 42 (1899) 558-; Am. I. Mn. E. T. 29 (1900) xxviii-.
- Enys, *John Samuel*. Cornwall Gl. S. T. 9 (1878) (*Rp.* 59) 9-.

- Epstein, *Ludwig*. I. Elect. E. J. 29 (1900) 950-.
- Ericsson, (*Capt.*) *John*. Méx. Obs. Bl. 2 (1889) 394-; Nt. 39 (1889) 466, 517; Railroad & Eng. J. 63 (1889) 151-; Science 13 (1889) 189-; Stockh. Vt. Ak. Lefn. 3 (1886-94) 355-.
- Erkel, *F. van*. 's Gravenh. I. Ing. Ts. (1899-1900) (*Verg.*) 62.
- Euler, *Leonhard*. Basel Vh. 7 (1885) (*Anh.*) 39-; Barcel. Ac. Mm. 1 (1892-1900) 241-.
- Éval'd, *Theodor Theodorovich*. Rs. Ps.-C. S. J. 11 (*Ps.*) (1879) [*Pt.* 1] 117-.
- Evans, (*Capt. Sir*) *Frederick John Owen*. As. S. M. Not. 46 (1886) 183-; Elect. 16 (1886) 127-; Gg. S. P. 8 (1886) 112-; Lpldina. 22 (1886) 57; Nt. 33 (1886) 246-; R. S. P. 40 (1886) i-.
- Falke, *Jacob von*. Wien Pht. Cor. S. 34 (1897) 372.
- Fambri, *Paulo*. N. Antol. Sc. 153 (1897) 131-; Ven. I. At. (1897-98) 319-.
- Faraday, *Michael*. Am. J. Phm. 39 (1867) 576-; Arch. Sc. Ps. Nt. 30 (1867) 131-; Ph. Mg. 34 (1867) 409-; Smiths. Rp. (1867) 227-; Am. J. Sc. 45 (1868) 145-; Münch. Sb. (1868) (1) 439-; N. Cim. 28 (1868) 79-; Rec. Mth. (Moscou) 3 (1868) (*Pt.* 2) 17-; Par. Bl. S. C. 12 (1869) 172-; R. I. P. 5 (1869) 199-; R. S. P. 17 (1869) i-; Mag. Tud. Ak. Étk. (*Term.*) 1 (1870) (*No.* 10) 16 pp.; Par. Ac. Sc. Mm. 36 (1870) vii-; Md. Chir. S. P. 6 (1872) 53-; Am. Ac. P. 8 (1873) 31-; Elect. 19 (1887) 140-.
- Farmer, *Moses Gerrish*. Am. Ac. P. 29 (1894) 415-.
- Fasoldt, *Chas*. Mer. S. J. (1889) 829-.
- Fawcett, *Henry*. J. Tél. 8 (1884) 235-.
- Fechner, *Gustav Theodor*. Lpldina. 23 (1887) 217-; Lum. Élect. 26 (1887) 492; Humb. 7 (1888) 84; Ph. Stud. 4 (1888) 471-; Wien Alm. 38 (1888) 196-.
- Feilitzsch, *F. K. O. (Frhr.) von*. Term. Közl. 18 (1886) 516.
- Fein, *Wilhelm Emil*. Dingler 310 (1898) 40; Elekttech. Z. 19 (1898) 716.
- Ferraris, *Galileo*. Elect. 38 (1897) 497; Elekttech. Z. 18 (1897) 99; Lpldina. 33 (1897) 54; N. Cim. 5 (1897) 231-; Par. Poids et Mes. PV. (1897) 6-; Ps. Rv. 4 (1897) 505-; Rm. R. Ac. Linc. Rd. 6 (1897) (*Sem.* 1) 189-; Rv. Sc. Ind. 29 (1897) 102-; Tor. Ac. Sc. Mm. 47 (1897) 143-; Ven. I. At. (1896-97) 239-; Term. Közl. 30 (1898) 648.
- Field, *Cyrus W.* J. Tél. 16 (1892) 221; Lum. Élect. 45 (1892) 196.
- Fievez, *Charles*. Ciel et Terre 10 (1889-90) 565-; Nt. 41 (1890) 400; Obs. 13 (1890) 124-; Rio Obs. Rv. (1890) 41; Spet. It. Mm. 19 (1891) 17-.
- Fizeau, *Armand Hippolyte Louis*. Am. J. Sc. 2 (1896) 398; Asps. J. 4 (1896) 367-; Elect. 37 (1896) 699-; Lpldina. 32 (1896) 182; Nt. 54 (1896) 523-; N. Ts. Fs. K. 1 (1896) 439-.
- Flachat, *Eugène*. Rv. Sc. 9 (1898) 801-; Science 8 (1898) 14-.
- Fliedner, *Conrad*. Wet. Gs. Nt. B. (1885-87) xxxi-.
- Fodor, *Johann*. Wien Pht. Cor. 27 (1890) 294-.
- Forbes, *James David*. Edinb. Gl. S. T. 1 (1870) 238-; R. S. P. 19 (1871) i-; Edinb. R. S. P. 7 (1872) 11-.
- Forquenot, —. Gén. Civ. 8 (1885-86) 13-.
- Foucault, *Jean Bernard Léon*. Rv. Cours Sc. 6 (1869) 484-; R. S. P. 17 (1869) lxxxiii-; Rv. Quest. Sc. 5 (1879) 108-, 516-; Rv. Sc. 3 (1882) 161-.
- Fox, *Robert Were*. Cornwall Gl. S. T. 9 (1878) (*Rp.* 64) xi-.
- Foy, *Alphonse*. A. Tél. 15 (1888) 5-.
- Frankland, (*Sir*) *Edward*. Am. C. J. 22 (1899) 410-; Anal. 24 (1899) 225-; Berl. B. 32 (1899) 2540-; 33 (1900) 3847-; C. N. 79 (1899) 81-; C. R. 129 (1899) 1060-; C. Ztg. 23 (1899) 697; Lpldina. 35 (1899) 179; Mon. Sc. 13 (1899) 771-; Nt. 60 (1899) 372; S. Afr. C. Mtl. S. J. 2 (1899) 181-; S. Afr. C. Mtl. S. P. 2 (1897-99) 835; S. C. In. J. 18 (1899) 735; Z. Angew. C. (1899) 822-; Manch. Lt. Ph. S. Mm. & P. 44 (1900) xxxviii-; Md.-Chir. T. 83 (1900) cxix; Wien Alm. 50 (1900) 289-; Münch. Ak. Sb. 30 (1901) 373-.
- Fraunhofer, *Joseph von*. Czgt. Opt. 8 (1887) 73-; Z. Instk. 7 (1887) 114-.
- Freeman, (*Rev.*) *Alexander*. Obs. 20 (1897) 293; As. S. M. Not. 58 (1898) 136-; L. Ps. S. P. 16 (1899) (*Ann. Meet.* 1898) 8.
- Fresnel, *Jean Augustin*. C. R. 99 (1884) 451-; Habana Ac. A. 21 (1884) 53-; Les Mondes 9 (1884) 90-.
- Frew, *John*. I. & S. I. J. (1899) (*No.* 2) 293-.
- Frīč, *Jan*. As. Nr. 143 (1897) (*Beil.* zu No. 3415) 2 pp.; Z. Zuckin. Böhm. 21 (1896-97) 396-.
- Frick, *George*. Am. Eng. & Railroad J. 67 (1893) 101-.
- Fripp, *Henry Edward*. Bristol Nt. S. P. 7 (1894) 1-.
- Fristoe, *Eduard T.* Wash. Ph. S. Bil. 12 (1895) 460-.
- Froment, *Paul Gustave*. A. Cons. Arts et Mét. 7 (1895) 125-.
- Gaiffe, *Adolphe*. Lum. Élect. 24 (1887) 138-.
- Gaillard, *François Alexandre Narcisse*. A. Tél. [19] (1892) 85-.
- Gallenkamp, *W.* Berl. Ps. Gs. Vh. (1890) 71-.
- Galton, (*Sir*) *Douglas Strutt*. Am. Eng. & Railroad J. 73 (1899) 136; Elect. 42 (1899) 725-; I. CE. P. 137 (1899) 413-; I. Elect. E. J. 28 (1899) 674-; I. MÉ. P. (1899) 129-; I. & S. I. J. (1899) (*No.* 1) 262; Nt. 59 (1898-99) 512-; Science 9 (1899) 421; Gl. Mg. 7 (1900) 429-; Met. S. QJ. 26 (1900) 215-.
- Gassiot, *John Peter*. C. S. J. 33 (1878) 227-.
- Gaugain, *Jean Mothée*. A. Tél. 7 (1880) 409-, 513-; 8 (1881) 67-; Caen Ac. Mm. (1881) 3-.
- Gaulard, *Lucien*. Lum. Élect. 30 (1888) 497-; Railroad & Eng. J. 63 (1889) 48.
- Gauss, *Johann Friedrich Karl*. R. S. P. 7 (1856) 589-; Časopis 6 (1877) 145-; Nt. 15 (1877) 533-; 28 (1883) 272-; Term. Közl. 16 (1884) 496-; Science 9 (1899) 697-.

- Gazzeri, *Giuseppe*. Firenze Ac. Georg. At. 26 (1848) 28-; Pisa S. Tosc. At. (*Mm.*) 8 (1887) 77-.
- Géraldy, *Frank*. Elekttech. Z. 14 (1893) 304; Lum. Élect. 48 (1893) 201-.
- Gherardi, *Silvestro*. Tor. Ac. Sc. At. 15 (1879) 369-; Rm. R. Ac. Linc. T. 4 (1880) 16-.
- Gidel, —. A. Tél. 20 (1893) 378.
- Gilbert, *Louis Philippe*. Brux. S. Sc. A. 16 (1892) (*Pt.* 1) 102-; Mathesis 12 (1892) 57; Par. S. Phlm. Bil. 4 (1892) 138-; Rv. Quest. Sc. 31 (1892) 620-; 33 (1893) 591-.
- Gintl, *Julius Wilhelm*. Wien Alm. 34 (1884) 196-.
- Girard, *Philippe de*. Rv. Sc. 40 (1887) 257-.
- Giraud-Teulon, *Marc Antoine Louis Félix*. Arch. Gén. Md. 160 (1887) 505-; Lpldina. 23 (1887) 162; A. d'Ocul. 99 (1888) 9-; Par. S. Chir. Bil. et Mm. 15 (1889) 15-.
- Gisborne, —. Lum. Élect. 45 (1892) 634.
- Glan, *Paul*. Berl. Ps. Gs. Vh. (1898) 121-; Lpldina. 34 (1898) 141-.
- Göschl, *Alexander*. Wien Pht. Cor. 37 (1900) 598-.
- Goetz, *George W.* Am. I. Mn. E. T. 27 (1898) 436-.
- Goodwin, *H. Stanley*. Am. Eng. & Railroad J. 67 (1893) 101.
- Goodwin, *John Marston*. Railroad & Eng. J. 65 (1891) 574.
- Gordon, *James Edward Henry*. Elect. 30 (1893) 417-; Elect. Rv. 32 (1893) 159-; I. CE. P. 113 (1893) 346-; Lum. Élect. 47 (1893) 439-.
- Gottschalk, *Philippe Alexandre*. Gén. Civ. 32 (1897-98) 306; I. ME. P. (1898) 312-; I. & S. I. J. (1898) (*No.* 2) 328-; Par. Ing. Civ. Mm. (1898) (*Pt.* 1) 355-.
- Gouin, *Ernest*. Gén. Civ. 6 (1884-85) 370; Par. Ing. Civ. Mm. (1885) (*Pt.* 1) 569-.
- Govì, *Gilberto*. Firenze Ac. Georg. At. 12 (1889) xxxix-; Par. Poids et Mes. PV. (1889) 10-; Rv. Sc.-Ind. 21 (1889) 176; Tor. Ac. Sc. At. 25 (1890) 10-.
- Gralath, *Daniel*. Danzig Schr. 6 (1884-87) (*Heft* 4) 192-.
- Grawinkel, *Carl*. Elekttech. Z. 15 (1894) 461.
- Gregory, *Walter George*. L. Ps. S. P. 11 (1892) (*Ann. Meet.* 1892) 11.
- Griffith, *Ezra Hollis*. Am. Mer. S. P. 15 (1893) 247-.
- Grinwis, *Cornelis Hubertus Carolus*. Amst. Ak. Vs. 8 (1900) 326.
- Grove, (*Sir*) *William Robert*. Am. J. Sc. 2 (1896) 314; Elect. 37 (1896) 483-; Elect. Rv. 39 (1896) 181; Lpldina. 32 (1896) 137-; Nt. 54 (1896) 393-; I. CE. P. 127 (1897) 358-.
- Grunert, *Johann August*. Arch. Mth. Ps. 55 (1873) 1-; Wien Alm. (1873) 145-.
- Gubkin, *Ivan Sergéevitch*. Mosc. S. Sc. Bil. 78 (*No.* 2) (1893) 64-.
- Guerout, *Auguste*. Lum. Élect. 19 (1886) 433.
- Guibal, *Théophile*. Gén. Civ. 13 (1888) 366; Par. Ing. Civ. Mm. (1888) (*Pt.* 2) 531-; Rv. Un. Mines 4 (1888) 1-; Hain. S. Mm. 2 (1890) xix-; Fed. I. Mn. E. T. 1 (1892) 79-.
- Guidi, *Filippo*. Rm. N. Linc. At. 53 (1900) 50-.
- Guilleaume, *F. C.* Lum. Élect. 26 (1887) 595.
- Gusinde, *Oswald*. Elekttech. Z. 17 (1896) 792.
- Guthrie, *Francis*. J. Bt. 37 (1899) 528; Nt. 61 (1899-1900) 84.
- Guthrie, *Frederick*. Gl. S. QJ. 43 (1887) (*P.*) 48; L. Ps. S. P. 8 (1887) (*Ann. Meet.* 1887) 9-; Nt. 35 (1887) 8-; Term. Közl. 19 (1887) 505.
- Gylden, *Johann August Hugo*. C. R. 123 (1896) 771-; Lpldina. 32 (1896) 189; Obs. 19 (1896) 446; St. Pét. Ac. Sc. Bil. 5 (1896) lxxvii-; Acta Mth. 20 (1897) 397-; As. Nr. 142 (1897) 49-; As. S. M. Not. 57 (1897) 222-; Bil. As. 14 (1897) 289-; Ciel et Terre 17 (1896-97) 568-; Helsingf. Acta 23 (1897) No. 9, 29 pp.; Leip. As. Gs. Vjschr. 32 (1897) 8-; Nt. 55 (1896-97) 38, 158-; Wiad. Mt. 1 (1897) 31-; Münch. Ak. Sb. 27 (1898) 409-.
- Hachette, *Jean Nicolas Pierre*. Fr. S. Ag. Mm. (1834) 143-.
- Hänsch, *Hermann*. Berl. Ps. Gs. Vh. (1896) 77-.
- Haidinger, *Wilhelm Karl von*. Ausl. 44 (1871) 449-; Bonn Cor.-Bl. NH. Vr. (1871) 15-; Rv. Cours Sc. 1 (1871) 410-; Wien Alm. (1871) 159-; Wien Jb. Gl. 21 (1871) 31-; R. S. P. 20 (1872) xxv-; Mag. Tud. Ak. Évk. 13 (1876) (*No.* 10) 15-.
- Hajech, *Camillo*. Mil. I. Lomb. Rd. 17 (1884) 56-.
- Hake, *Rudolph*. Elekttech. Z. 18 (1897) 281.
- Hallaschka, *Franz Cassian*. Brünn Mt. 65 (1885) (*Beil.*) 33.
- Hallaue, *Octave René*. Mulhouse S. In. Bil. 54 (1884) 139-; Science 4 (1884) 306-.
- Halske, *Johann Georg*. Berl. Ps. Gs. Vh. (1890) 39-.
- Hamilton, (*Sir*) *William Rowan*. Am. J. Sc. 42 (1866) 293-; As. S. M. Not. 26 (1866) 109-; Ir. Ac. P. 9 (1867) 307-.
- Hampson, *Robert Stewart*. I. Elect. E. J. 28 (1899) 675-.
- Hankel, *Wilhelm Gottlieb*. Elekttech. Z. 20 (1899) 181; Leip. Mth. Ps. B. 51 (1899) lxxvii-; Lpldina. 35 (1899) 58-; Ps. Rv. 9 (1899) 58; Münch. Ak. Sb. 30 (1901) 348-.
- Harris, (*Sir*) *William Snow*. R. S. P. 16 (1868) xviii-.
- Harting, *Pieter*. Lpldina. 21 (1885) 215; Amst. Ak. Jb. (1888) 1-.
- Hartnack, *Edmund*. Term. Közl. 24 (1892) 642; Ts. Ps. C. 31 (1892) 64.
- Hasler, *Gustav*. Sch. Nf. Gs. Vh. (1900) xlvi-.
- Haughton, (*Rev.*) *Samuel*. Gl. Mg. 4 (1897) 573-; I. ME. P. (1897) 514-; Mn. Mg. 11 (1897) 346-; Gl. S. QJ. 54 (1898) lxvi-; Ir. Ntlist. 7 (1898) 1-; Nt. 57 (1897-98) 65-; R. S. P. 62 (1898) xxix-.
- Hausmann, *Johannes*. Elekttech. Z. 21 (1900) 1004.
- Hawksley, *Thomas*. I. & S. I. J. (1893) (*No.* 2) 290; Nt. 48 (1893) 522; I. CE. P. 117 (1894) 364-; Met. S. QJ. 20 (1894) 111-; R. S. P. 55 (1894) xvi-.

- Hearder, *Jonathan Nash*. Devon. As. T. 9 (1877) 55-; Plym. I. T. 6 (Pt. 1) (1877) 150-.
 Heid, *Hermann*. Wien Pht. Cor. 28 (1891) 214-.
 Heller, *Ágost*. Mth. Nt. B. Ung. 18 (1903) 478-.
 Helmholz, *Hermann Ludwig Ferdinand von*. A. d'Ocul. 112 (1894) 225-; Arch. f. Oph. 40 (1894) (Ab. 4) [v]-; Arch. Oph. 23 (1894) 514-; Arch. Ot. 23 (1894) 382; Berl. P. 27 (1894) 2643-; Bresl. Schl. Gs. Jbr. (1894) (*Allg. B.*) 32-; [Bucarest S. Sc. Bl. 3 (1894)] 260-; C. N. 70 (1894) 146; C. R. 119 (1894) 1044-; C. Ztg. 18 (1894) 1395; Cztg. Opt. 15 (1894) 205-; Dubl. J. Md. Sc. 98 (1894) 459-; Elect. Rv. 35 (1894) 319-; Elekttech. Z. 15 (1894) 613-; J. Tél. 18 (1894) 358; Lpldina. 30 (1894) 163; Mon. Sc. 8 (1894) 782, 801-; Nt. 50 (1894) 479-; Rv. Sc. 2 (1894) 379, 429-; 8 (1897) 321-, 360-; Rv. Sc.-Ind. 26 (1894) 160; Rv. Sper. Freniatr. 20 (1894) 671-; Smiths. Rp. (1894) 709-; (1895) 787-; St. Pét. Ac. Sc. Bil. 1 (1894) (*Prot.*) 51-; Wien Md. Wschr. 44 (1894) 1645-; 46 (1896) 1-, 44-, 98-; Z. Instk. 14 (1894) 341-; Z. Nw. 67 (1894) 321-; Am. Ac. P. 30 (1895) 592-; Ciel et Terre 15 (1894-95) 422; Crelle J. Mth. 114 (1895) 353; Frkf. a. M. Ps. Vr. Jbr. (1894-95) 24-; Fsch. Md. 13 (1895) 123-, 163-; I. CE. P. 119 (1895) 361-; Königsb. Schr. 35 (1895) 63-, [38]; L. Ps. S. P. 13 (1895) (*Ann. Meet.*) 1895 9-; Manch. Lt. Ph. S. Mm. & P. 9 (1895) 230-; Md.-Chir. T. 78 (1895) cvi; Phm. J. 25 (1895) 222; Ps. Rv. 2 (1895) 222-; Senckb. Nf. Gs. B. (1895) v-; Term. Kōzl. 27 (1895) 18-; Wien Alm. 45 (1895) 283-; Z. Ohrh. 26 (1895) 252-; Zür. Nf. Gs. Njbl. (1895) 36 pp.; Berl. Ak. Ab. (1896) 50 pp.; C. S. J. 69 (1896) 885-; Münch. Ak. S. B. 25 (1896) 185-; R. I. P. 14 (1896) 481-; R. S. P. 59 (1896) xvii-; Science 3 (1896) 189-; Würtb. Jh. 52 (1896) ci-; Gen. S. Ps. Mm. 32 (1894-97) (Pt. 1) lxxvi-; Heidl. Nt. Md. Vh. 5 (1897) 315-; N. Antol. Sc. 171 (1900) 710-; Practit. 64 (1900) 664-.
 Hemenway, *Frank F.* Am. Eng. & Railroad J. 72 (1898) 384.
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 Herschel, (*Sir*) *John Frederick William*. Brux. Ac. Bil. 31 (1871) 478-; Smiths. Rp. (1871) 109-; Am. Ph. S. P. 12 (1872) 217-; As. S. M. Not. 32 (1872) 122-; Edinb. R. S. P. 7 (1872) 543-; R. S. P. 20 (1872) xvii-; Rv. Sc.-Ind. 3 (1872) 40-; Am. Ac. P. 8 (1873) 461-; Wien Alm. (1873) 147-; Mag. Tnd. Ak. Étk. (*Mth.*) 3 (1875) (No. 3) 14 pp.; Wien Pht. Cor. 24 (1887) 7-.
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- Howard, *James Livezey*. L. Ps. S. P. 17 (1901) (*Ann. Meet.* 1900) 13-; Ph. Mg. 49 (1900) 160.
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- Humboldt, *Pierre Césaire*. A. Tél. 12 (1885) 573-.
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- Jackson, *George*. Mer. S. J. (1895) 16.
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- Johnson, *Charles Roberts*. Am. Eng. & Railroad J. 67 (1893) 499-.
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- Voigt, *Thomas Heinrich*. Wien Pht. Cor. 33 (1896) 400-.
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- Ward, *William Sykes*. Yorks. Gl. S. P. 9 (1885-87) 316; 10 (1889) 241-; C. S. J. 53 (1888) 518.
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- Weiss, *Theodor*. Hann. Arch.-Vr. Z. 32 (1886) 375-.
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- Wünsche, *Emil*. Wien Pht. Cor. 36 (1899) 480-.
- Wyles, *Frederick*. I. Elect. E. J. 29 (1900) 957.
- Wylie, *Robert*. I. & S. I. J. (1886) 804.
- Young, *Thomas*. Par. Mm. de l'I. 13 (1835) (*H.*) 57-; Edinb. N. Ph. J. 19 (1835) 39-; Smiths. Rp. (1869) 111-; R. I. P. 11 (1887) 553-; 16 (1902) 204-.
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- Zöllner, *Johann Karl Friedrich*. C.-Ztg. 6 (*Sem.* 1) (1882) 381.

0020 Periodicals, etc.

0020 Periodicals, Reports of Institutions, Societies, Congresses, etc.

- Brussels Academy, report on work in physics and meteorology. *Duprez, F. J.* Brux. Ac. Cent. Anniv. 2 (1872) 88 pp.
- Bureau International des Poids et Mesures, reports. *Benoit, J. R.* Par. Poids et Mes. P.V. (1890) 2-; (1891) 19-; (1892) 26-; (1894) 45-, 90-; (1895) 8-, 31-; (1897) 14-; (1899) 12-; (1900) 3-.
- Edinburgh University, physical laboratory, notes. *Tait, P. G.* [1870] Edinb. R. S. P. 7 (1872) 206-.
- Electrical Congress, International, Frankfort, report. *Jacquin, C.* Lum. Élect. 46 (1892) 567-.
- congresses of Paris. *Preece, W. H.* Tel. E. J. 13 (1884) 361-.
- Engineers, Institution of, visit to Switzerland, 1899. *Threlfall, R.* Nt. 60 (1899) 578-.
- — — — —, — — — — —, — — — — —. *Inst. Elect. Eng., Swiss Visit Comm.* I. Elect. E. J. 29 (1900) 195-, 243-.
- instruments of International Exhibition, 1862, report. *Jenkin, F.* Tel. J. 1 (*1864) 18-, 26-, 41-, 52-, 65-, 76-, 87-, 100-, 113-, 125-, 138-, 152-, 162-, 171-, 186-, 197-, 207-, 222-, 233-, 244-, 255-, 268-, 278-, 292-.
- units, International Conference, conclusions. *Helmholtz, — von.* Berl. Ps. Gs. Vh. (1884) 26-.
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- Exhibition, Paris, 1881, experiments, report. *Allard, E., & others.* A. C. 29 (1883) 5-.
- — — — — at Paris Observatory. *Juppont, —.* Gén. Civ. 6 (1884-85) 336, 351-, 366-, 383-, 398-, 415-; 7 (1885) 25-, 41-, 59-, 73-, 88-, 107-, 122-.
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- Steam engines at Chicago Exhibition. *Freytag, F.* Dingler 290 (1893) 121-, 145-, 241-, 265-; 291 (1894) 53-, 145-, 311-.

General Treatises, etc. 0030

- Technical Conference, Paris, July 1889. *R., L.* A. Tél. 16 (1889) 549-.
- Telegraphic Conference, International, Berlin. *Anon.* A. Tél. 12 (1885) 514-.
- U. S. Geol. Surv. (Physical Laboratory), administrative report. *Barus, C.* U. S. Gl. Sv. Rp. (*1882-83) 52-.
- — — — —, Division of Chemistry and Physics, reports 1883-93. *Clarke, F. W.* U. S. Gl. Sv. Rp. (1883-84) 59-; (1884-85) 86-; (1885-86) 127-; (1886-87) 189-; (1887-88) 141-; (1888-89) (Pt. 1) 177-; (1889-90) (Pt. 1) 125-; (1890-91) (Pt. 1) 127-; (1891-92) (Pt. 1) 159-; (1892-93) (Pt. 1) 267-; (1893-94) 195-; U. S. Gl. Sv. Bll. No. 27 (1886) 80 pp.; No. 42 (1887) 152 pp.; No. 55 (1889) 96 pp.; No. 60 (1890) 174 pp.; No. 64 (1890) 60 pp.; No. 78 (1891) 131 pp.; No. 90 (1892) 77 pp.; No. 113 (1893) 115 pp.
- Valorous*, physical investigations of P. H. Carpenter. *Carpenter, W. B.* R. S. P. 25 (1877) 230-.

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- Electrical system of bodies (J. W. Ritter). *Pfaff, C. H.* Gilbert A. 28 (1808) 223-.
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- Electrostatics and magnetism (papers by Sir W. Thomson). *Bertrand, J.* J. Sav. (1873) 451-.
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- Text-book, plan. *Rodig, —.* Gilbert A. 7 (1801) 383-.

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- Smithsonian meteorological and physical tables. *Guyot, A.* [1859-84] Smiths. Misc. Col. 1 (1862) Art. 3, 634 pp.; 28 (1887) xxv + 747 pp.
- physical tables. *Gray, T.* Smiths. Misc. Col. 35 (1897) Art. 3, xxxiv + 301 pp.
- Stereometric weighing. *Neovius, A.* Helsingf. Acta 19 (1893) No. 16, 28 pp.
- Wave-length tables of spectra of elements and compounds. *Brit. Ass., Comm. B. A. Rp.* (1890) 224-; (1891) 161-; (1892) 193-; (1893) 387-; (1894) 248-; (1895) 273-; (1896) 273-; (1897) 75-; (1898) 313-; (1899) 257-; (1900) 193-.
- Wave-lengths, standard, new table. *Rowland, H. A.* As. & Asps. 12 (1893) 321-.

0032 Bibliographies.

- Electrolysis and its applications (1784-1880). *Webb, W. W.* N. Y. Ac. A. 2 (1882) 313-.
- Gas cells and e. m. f. of gases. *Bose, E. Z.* Ps. C. 34 (1900) 730-.
- Gases, occlusion and diffusion. *Bose, E. Z.* Ps. C. 34 (1900) 710-.
- Heat conduction. *Gibson, G. A.* Edinb. Mth. S. P. 7 (1889) 5-.
- Light, chemical influence. *Tuckerman, A.* Smiths. Misc. Col. 34 (1893) Art. 9, 22 pp.
- Physics, 1884-86. *Barker, G. F.* Smiths. Rp. (1884) 487-; (1885) 632-; (1887) 384-.
- Röntgen rays, in France. *Dollinger, F.* Fsch. Röntgenstr. 1 (1897-98) 146-; 2 (1898-99) 36-, 70-; 3 (1899-1900) 111-, 147-.
- Spectroscopy. *Brit. Ass., Comm. B. A. Rp.* (1881) 328-; (1884) 295-; (1889) 344-; (1894) 161-; (1898) 439-.
- , *Tuckerman, A.* Smiths. Misc. Col. 32 (1888) Art. 2, x + 423 pp.
- Thermodynamics. *Tuckerman, A.* [1890] Smiths. Misc. Col. 34 (1893) Art. 7, 239 pp.
- Viscosity of liquids, 1800-89. *Gee, W. W. H.* Manch. Lt. Ph. S. Mm. & P. 3 (1890) 123-.
- Vision, chief subjective phenomena, analytic bibliography (1880-82). *Plateau, J.* Brux. Ac. Mm. 45 (1884) (No. 4) 20 pp.

0040 Addresses, Lectures, etc., of a general character.

- Address, 21 December, 1896. *Cornu, A.* C. R. 123 (1896) 1099-.
- , presidential. *Cocchi, —.* It. S. Gl. Bil. 6 (1887) 424-.
- Air, adventures of a particle. *Mensbrugge, G. van der.* Brux. Ac. Bil. 30 (1895) 701-.
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- Combustion, and production of mechanical, thermal and electrical power. *Le Chatelier*, H. Rv. Sc. 9 (1898) 225-.
- Congrès International de Chronométrie, inaugural address, 28 July, 1900. *Caspari*, —. Cg. Int. Chron. (1900) 1-.
- Economic nature of physical research. *Mach*, E. Wien Alm. (1882) 293-.
- Electric distribution of time. *Brown*, A. D. Franklin I. J. 125 (1888) 462-; 126 (1888) 14-.
- Exhibition and pure research. *Snyder*, M. B. Franklin I. J. 122 (1886) 401-.

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- Electricity. (Presidential address, Société Helvétique, Geneva.) *Delarive*, A. Bb. Un. 58 (1845) 320-.
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- , applications. *Fraser*, W. J. Sc. 21 (1884) 327-, 399-, 456-.
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- Electrochemistry, scientific of the present and technical of the future. *Ostwald*, —. Elekttech. Z. 15 (1894) 329-.
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- Force. *Tyndall*, J. R. I. P. 3 (1858-62) 527-.
- Glasgow Philosophical Society, "Graham Lecture." (Graham's researches on molecular movement.) *Roberts-Austen*, W. C. Glasg. Ph. S. P. 11 (1879) 345-.
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- polyatomic gases. *Pirogov, N. N. Rs. Ps.-C. S. J. 18 (Ps.)* (1886) (*Suppl.*) 70 pp.; *Fschr. Ps.* (1886) (*Ab. 2*) 238-.
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- (*Stankevič*). *Pirogov, N. N. Rs. Ps.-C. S. J. 19 (Ps.)* (1887) 133-.
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- *Heen, P. de.* Brux. Ac. Bil. 32 (1896) 75-.
- electricity the cause of inverse motion. *Delsaulx, J.* Nt. 14 (1876) 449-.
- — — motion. *Delsaulx, J.* Nt. 14 (1876) 288-.
- experiments. *Böttger, R. C.* Berl. B. 9 (1876) 798-.
- *Crookes, W.* [1876] R. S. P. 25 (1877) 304-.
- *Krüss, A. H.* A. Ps. C. 159 (1876) 332-.
- *Ledieu, A. C. H.* C. R. 82 (1876) 1372-, 1476-.
- *Fonvielle, W. de.* C. R. 83 (1876) 970-.
- *Righi, A.* N. Cim. 16 (1876) 228-.
- *Rossetti, F.* Ven. I. At. 2 (1875-76) 869-.
- *Stroumbo, S.* Les Mondes 41 (1876) 208-.
- *Weinhold, A. F.* Carl Rpm. 12 (1876) 107-, 220-.
- *Crookes, W.* Nt. 15 (1877) 224-, 299-.
- *Neesen, F. A.* Ps. C. 160 (1877) 143-.
- *Giordano, G.* Nap. Rd. 17 (1878) 17.
- *Luca, S. de.* Nap. Rd. 17 (1878) 18-.
- *Schoultz, E. von.* Göteborg. Hndl. 16 (1878) 10 pp.
- *Ferrini, R.* Mil. I. Lomb. Rd. 14 (1881) 101-.
- *Lancetta, P.* Rv. Sc.-Ind. 20 (1888) 240-.
- *Bennett, A. R.* [1890] I. Elect. E. J. 19 (1891) 607-.
- *Tuchschmid, A.* Aarau Mt. 7 (1895) 62-.
- explanation. *Ziegler, O.* (xii) Ausl. 50 (1877) 515-.
- by theory of emission. *Fonvielle, W. de.* C. R. 83 (1876) 52-, 148-.
- forms. *Avergniat, (Frères).* C. R. 83 (1876) 273-, 323.
- *Zöllner, J. C. F.* A. Ps. C. 160 (1877) 459-.
- (explanation of Zöllner's). *Puluj, J.* Wien Ak. Sb. 81 (1880) (Ab. 2) 1092-; 82 (1881) (Ab. 2) 263-.
- *Baur, C.* A. Ps. C. 19 (1883) 12-.
- *Evans, G. W.* Science 2 (*1883) 215.
- *Seguy, G.* C. R. 120 (1895) 725.
- gaseous movements in. *Salet, G.* C. R. 83 (1876) 968-.
- heat and not light the motive power. *Cunnington, H. A.* Pop. Sc. Rv. 15 (1876) 128-.
- magnetic phenomena observed. *Basso, G.* Tor. Ac. Sc. At. 12 (1876) 502-.
- and mechanical action of light. *Carbonnelle, (le rév. père) L., & Ghysens, É.* [1876] (xii) Brux. S. Sc. A. 1 (1877) (Pt. 2) 59-.
- — — *Ledieu, A. C. H.* C. R. 82 (1876) 1241-, 1293-.
- — — *Montani, P.* Rm. R. Ac. Linc. At. 3 (1876) (Pt. 2) 597-.
- movement of glass case. *Crookes, W.* R. S. P. 24 (1876) 409-.
- movements. *Stokes, G. G.* [1877] R. S. P. 26 (1878) 546-.
- nature of force involved. *Rood, O. N.* Am. J. Sc. 12 (1876) 405-.
- observations. *Wartmann, É. F.* Arch. Sc. Ps. Nt. 55 (1876) 313-.
- *Canestrini, E.* Padova S. Sc. At. 9 (1885) 185-.
- polarisation stress. *Stoney, G. J.* B. A. Rp. (1879) 256.
- pressure in. *Donle, W.* A. Ps. C. 68 (1899) 306-.
- *Riecke, E.* Gött. Nr. (1899) 166-.
- pyro-electricity the cause of action. *Fonvielle, W. de.* C. R. 84 (1877) 122-.
- and telephone and theoscope, theory. *Challis, J.* Ph. Mg. 5 (1878) 452-.
- theories. *Lippmann, G. J.* de Ps. 5 (1876) 220-, 366-; Rv. Sc. 11 (1876) 392-.
- theory. *Challis, J.* [1875] Ph. Mg. 1 (1876) 395-.
- *Clausius, R.* Bonn Niedr. Gs. Sb. (1875) 309-.
- *Crookes, W.* J. Sc. 5 (1875) 337-; 6 (1876) 228-.
- *Challis, J.* Ph. Mg. 2 (1876) 374-.
- *Crookes, W.* C. R. 83 (1876) 1175-, 1232-, 1289-; 84 (1877) 388-.
- *Challis, J.* Ph. Mg. 3 (1877) 278-, 395-.
- *Mees, R. A.* Amst. Ak. Vs. M. 13 (1878) 265-; Arch. Néerl. 14 (1879) 97-.
- use as photometer. *Pedler, A.* Beng. As. S. P. (1876) 187-.
- (athermanous), use as photometer. *Coulon, R.* Lum. Élect. 4 (*1881) 344-.

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—, gaseous. *Herapath, J.* Tilloch Ph. Mg. 60 (1822) 18-; 62 (1823) 61-, 136-.

— of heated bodies. *Fresnel, A. J.* A. C. 29 (1825) 57-, 107-.

— — — *Powell, B.* Thomson Rc. 1 (1835) 250-.

— — — *Fusinieri, A.* A. Sc. Lomb. Ven. 7 (1837) 38-.

— between heated surfaces. *Powell, B.* B. A. Rp. (1834) 549-; Ph. Mg. 12 (1838) 317-.

— — — and certain pulverulent bodies. *Addams, R.* (vi *Adds.*) Ph. Mg. 6 (1835) 415-.

Repulsive power of heat. *Powell, B.* Phil. Trans. (1834) 485-.

— — — sun's rays. *Kérickuff, H. de.* C. R. 53 (1861) 1256-.

— — —, maximum. *Hirn, G. A.* C. R. 82 (1876) 1472-.

— — — —, — (Hirn). *Ledieu, A. C. H.* C. R. 83 (1876) 119-, 384-.

— — — —, — (Ledieu). *Hirn, G. A.* C. R. 83 (1876) 264-.

Resistance in gases. *Kleiber, I. A.* Rs. Ps.-C. S. J. 18 (Ps.) (1886) 52-; Fsch. Ps. (1886) (Ab. 2) 252.

Rotation, molecular, of gases. *Hinrichs, G.* C. R. 76 (1873) 1357-.

Solids, application of principles of mechanical theory of gases. *Mousson, A.* Arch. Sc. Ps. Nt. 2 (1879) 505-.

Solids and gases or vapours, molecular action between. *Rave, A.* (xii) Barcel. Ac. Mm. 1 (1878) 331-.

Space, relative occupation of, by gases. *Schmidt, G. A.* Ps. C. 6 (1879) 612-.

Spectra, line-, of elements. *Julius, V. A.* Amst. Ak. Vh. 26 (1888) 125 pp.; Delft Ec. Pol. A. 5 (1889) 1-.

Spectrum analysis, application to molecular mechanics. *Janssen, J. B. A.* Rp. (1888) 547-.

Steam funnel of locomotives. *Gregorio, A. de.* Palermo Ac. At. 3 (1895) (Sc. Nt.) 103-.

Stresses in rarefied gases arising from inequalities of temperature. *Maxwell, J. C.* [1878] Phil. Trans. 170 (1880) 231-.

Sunbeams and atoms. *Ball, (Sir) R.* Smiths. Rp. (1893) 121-.

Surface tension, density and heating, molecular theory. *Fuchs, K.* Exner Rpm. 24 (1888) 298-.

Theory of gases. *Prevost, P.* Bb. Un. 9 (1818) 192-.

— — —. *La Place, P. S. (marquis) de.* A. C. 18 (1821) 273-; Con. des Temps (1825) 219-, 302-, 386-.

— — —. *Krönig, A.* Pogg. A. 99 (1856) 315-.

— — —. *Stefan, J.* Wien SB. 47 (Ab. 2) (1863) 81-.

— — —. *Moutier, J. C. R.* 66 (1868) 344-.

— — —. *Wittwer, W. C. Z.* Mth. Ps. 14 (1869) 81-; 17 (1872) 13-.

— — —. *Puschl, K.* [1874] Wien Ak. Sb. 70 (1875) (Ab. 2) 413-.

— — — (perfect gases). *Walter, A. D. Nf. B.* (*1877) 105-.

— — —. *Bouty, E.* Rv. Sc. 18 (1880) 967-.

— — —, dynamical problems illustrating. *Rayleigh, (Lord).* Ph. Mg. 32 (1891) 424-.

— — —, Liouville's law and the corresponding law in. *Wind, C. H.* Wien Ak. Sb. 106 (1897) (Ab. 2a) 21-.

— — —, statistical dynamics illustrated by meteor swarms and optical rays. *Larmor, J. B. A.* Rp. (1900) 632-.

— — — liquids. *Konovalov, D.* Rs. Ps.-C. S. J. 18 (C.) (1886) 395-; Z. Ps. C. 1 (1887) 39-; 2 (1888) 1-.

— — —. *Stankevič, B. V.* [1889] Vars. S. Nt. Tr. (1889-90) (C. R., Ps. C.) No. 4, 3-, No. 5, 1-, No. 6, 11-.

— — — (incompletely miscible). *Fuchs, K.* Exner Rpm. 26 (1890) 664-.

— — —. *Jäger, G.* Wien Ak. Sb. 101 (1892) (Ab. 2a) 920-.

— — — with simple molecules. *Bakker, G. J. de* Ps. 6 (1897) 577-; 7 (1898) 511-.

Thermal condition of gases. *Puschl, K.* Wien SB. 45 (Ab. 2) (1862) 357-.

— — — transpiration and radiometer motion. *Sutherland, W.* Ph. Mg. 42 (1896) 373-, 476-.

— — —. *Reynolds, O.* Ph. Mg. 43 (1897) 142-.

— — —. *Sutherland, W.* Ph. Mg. 44 (1897) 52-.

Thermodynamic potential, kinetic interpretation. *Waals, J. D. van der.* Amst. Ak. Vs. 3 (1895) 205-; Arch. Néerl. 30 (1897) 137-.

Thermodynamic surface of water. *Goldhammer, D. A.* Mosc. Un. Mm. (Ps.-Mth.) 6 (1885) 1-.

Thermodynamics, second law, demonstration from mechanical principles. *Michelson, V. A.* Rec. Mth. (Moscou) 13 (1886) 229-.

— — —, and kinetic theory of gases. *Burbury, S. H.* Ph. Mg. 1 (1876) 61-.

Transformation of state of bodies, new theory. *Moulin, H.* Par. S. Ps. Sé. (1896) 45-, 268-.

Transformation layer between liquid and vapour. *Waals, J. D. van der.* [1888] Amst. Ak. Vs. M. 5 (1889) 171-; Fschr. Ps. (1888) (Ab. 2) 331-.

Vacuum, nature of so-called. *Preston, S. T.* Ph. Mg. 4 (1877) 110-.

— — —. *Stoney, G. J.* Ph. Mg. 4 (1877) 222-.

Velocities of gases. *Mott, A. J.* [1881] Lpool. Lt. Ph. S. P. 36 (1882) 81-.

Velocity of gases, limiting. *Pirogov, N. N.* Rs. Ps.-C. S. J. 18 (Ps.) (1886) 93-, 295-; Fschr. Ps. (1886) (Ab. 2) 238-.

— — —. (Pirogov). *Stankevič, B. V.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 32-.

— — —. (Stankevič). *Pirogov, N. N.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 133-.

— — —, molecular. *Brusotti, F.* Mil. I. Lomb. Rd. 5 (1872) 754-.

— — —. *Violi, A.* Rm. R. Ac. Linc. T. 8 (1884) 22-, 62-.

— — —, and velocity of sound. *Brusotti, F.* Mil. I. Lomb. Rd. 10 (1877) 209-.

— — — liquids, molecular. *Guglielmo, G.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 2) 254-.

— — —, mean, of molecules of imperfect gases. *Blaserna, P.* C. R. 69 (1869) 134-.

— — —, molecular. *Wächter, F.* Lieb. A. 191 (1878) 309-; 192 (1878) 256.

— — —. *Jäger, G.* Wien Ak. Sb. 99 (1891) (Ab. 2a) 860-.

— — —, and temperature. *Juppont, —.* Toul. Ac. Sc. Bll. 1 (1898) 117-.

— — — of reacting gas molecules. *Cantor, M.* A. Ps. C. 62 (1897) 482-.

— — —, total molecular, of body, results of calculation. *Sandrucci, A.* Rv. Sc.-Ind. 18 (1886) 217-, 267-.

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Clausius, R. Bonn Sb. Niedr. Gs. (1870) 114-; C. R. 70 (1870) 1314-.

Cerruti, V. Nap. Rd. 15 (*1876) 154-; As. Fr. C. R. 5 (1876) 122-.

Pirogov, N. N. Rs. Ps.-C. S. J. 20 (Ps.) (1888) 1-; 21 (Ps.) (1889) 219-; 23 (Ps.) (1891) 127-; Fschr. Ps. (1889) (Ab. 2) 207-; (1891) (Ab. 2) 248; Z. Mth. Ps. 37 (1892) 257-.

application to kinetic theory of gases. *Lorentz, H. A. A. Ps. C.* 12 (1881) 127-, 660-.

— — —. *Eddy, H. T.* Franklin I. J. 85 (1883) 339-, 409-.

— — —. *Sonin, N. J.* [1889] Vars. S. Nt. Tr. (1889-90) (C. R., Ps. C.) No. 7, 1-; Fschr. Ps. (1890) (Ab. 2) 247-.

case. *Clausius, R.* C. R. 78 (1874) 1731-.

of Clausius. *Combescuré, É.* [1869] *Mntp. Mm. Ac. Sect. Sc.* 7 (1867-71) 418-.

— — — *Lucas, F. C. R.* 79 (1874) 103-.

— — — *Basevi, C. E. Nt.* 52 (1895) 413-.

— — — *Gray, A. Nt.* 52 (1895) 568.

— — — *Burbury, S. H. Nt.* 52 (1895) 568.

— — — *Baynes, R. E. Nt.* 52 (1895) 569.

— — — and new theorem. *Yvon-Villargeau, A. C. R.* 75 (1872) 232-, 377-, 990-.

equation. *Clausius, R. C. R.* 75 (1872) 912-.

— $\frac{1}{2}m \frac{d^2r^2}{dt^2} = mv^2 + (Xx + Yy + Zz)$. *Mantel, W. N. Arch. Wisk.* 18 (1891) 127-.

— complete. *Grinwis, C. H. C. Amst. Ak. Vs. M.* 1 (1885) 19-; *Arch. Néerl.* 19 (1884) 461-.

— for gases and vapours. *Tait, P. G. Nt.* 45 (1892) 199-.

—, van der Waals's treatment of Laplace's pressure in. *Rayleigh, (Lord).* *Nt.* 44 (1891) 499.

— — — — — *Tait, P. G. Nt.* 44 (1891) 546-.

— — — — — *Rayleigh, (Lord).* *Nt.* 44 (1891) 597.

— — — — — *Tait, P. G. Nt.* 44 (1891) 627-.

equations and Clausius. *Kool, C. J. Laus. S. Vd. Bll.* 28 (1892) 87-.

forms, various. *Clausius, R. A. Ps. C. (Jubelbd.)* (1874) 411-.

and internal pressure in fluids. *Amagat, E. H. C. R.* 120 (1895) 489-, 580.

of system of hard colliding bodies. *Rayleigh, (Lord).* *Nt.* 45 (1892) 80-.

theorem, analogue to. *Rayleigh, (Lord).* *Ph. Mg.* 50 (1900) 210-.

in thermodynamics. *Herschel, A. S. Nt.* 18 (1878) 39-, 142.

Volatile bodies, motion of particles. *Bodaszewski, É. J. (XII) Kosmos (Lw.)* 6 (1881) 49; 7 (1882) 177-.

0250 Absorption and Adsorption of Gases.

(For Moser's Images, Thermography, see 4225.)

Absorbent powers of earths. *Leslie, John. Nicholson J.* 4 (1801) 196-.

Absorption of air by bodies. *Rhuland, —. J. de Ps.* 84 (1817) 88-.

— — — gases by caoutchouc. *Hüfner, G. A. Ps. C.* 34 (1888) 1-.

— — — — — *Kayser, H. A. Ps. C.* 43 (1891) 544-.

— — — charcoal. *Hasselt, A. van. (XII) Mbl. Nt.* 6 (1876) 111-.

— — — — — *Smith, R. A. R. S. P.* 28 (1879) 322-.

— — — glass. *Gáspár, J. Orv.-Termt. Éts. (Termt. Szak)* (1886) 51-.

Absorption of gases in liquids at different temperatures. *Bohr, C. A. Ps. C.* 62 (1897) 644-.

— — —, and temperature. *Müller-Erzbach, W. Exner Rpm.* 22 (1896) 538-.

— — — water vapour by solids. *Ihmori, T. A. Ps. C.* 31 (1887) 1006-.

— — — — — solutions. *Guglielmo, G. Tor. Ac. Sc. At.* 17 (1881) 54-.

Adhesion of air, to water vapour in particular. *Volz, W. L. Pogg. A.* 17 (1829) 89-.

— — — gases to substances. *Töpler, A. Riga Cor.-Bl.* 15 (1866) 42-.

— — — — — surface of solids. *Matteucci, C. C. R.* 64 (1867) 74-.

Adsorbed air layer on glass surfaces, thickness. *Schumann, O. A. Ps. C.* 27 (1886) 91-.

Adsorption of gases by powdered glass. *Müllerfarth, P. A. Ps.* 3 (1900) 328-.

—, variation with thickness of layer. *Müller-Erzbach, W. A. Ps. C.* 28 (1886) 684-; *Wien Ak. Sb.* 98 (1890) (*Ab. 2a*) 327-; *Exner Rpm.* 25 (1889) 565-; *D. Nf. Vh.* (1894) (*Th. 2, Hälfte 1*) 70-; *Wien Ak. Sb.* 105 (1896) (*Ab. 2a*) 263-.

Condensation of air on glass surfaces. *Dibbits, H. C. (XII) Mbl. Nt.* 7 (1877) 91-.

— — — — — *Voigt, W. A. Ps. C.* 19 (1883) 39-.

— — — carbon dioxide on glass surfaces. *Bunsen, R. W. A. Ps. C.* 20 (1883) 545-.

— — — — — *Kayser, H. A. Ps. C.* 21 (1884) 495-.

— — — — — *Bunsen, R. W. A. Ps. C.* 22 (1884) 145-.

— — — — — *Krause, H. A. Ps. C.* 36 (1889) 923-.

— — — — —, and diffusion through layers of grease. *Kayser, H. A. Ps. C.* 23 (1884) 416-.

— — — compressed carbon dioxide on glass under action of light. *Pfaundler, L. A. Ps. C.* 24 (1885) 493-.

— — — gases on glass surfaces. *Chappuis, P. A. Ps. C.* 8 (1879) 1-, 671-.

— — — — — *Bottomley, J. T. R. S. P.* 38 (1885) 158-.

— — — smooth bodies. *Magnus, G. Berl. B.* (1853) 378-.

— — — — — solids. *Bertrand, A., & Jamin, —. C. R.* 36 (1853) 994-.

— — — — — *Weber, F. Halle Z. Nw.* 40 (1872) 189-.

— — — — — and heat thereby disengaged. *Favre, P. A. C. R.* 39 (1854) 729-.

— — — — — surfaces. *Kayser, H. Berl. Ps. Gs. Vh.* (1885) 44-.

— — — — — and vapours on solids. *Quincke, G. Pogg. A.* 108 (1859) 326-.

— — — vapours on solids. *Magnus, G. A. Ps. C.* 121 (1864) 174-.

Gases contained in steel. *Anon. Oestr. Z. Brgw.* 32 (1884) 387-, 409-, 424-.

—, permanent, fixed by moist glass surfaces. *Mehlhorn, F. Berl. Ps. Gs. Vh.* (1898) 123-.

Occlusion of gases by coke. *Storer, F. H., & Lewis, D. S. Am. C. J.* 4 (1882-83) 409-.

— — — — — metallic oxides. *Richard's, T. W., & Rogers, E. F. Am. Ac. P.* 28 (1893) 200-.

0250 Occlusion of Gases

- Occlusion of gases by metals. *Odling, W.*
[1867] R. I. P. 5 (1869) 159-.
- — — — — *Bose, E.* Z. Ps. C. 34 (1900)
701-.
- — — — — platinum black. *Mond, L., Ramsay, W., & Shields, J.* Phil. Trans. (A) 190 (1898) 129-.
- — — — — hydrogen by iron. *Bellati, M., & Lussana, S.* Ven. I. At. (1888-89) 1321-.
- — — — — metals. *Graham, T. R. S. P.* 16 (1868) 422-; C. R. 66 (1868) 1014-.
- — — — — meteoric iron. *Graham, T. R. S. P.* 15 (1867) 502-; C. R. 64 (1867) 1067-.
- — — — — nickel, resistance of nickel. *Bellati, M., & Lussana, S.* Ven. I. At. (1887-88) 1567-.
- — — — — and oxygen by palladium. *Mond, L., Ramsay, W., & Shields, J.* Phil. Trans. (A) 191 (1898) 105-.
- — — — — platinum black. *Mond, L., Ramsay, W., & Shields, J.* Phil. Trans. (A) 186 (1896) 657-.
- — — — — phenomena. *Schutzenberger, P.* C. R. 98 (1884) 1520-.

0300 Capillarity. (See also Chemistry 7165.)

(For Spheroidal State see 1840.)

- Leslie, John.* Tilloch Ph. Mg. 14 (1802) 193-.
- Milon, —.* J. de Ps. 54 (1802) 128-.
- Örsted, H. C.* Kiøb. Ov. (1819-20) 12-.
- Poisson, S. D.* Magendie J. de Pl. 6 (1826) 361-.
- Emmett, J. B.* Ph. Mg. 1 (1827) 115-, 332-.
- Magnus, G.* Pogg. A. 10 (1827) 153-.
- Strong, T.* Silliman J. 18 (1830) 70-.
- Clausen, T.* Gruithuisen N. Analekt. 1 (1834) (Heft 2) 5-.
- Cooper, P.* Thomson R. C. 4 (1836) 344-.
- Örsted, H. C.* Kiøb. Ov. (1840) 22-; Erdm. J. Pr. C. 23 (1841) 472-.
- Simon, —.* C. R. 12 (1841) 892-; A. C. 32 (1851) 5-.
- Örsted, H. C.* A. C. 4 (1842) 379-.
- Mossotti, O. F.* (vi Adds.) II Cim. 4 (1846) 439-.
- Henry, J.* Am. Ph. S. P. 4 (1847) 176-.
- Desains, E.* [1852-56] C. R. 34 (1852) 765-; A. C. 51 (1857) 385-.
- Wertheim, G.* [1854] A. C. 63 (1861) 129-.
- Desains, E.* C. R. 43 (1856) 1077-.
- Zantedeschi, F.* Ven. At. (1855-56) 811-.
- Wertheim, G.* C. R. 44 (1857) 1022-.
- Osann, G.* [1858] Würzb. Vh. 9 (1859) 44-.
- Bède, É.* Brux. Mm. Cour. 4^o, 30 (1861) 198 pp.
- Bashforth, F. B. A.* Rp. (1862) (pt. 2) 2-.
- Bède, É.* [1862] (vii) Brux. Mm. Cour. 4^o, 32 (1865) 17 pp.; 33 (1867) 37 + 28 pp.
- Potter, R.* Camb. Ph. S. P. 1 (1866) 21-.
- Roger, É.* C. R. 62 (1866) 134-, 848-; 74 (1872) 1510-; 76 (1873) 816-.
- Tait, P. G.* Edinb. R. S. P. 5 (1866) 593-.
- Mensbrugge, G. van der.* Les Mondes 21 (1869) 302-.
- Duclaux, E.* J. de Ps. 1 (1872) 350-.
- Scholz, R. A.* Ps. C. 148 (1873) 62-.
- Tait, P. G.* [1873-75] (xi) Edinb. R. S. P. 8 (1875) 208-, 485.
- Spring, W.* Brux. Ac. Bl. 41 (1876) 914-.
- Coutance, A. G. A.* (xii) Brest S. Ac. Bl. 6 (1880) 81-.
- Eötvös, (báró) L.* (xii) Mag. Tud. Ak. Ets. 16 (No. 2) (1882) 48.
- Riley, J. T.* Ph. Mg. 15 (1883) 191-.
- Worthington, A. M.* [1885] Birm. Ph. S. P. 5 (1885-87) 83-.
- Thomson, (Sir) W.* [1886] R. I. P. 11 (1887) 483-.
- Nasse, O.* Meckl. Vr. Nt. Arch. (1889) xvi-.
- Gossart, É.* C. R. 113 (1891) 537-.
- Briggs, J. E.* [1896] Jam. I. J. 2 (1899) 212-.
- Mensbrugge, G. van der.* [1900] Sc. Abs. 4 (1901) 355.
- Absorption of gases, capillary. *Bunsen, R. W.* A. Ps. C. 24 (1885) 321-; 25 (1885) 680.
- Action of liquid on solid at short distance. *Cintolesi, F.* (xii) Rv. Sc.-Ind. 7 (1875) 219-.
- Adhesion. *Schwabe, H.* Anhalt Vh. Nt. Vr. 8 (1849) 10.
- , apparent. *Stefan, J.* Wien Ak. Sb. 69 (1874) (Ab. 2) 713-.
- experiments. *Ruhland, R. L.* Schweigger J. 11 (1814) 146-.
- , use of lamp-black in. *Geubel, H. K.* (xii) Arch. Phm. 121 (1852) 111-.
- , liquid. *Link, H. F.* Gilbert A. 24 (1806) 121-; 26 (1807) 146-.
- , —. *Tomlinson, C.* Ph. Mg. 33 (1867) 401-.
- between liquid and damp paper. *Dapples, C.* Laus. S. Vd. Bl. 15 (1878) (PV.) 91-.
- of liquids to mercury. *Gore, G.* Ph. Mg. 26 (1863) 142-.
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- , and temperature. *Brunner von Wattenmüll, C.* Berl. B. (1846) 181-.
- , —, *Frankenheim, M. L.* Pogg. A. 72 (1847) 177-.
- , —, *Kasterin, N. P.* Rs. Ps.-C. S. J. 25 (Ps.) (1893) 51-; J. de Ps. 3 (1894) 234-.
- modifications. *Addison, W.* R. S. P. 5 (1845) 560.
- nature and chemical importance. *Mohr, C. F.* Lieb. A. 196 (1879) 183-.
- and relationship to magnetism. *Ritter, J. W.* Gilbert A. 4 (1800) 1-.
- of salt solutions. *Schulze, F.* D. Nf. Tbl. (*1872) 122-.
- , *Quincke, G. H.* [1876] A. Ps. C. 160 (1877) 337-, 560-.
- , *Volkman, P.* A. Ps. C. 17 (1882) 353-; 53 (1894) 664-.
- semi-liquid body. *Bowen, H. C.* Sch. Mines Q. N. Y. 10 (1888) 297-.
- in snow crystal. *Dana, J. D.* Silliman J. 5 (1848) 100-.
- and submersion figures. *Tomlinson, C.* C. N. 55 (1887) 1-.
- surface tension of solidifying gold. *Heydweiller, A.* A. Ps. C. 62 (1897) 694-.
- theory. *Schmidt, G. G.* Münch. D. (1808) 279-.
- of water. *Carradori, G.* Brugnatelli G. 1 (1808) 467-.
- , experiments. *Runford, B.* (Count). [1806] Par. Mm. de l'I. (1807) (Sem. 2) 97-.
- , —, *Bellavitis, G.* Ven. At. 6 (1847) 86-.

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Drops 0300

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- water vapour in capillary spaces. *Mensbrugghe, G. van der.* Brux. Ac. Bil. 19 (1890) 101-.
- — — porous bodies. *Knop, W.* (viii) C. B. 7 (1862) 545-.
- — — —, especially soil. *Knop, W.* Dresden Lndw. V.-St. 6 (1864) 281-.
- Condensation-producing atmospheric dust, absorption by solid nuclei and surfaces, and diffusion velocity of supposedly non-ionised dust. *Barus, C.* Science 11 (1900) 201-.
- Condensed water on glass, amount and cause. *Warburg, E., & Ihmori, T.* A. Ps. C. 27 (1886) 481-.
- Constitution of liquids, dependence of capillarity on. *Wilhelmy, L.* [1863] (viii) A. Ps. C. 121 (1864) 44-; 122 (1864) 1-.
- — —, experiments. *Mensbrugghe, G. van der.* Brux. S. Sc. A. 20 (1896) (Pt. 1) 22-, 65-.
- — — and solids, important analogy. *Mensbrugghe, G. van der.* Brux. S. Sc. A. 19 (1895) (Pt. 1) 8-.
- and molecular weight, capillary phenomena in relation to. *Traube, J.* Berl. B. 17 (1884) 2294-.
- Contact angle. *Mensbrugghe, — van der.* Brux. S. Sc. A. 21 (1897) (Pt. 1) 85-.
- between liquid and solid wall. *Moutier, J.* C. R. 70 (1870) 612-.
- of liquid which does not wet glass. *Maltzoz, C.* C. R. 114 (1892) 977-.
- — — liquids with other liquids. *Fuchs, K.* A. Ps. C. 29 (1886) 140-.
- — — and solids. *Magie, W. F.* Ph. Mg. 26 (1888) 162-.
- — —, molecular theory. *Fuchs, K.* Exner Rpm. 26 (1890) 419-.
- — —, and spreading of liquids over solids. *Quincke, G. H.* A. Ps. C. 2 (1877) 145-.
- of liquids with other liquids, movements produced by. *Draparnaud, J. P. R.* A. C. 47 (1803) 303-.
- — — of very different surface tension, phenomena observed. *Mensbrugghe, G. van der.* Brux. Ac. Bil. 33 (1872) 223-.
- 2 liquids, theory of phenomena observed. *Moutier, J.* Par. Éc. Norm. A. 3 (1874) 69-.
- movements, and explanation. *Prevost, B., & Prevost, P.* Gen. Mm. S. Ps. 3 (1826) (pte. 2) 97-.
- — — myelin forms. *Lehmann, O.* A. Ps. C. 56 (1895) 771-.
- surface of liquid and solid, effects of molecular forces. *Mensbrugghe, G. van der.* Brux. Ac. Bil. 13 (1887) 11-.
- — — —, properties. *Mensbrugghe, G. van der.* Brux. Ac. Bil. 40 (1875) 341-; 16 (1888) 695-; 17 (1889) 518-.
- Contact surface of 2 liquids having mutual attraction. *Mensbrugghe, G. van der.* C. R. 111 (1890) 169-; Brux. Ac. Bil. 20 (1890) 32-, 253-; 21 (1891) 420-.
- Curvature, influence. *Résal, H.* N. A. Mth. 12 (1873) 78-.
- Density variations near surface of liquid. *Monti, V.* Tor. Ac. Sc. At. 31 (1895) 150- or 194-.
- DROPS.
- Guthrie, Fred.* R. S. P. 13 (1864) 444-.
- of alcohol, movement on side of glass. *Gossart, É.* Rv. Sc. 49 (1892) 513-.
- breaking up of liquid streams into, theory. *Fuchs, K.* Exner Rpm. 27 (1891) 109-.
- equilibrium between 2 horizontal plates. *Bosscha, J.* Amst. Ak. Vs. M. 9 (1876) 259-; Arch. Néerl. 11 (1876) 467-.
- experiments. *Gand, É.* Les Mondes 24 (1871) 674-.
- falling, oscillations. *Lenard, P.* A. Ps. C. 30 (1887) 209-.
- , shape at moment of detachment. *Mathieu, É.* J. de Ps. 3 (1884) 203-.
- floating on surface of water. *Reynolds, O.* [1881] Manch. Lt. Ph. S. P. 21 (1882) 1-.
- formation. *Seezen, E. L.* Riga Cor.-Bl. 17 (1868) 37-.
- *Duclaux, E.* C. R. 70 (1870) 933-.
- *Bosscha, J.* [1871] (xii) Amst. Ak. Wet. P. (1871-72) (No. 5) 2-.
- *König, W.* Frkf. a. M. Ps. Vr. Jbr. (1892-93) 26.
- and efflux in electric and magnetic fields. *Umov, N. A.* Mosc. S. Sc. Bil. 92 (No. 2) (1896) 1-; Arch. Sc. Ps. Nt. 2 (1896) 524-.
- ‘halbbegrenzte.’ *Lehmann, O.* A. Ps. C. 43 (1891) 516-.
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- — — *Cima, A.* N. Cim. 3 (1856) 386-.
- — — (Cima). *Bizio, B.* N. Cim. 4 (1856) 105-.
- — — *Cintolesi, F.* Arch. Sc. Ps. Nt. 60 (1877) 369-.
- of mercury, chemotropic behaviour. *Bernstein, J.* Pflüg. Arch. Pl. 80 (1900) 628-.
- — —, resistance in capillary tubes. *Toscani, C.* N. Cim. 18 (1863) 226-.
- molten metals, certain regularities in weight. *Thaddeeff, K.* Berl. B. 28 (1895) 195-.
- — — — — *Traube, J.* Berl. B. 28 (1895) 419.
- oil, motion in alkaline solution. *Trouton, F. T.* Nt. 48 (1893) 529.
- pendent. *Worthington, A. M.* R. S. P. 32 (1881) 362-; L. Ps. S. P. 6 (1885) 355-; Ph. Mg. 19 (1885) 46-.
- rising in mass of denser liquid, deformation. *Résal, H. A.* C. R. 96 (1883) 822-.
- size under different circumstances. *Tate, T.* Ph. Mg. 27 (1864) 176-.

- size, dependence on external influences. *Traube, J.* Berl. B. 19 (1886) 1679-.
- ; and other investigations in capillarity. *Rayleigh, (Lord).* Ph. Mg. 48 (1899) 321-.
- , variations with interval between fall. *Binnie, W. B. A. Rp.* (1890) 731.
- on solid bodies, particularly on cylinders. *Lasswitz, C. T. V. K. A. Ps. C. Ergänz. 6* (1874) 441-.
- surface of ether, phenomena. *Sire, G. C. R.* 37 (1853) 657-.
- of water, fall. *Lullin, T.* [1894] Arch. Sc. Ps. Nt. 33 (1895) 252-.
- , travels and metamorphoses. *Mensbrugghe, G. van der.* Brux. Ac. Bil. 50 (1880) 423-.
- weight, effect of rate of formation. *Hannay, J. B.* Edinb. R. S. P. 20 (1895) 437-.
- , various liquids. *Boymond, —.* Humb. 3 (1884) 343.
- Dust-figures and mercury-figures. *Marx, C. M. Schweigger J. 54 (=Jb. 24)* (1828) 212-.
- Electricity, application to study of spontaneous motion of liquids. *Decharme, C. Lum. Élect.* 19 (1886) 289-, 341-, 395-, 449-.
- Equilibrium and motion of liquid under mutual action of molecules. *Sludskii, T. A.* (xii) Rec. Mth. (Moscou) [1] (1866) (Suppl.) 20 pp.
- Evaporation and capillarity, relation between theories. *Stefan, J.* Wien Ak. Sb. 94 (1887) (Ab. 2) 4-.
- from curved surface. *Winkelmann, A. A. Ps. C.* 35 (1888) 401-.
- of liquids, and theories of capillarity. *Mensbrugghe, G. van der.* C. R. 121 (1895) 461-.
- Evolution of gases or vapours, rôle of capillarity. *Almeida, J. C. d'.* C. R. 68 (1869) 442-, 533-.
- Expansion and capillary temperature coefficients. *Kablukov, I. Rs. Ps.-C. S. J.* 19 (C.) (1887) 173-; C. Ztg. 11 (1887) 477.
- Experimental physical communications. *Seyffer, O. E. J.* Würtb. Jh. 6 (1850) 198-.
- Experiments. *Link, H. F.* Pogg. A. 29 (1833) 404-; 31 (1834) 593-.
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- *Desains, É.* A. C. 63 (1861) 447-.
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- — — — —, explanation. *Maistre, X. de.* Bb. Un. 35 (1841) 192-.
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- , proof. *Deguin, —.* [1838] Toul. Mm. Ac. 5 (1839) 143-.
- , — *Lévy, L.* N. A. Mth. 8 (1889) 111-.
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- Pouillet, C. S. M. A. C.* 20 (1822) 141-.
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- Hydrometers, influence of capillarity. *Langberg, C.* (vii) *Ps. Mdd.* (1858) 1-.
- , —, —. *Jacobi, H.* [1871] *St. Pét. Ac. Sc. Mm. (Rs.)* 20 (*1872) (*App. No.* 4) 97 pp.; *St. Pét. Ac. Sc. Mm.* 17 (1872) (*No.* 5) 70 pp.
- , —, —. *Duclaux, É.* *J. de Ps.* 1 (1872) 197-.
- , —, —. *Coulier, —.* *J. Phm.* 23 (1876) 175-.
- , —, —. *Mensbrugge, G. van der.* *Brux. Ac. Bil.* 16 (1888) 31-.
- , —, — and pressure of air. *Stankart, F. J.* *Amst. Vs. Ak.* 1 (1866) (*Ntk.*) 320-; *Arch. Néerl.* 1 (1866) 355-.
- Hydrostatic pressure, negative. *Mensbrugge, G. van der.* *Brux. Ac. Bil.* 25 (1893) 365-433-.
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- , —, — and gases. *Puschl, C.* *Wien Ak. Sb.* 100 (1891) (*Ab. 2a*) 994-.
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- of liquid, photography. *Cohen, E.* *Rv. Sc.* 44 (1889) 252-.
- water, colliding. *Newall, H. F.* *Ph. Mg.* 20 (1885) 31-.
- , —, influence of electric field. *Mensbrugge, — van der.* *Brux. S. Sc. A.* 21 (1897) (*Pt. 1*) 127-.
- , —, instantaneous photographs. *Rayleigh, (Lord).* *B. A. Rp.* (1890) 752.

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- Sondhaus, K. F. J.* *A. Ps. C.* 157 (1876) 73-.
- Rücker, A. W.* [1885] *R. I. P.* 11 (1887) 243-.
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- lecture experiment. *Weinmann, J.* *Basel Vh.* 9 (1893) 243-.

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- Plateau, J. A. F.* *Brux. Ac. Sc. Mm.* 16 (1843) 34 pp.; 23 (1849) 150 pp.; *Pogg. A.* 80 (1850) 566-; *Brux. Ac. Sc. Mm.* 30 (1857) 56 pp.; 31 (1859) 52 pp.; 33 (1861) 46+63 pp.; *C. R.* 53 (1861) 461-; *Brux. Ac. Sc. Mm.* 36 (1867) 66 pp.; 37 (1869) 102+56+52+63+21 pp.
- Moutier, J.* *Par. S. Phlm. Bil.* 12 (1875) 90-.
- Plateau, J. A. F.* *Brux. Ac. Bil.* 2 (1881) 8-; 6 (1883) 704-.
- limiting rotation surfaces. *Terquem, A. C. R.* 92 (1881) 407-.
- Plateau's* experiments. *Beer, A.* *Pogg. A.* 100 (1857) 459-; 102 (1857) 320.
- , —. *Schwabe, H.* *Anhalt Vh. Nt. Vr.* 18 (1859) 10-.

- Plateau's* experiments (new phenomena). *Brewster, (Sir) D.* *Edinb. R. S. T.* 24 (1867) 505-.
- (liquid for). *Böttger, R.* *A. Ps. C.* 140 (1870) 660.
- , —. *Anders, T.* *Riga Cor.-Bl.* 33 (1890) 7-.
- , —. *Lindemann, —.* *Königsb. Schr.* 30 (1890) (*Sb.*) 16-.
- films (permanent). *Thompson, S. P.* [1877] *L. Ps. S. P.* 2 (1879) 209-; *Ph. Mg.* 5 (1878) 269-.
- systems. *Terquem, A.* *Par. S. Ps. Sé.* (1878) 115-; *C. R.* 86 (1878) 1057-.
- motion, equilibrium and forms. *Brewster, (Sir) D.* [1868] *Edinb. R. S. T.* 25 (1869) 111-.
- in motion, general property. *Mensbrugge, G. van der.* *Brux. Ac. Bil.* 1 (1881) 286-.
- motions. *Brewster, (Sir) D.* *Edinb. R. S. T.* 24 (1867) 653-.
- permanent, method of obtaining. *Malagoli, R.* *N. Cim.* 11 (1900) 351-.
- stability. *Lamarle, E.* [1864] *Brux. Ac. Sc. Mm.* 35 (1865) 104 pp.; 36 (1867) 165 pp.
- , —. *Fuchs, K.* *Exner Rpm.* 27 (1891) 715-.
- on surface of solids. *Quincke, G.* *A. C. 28* (1873) 286-.
- tension. *Mensbrugge, G. van der.* *Brux. Ac. Bil.* 22 (1866) 308-; 23 (1867) 448-; *C. R.* 64 (1867) 281; 65 (1867) 41-.
- , —. *Lüdtge, R.* *A. Ps. C.* 139 (1870) 620-.
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- , —. *Sondhaus, K. F. J.* *A. Ps. C. Ergänz.* 8 (1878) 266-.
- thermal effect of drawing out. *Thomson, (Sir) W.* [1858] *R. S. P.* 9 (1857-59) 255-.
- thickness and electrical resistance. *Reinold, A. W., & Rücker, A. W.* [1893] *Phil. Trans.* (A) 184 (1894) 505-.
- , limiting. *Reinold, A. W., & Rücker, A. W.* [1883] *Phil. Trans.* 174 (1884) 645-.
- , —. *Fischer, K. T.* [1896] *A. Ps. C.* 68 (1899) 414-.
- on wetted solids. *Clark, J. W.* *Nt.* 27 (1883) 370-.

- Liquid surfaces. *Hagen, G. H. L.* *Berl. Ab.* (1845) (*Mth.*) 41-; (1846) 1-.
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- , —, — (Lamarle). *Dupré, A.* *C. R.* 64 (1867) 902-.
- , —, —. *Massieu, F.* (x) *Fr. Cg. Sc.* 38 (1872) (2) 3-.
- , —, curved, equilibrium of vapour at. *Thomson, (Sir) W.* *Ph. Mg.* 42 (1871) 448-.
- , —, figures produced by second liquid. *Destrem, J. A., & Frébault, A.* (xii) *Toul. S. Sc. Bil.* 3 (1875-76) 148-.

- Liquid surfaces, free, physical properties. *Mensbrugghe, G. van der.* Brux. Ac. Bl. 17 (1889) 151-.
- , —, fundamental theorem. *Dupré, A. C. R.* 64 (1867) 741-.
- , —, impact with. *Worthington, A. M. R. S.* P. 33 (1882) 347-; 34 (1883) 217-.
- , —, —, photographic study. *Worthington, A. M., & Cole, R. S.* [1896-99] Phil. Trans. (A) 189 (1897) 137-; (A) 194 (1900) 175-.
- , —, instability of equilibrium. *Mensbrugghe, G. van der.* Brux. Ac. Bl. 11 (1886) 341-; 12 (1886) 623-, [898].
- , —, in motion, curious phenomena observed at. *Mensbrugghe, G. van der.* Brux. Ac. Bl. 48 (1879) 346-.
- , —, phenomena established in. *Mensbrugghe, G. van der.* Brux. Ac. Bl. 30 (1895) 488-.
- , —, plane, normal pressure at. *Kool, C. J. Laus. S. Vd. Bl.* 29 (1893) xiii-.
- , —, potential energy. *Mensbrugghe, G. van der.* Cuyper Rv. Un. 14 (1883) 308-.
- , —, —, applications. *Mensbrugghe, G. van der.* Brux. Ac. Bl. 46 (1878) 635-; 47 (1879) 326-.
- , —, —, variations (application of thermodynamics). *Mensbrugghe, G. van der.* Brux. Ac. Bl. 41 (1876) 769-; 42 (1876) 21-; 49 (1880) 620-.
- , —, —, —. *Mensbrugghe, G. van der.* [1878] Brux. Ac. Mm. 43 (1882) (No. 4) 39 pp.
- , —, properties. *Blondlot, R.* Nancy S. Sc. Bl. (1884) 25-.
- , —, —. *Barcroft, J.* [1895] Belfast NH. S. Rp. & P. (1895-96) 24-.
- , —, of revolution, critical mean curvature. *Rücker, A. W. B. A. Rp.* (1886) 518-; *L. Ps. S. P.* 8 (1887) 108-; *Ph. Mg.* 23 (1887) 35-.
- Meniscus, barometric, variations. *Ragona-Scinà, D.* Palomba Rac. 2 (1846) 43-, 49-.
- , of liquids, vertical action. *Mensbrugghe, G. van der.* Brux. Ac. Bl. 8 (1884) 326-.
- , —, mercury surface. *Danger, F. P. A. C.* 24 (1848) 501-; *C. R.* 27 (1848) 381-.
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- , —, on iron wires. *Kemp, K. T.* Edinb. N. Ph. J. 6 (1829) 340-.
- , —, covered with sulphuric acid, movement. *Prandi, P.* (viii) Bologna Opusc. Sc. N. Col. (1824) 117-.
- , —, depression, capillary. *Young, (Dr.) T.* [Signed S. B. L.] [1820] QJ. Sc. 11 (1821) 83-.
- , —, —. *Ivory, J.* Tilloch Ph. Mg. 57 (1821) 267-.
- , —, —. *(Ivory). Young, (Dr.) T.* [Signed S. B. L.] Tilloch Ph. Mg. 57 (1821) 376-.
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- , —, —. *Ekelund, A. W.* Lund Phys. Sällsk. Ts. 1 (1837) 125-.
- , —, —. *Goutkowski, C., & Mendelejeff, D.* A. Ps. C. Beibl. 1 (1877) 455-.
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- , —, forces. *Quincke, G. H.* [1873] (xi) Würzb. Ps. Md. Vh. 6 (1874) (Sb.) viii-.
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- , —, distance at which they are effective. *Quincke, G. A. Ps. C.* 137 (1869) 402-.
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- , —, physics. *Weinberg, B. P.* Rs. Ps.-C. S. J. 32 (Ps.) (1900) 66; *Fschr. Ps.* (1900) (Ab. 1) 276.
- , —, pressure. *Bakker, G. Z. Ps. C.* 12 (1893) 280-.
- Motion of liquids in capillary spaces. *Duclaur, É. A. C.* 25 (1872) 433-; *C. R.* 74 (1872) 368-.
- , —, peculiar. *Cauchy, A. L.* Par. Éc. Pol. J. (19^e cah.) (1823) 204-.

MOTION OF SOLIDS AND LIQUIDS ON LIQUIDS.

- Lehot, C. J.* Bb. Brit. 59 (1815) 377-.
- Carradori, G.* Brugnatielli G. 9 (1816) 124-; 10 (1817) 274-.
- Gillieron, L.* Bb. Un. 26 (1824) 190-.
- Moutier, J.* Par. S. Phlm. Bl. 4 (1880) 245-.
- Le Conte, J.* Am. J. Sc. 27 (1884) 307-.
- Benzoic acid on water. *Tomlinson, C. C. N.* 10 (1864) 25.
- Camphor. *Levat, —.* As. Fr. C. R. (1891) (Pt. 2) 331-.
- , —, and other bodies. *Schweigger-Seidel, F. W.* Schweigger J. 44 (=Jb. 14) (1825) 285-.
- , —, —. *Fechner, G. T.* Kastner Arch. Ntl. 9 (1826) 408-.
- , —, —, on water. *Prevost, B. A. C.* 21 (1797) 254-; 22 (1797) 111-; 24 (1797) 31-.
- , —, —, — (Prevost). *Carradori, G.* A. C. 37 (1800) 38-.
- , —, —, —. *(—). Biot, J. B.* Par. S. Phlm. Bl. 3 (1801) 42-.
- , —, —, —, and mercury. *Boisgiraud, —, & Joly, —.* C. R. 12 (1841) 690-.
- , —, —, —. *Fusiniéri, A.* (vi Add.) Majocchi A. Fis. C. 3 (1841) 157-.
- , —, liquids on water. *Tomlinson, C. Ph.* Mg. 46 (1873) 376-.

Camphor on Water.

- Venturi, G.* [1797] Par. Mm. Sav. Étr. 1 (1806) 125-.
- Carradori, G.* Brugnatielli G. 1 (1808) 97-.
- Barlocci, S. G.* Arcad. 2 (1819) 226-.
- B., F.* (vi Add.) Thomson A. Ph. 8 (1824) 75-.
- Matteucci, C. A.* Sc. Lomb. Ven. 3 (1833) 194-.
- Dutrochet, H. C. R.* 12 (1841) 2-, 29-, 126-, 598-.

- (Dutrochet.) *Biot, J. B. C. R.* 12 (1841) 621-, 667-.
- Fusiniere, A. A. Sc. Lomb. Ven.* 11 (1841) 6-.
- Nüschel, A. (viii) Riga Cor.-Bl.* 3 (1849) 20-, 33-.
- Tomlinson, C. C. N.* 8 (1863) 28, 37-, 123-; *Intell. Obs.* 4 (1864) 17-; *Ph. Mg.* 38 (1869) 409-; *C. N.* 36 (1877) 215-.
- Skey, W.* [1878-80] *N. Z. I. T.* 11 (1879) 473-; 12 (1880) 403-.
- Casamajor, P.* *Am. C. S. J.* 7 (1885) 13-.
- Hart, T. C. N.* 51 (1885) 277-.
- Tomlinson, C. C. N.* 52 (1885) 50.
- Rayleigh, (Lord). R. S. P.* 47 (1890) 364-.
- action of oils. *Tomlinson, C. Ph. Mg.* 26 (1863) 187-; *R. S. P.* 48 (1891) 258.
- motion connected with electricity. *Virey, J. J. J. Phm.* 5 (1819) 237-.
- — — — *Casamajor, P. C. N.* 36 (1877) 191-, 285-.
- Creosote on water. *Tomlinson, C. Ph. Mg.* 22 (1861) 111-.
- Eugenic acid on water. *Tomlinson, C. Ph. Mg.* 27 (1864) 528-.
- Floating bodies, apparent attractions and repulsions. *Le Conte, (Prof.) J. Am. J. Sc.* 24 (1882) 416-.
- — — — —, elementary theory. *Mensbrugghe, G. van der. Brux. Ac. Bil.* 5 (1883) 482-.
- — — — — when vapours of volatile liquids are allowed to fall on liquid surfaces. *Dutrochet, H. C. R.* 14 (1842) 1028-; 15 (1842) 25-.
- — — — —, attractive power on water. *Carradori, G. Tilloch Ph. Mg.* 11 (1801) 27-.
- — — — —, horizontal motion under capillary forces. *Worthington, A. M. Ph. Mg.* 15 (1883) 198-.
- — — — —, small, experiment of Mariotte's. *Bouty, E. J. de Ps.* 2 (1873) 263-.
- — — — —, needles, attraction. *Camilli, S. G. Arcad.* 37 (1828) 159-.
- Liquids on water. *Tomlinson, C.* [1869] *Ph. Mg.* 39 (1870) 32-.
- Organic acids, crystals. *Schefczik, A. Wien Jb. Gl.* 6 (1855) 263-.
- Phosphorus on mercury. *Carradori, G. Brugnatielli G.* 3 (1810) 261-.
- Powders on water. *Marangoni, C. Rm. R. Ac. Line. Rd.* 4 (1888) (*Sem.* 1) 520-.
- Salts on water, gyratory movements. *Lescœur, H. Par. S. C. Bil.* 24 (1875) 270-.
- Solids, gyratory movements. *Weber, R. Arch. Sc. Ps. Nt.* 12 (1884) 510-.
- Substance which moves on water like camphor. *Morren, C. F. A. Quetelet Cor. Mth.* 10 (1838) 339-.
- Wicks, small lighted, on oil. *Wilson, P.* [1795] *Edinb. R. S. T.* 4 (1798) 163-.
- Motions, rotatory, in mixture of alcohol and laurel oil. *Hancock, T. Edinb. J. Sc.* 3 (1830) 51-.
- — — — — mixtures of water and volatile liquids. *Harting, P. Amst. Vs. Ak.* 3 (1855) 445-; *Pogg. A.* 97 (1856) 50-.
- Motions, spontaneous, of certain bodies in proximity or contact. *Prevost, B. A. C. 40* (1801) 1-.
- — — — — (Prevost). *Carradori, G. A. C.* 48 (1803) 197-.
- — — — — on surface of alcoholic liquors, certain curious. *Thomson, Jas. B. A. Rp.* (1855) (*pt.* 2) 16-.
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- — — — — drops on water. *Challis, J. Ph. Mg.* 8 (1836) 288-.
- — — — — films, thin, on water, properties. *Oberbeck, A. A. Ps. C.* 49 (1893) 366-.
- — — — — on water, molecular forces illustrated by. *Oberbeck, —. N.-Vorp. Mt.* 24 (1892) xxiv-.
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- — — — — specified diameter, method of obtaining. *Barus, C. Ps. Rv.* 6 (1898) 52-.
- Porous mass, experiments on absorption. *Magrini, L. Mil. I. Lomb. Rd.* 1 (1864) 221-.
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- Ripples, interference. *Matthiessen, L. A. Ps. C.* 32 (1887) 626-.
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— — and conductivity of solutions of potassium chloride and sulphate. *Barnes, J.* [1899] N. Scotia I. Sc. P. & T. 10 (1903) 49-.

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— — at high temperatures. *Kasterin, N. P.* Rs. Ps.-C. S. J. 24 (Ps.) (1892) 196-; J. de Ps. 2 (1893) 529-.

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— — —, value at different heights. *Marangoni, C.* Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 1) 515-.

— — metals. *Gouy, —.* C. R. 114 (1892) 343-.

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- — —, investigated by method of ripples. *Rayleigh, (Lord)*. Ph. Mg. 30 (1890) 386-.
- of water and mercury, influence of electrification. *Merritt, E., & Barnett, S. J.* Ps. Z. 1 (1900) 249-.
- — — —, measurement by capillary tubes. *Quincke, G.* [1894] A. Ps. C. 52 (1894) 1-; Heidl. Nt. Md. Vh. 5 (1897) 228-.
- — — — (Quincke). *Lohnstein, T.* A. Ps. C. 53 (1894) 1062-.
- — — in narrow capillaries. *Volkman, P.* A. Ps. C. 66 (1898) 194-.
- — —, variation with temperature. *Weinberg, B. P.* Rs. Ps.-C. S. J. 24 (*Ps.*) (1892) 44-; J. de Ps. 1 (1892) 378-; Z. Ps. C. 10 (1892) 34-.
- — — —. *Lohnstein, T.* Z. Ps. C. 10 (1892) 504-.
- Surface viscosity of films of solution of sapo-
nine. *Mensbrugghe, G. van der*. Brux. Ac. Bil. 29 (1870) 368-.
- — — water. *Rayleigh, (Lord)*. R. S. P. 48 (1891) 127-.
- Temperature, influence on capillarity. *Fran-
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- — — —. *Buys-Ballot, C. H. D.* Pogg. A. 71 (1847) 177-.
- — — — (Buys-Ballot). *Merian, R.* Pogg. A. 73 (1848) 485-.
- — — —. *Franckenheim, M. L.* Pogg. A. 75 (1848) 229-; 77 (1849) 445-.
- — — — (Franckenheim). *Buff, W.* Pogg. A. 78 (1849) 578-.
- — — —. *Wolf, C.* A. C. 49 (1857) 230-.
- — — —. *Drion, C.* A. C. 56 (1859) 221-.
- — — — (angle). *Traube, J.* J. Pr. C. 31 (1885) 514-.
- at which liquids cease to moisten vessels which contain them. *Wolf, C.* C. R. 42 (1856) 968-.
- Textile bands, effects of atmospheric changes. *Woodbury, C. J. H.* Franklin I. J. 78 (1879) 52-.
- Theorem of Laplace. *Canestrini, E.* Rv. Sc.-Ind. 23 (1891) 125-.

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- La Place, P. S. (marquis) de*. Par. Éc. Pol. Cor. 1 (1804-08) 246-; J. de Ps. 62 (1806) 120-; 63 (1806) 248-, 413-; 65 (1807) 88-.
- Brandes, H. W.* Gilbert A. 33 (1809) 38-.
- Knight, T.* Nicholson J. 27 (1810) 126-.
- La Place, P. S. (marquis) de*. Par. S. Phlm. Bil. (1819) 122-.
- Buquoy, G. von*. Oken Isis (1824) 1068-.
- Ivory, J.* Ph. Mg. 3 (1828) 1-.
- Sang, E.* Edinb. N. Ph. J. 8 (1830) 280-.
- Poisson, S. D.* A. C. 46 (1831) 61-.
- Parrot, G. F.* Pogg. A. 27 (1833) 234-.
- Challis, J. B.* A. Rp. (1834) 253-; Ph. Mg. 8 (1836) 89-.
- Mainardi, G.* [1836] Mod. S. It. Mm. 21 (1837) 301-.

- Mile, J.* Pogg. A. 45 (1838) 287-, 501-.
- Roselli, E.* G. Arcad. 113 (1847) 3-.
- Bertrand, J.* Liouv. J. Mth. 13 (1848) 185-.
- Davidof, A. von.* Mosc. Bil. S. Nt. 28 (1855) 354-.
- Valson, C. A.* C. R. 45 (1857) 10-.
- Gilbert, —.* C. R. 45 (1857) 771-.
- Valson, C. A.* C. R. 46 (1858) 95-.
- Nägeli, C.* Münch. Sb. (1866) (I.) 597-.
- Betti, E.* N. Cim. 25 (*1867) 81-, 225-.
- Mousson, A.* Zür. Vjschr. 15 (1870) 305-.
- Sang, E.* [1870] Edinb. R. S. P. 7 (1872) 160-.
- Stahl, J.* A. Ps. C. 139 (1870) 239-.
- Boscha, J.* [1871] (xii) Amst. Ak. Wet. P. (1871-72, No. 3) 5-.
- Moutier, J.* J. de Ps. 1 (1872) 291-; Par. S. Phlm. Bil. 1 (1877) 45-.
- Heringa, P. M.* N. Arch. Wisk. 4 (*1878) 1-; Arch. Néerl. 13 (1878) 1-; 15 (1880) 124-.
- Reinhold, A.* Arch. Mth. Ps. 63 (1879) 110-.
- Roger, E.* C. R. 90 (1880) 908-.
- Padova, E.* Rm. R. Ac. Linc. Rd. 1 (1892) (Sem. 1) 331-.
- Langlois, M.* C. R. 123 (1896) 35-.
- Rozing, B. L.* Rs. Ps.-C. S. J. 30 (Ps.) (1898) 209-.
- Bakker, G.* Z. Ps. C. 33 (1900) 477-.
- dynamical. *Bakker, G.* J. de Ps. 8 (1899) 545-; 9 (1900) 394-.
- and experiments of Professor Dewar. *Mensbrugghe, G. van der.* Brux. S. Sc. A. 24 (1900) (Pt. 1) 58-.
- Gauss's. *Lippmann, G.* J. de Ps. 6 (1877) 108-.
- , and spreading of one liquid over another. *Mensbrugghe, G. van der.* Brux. Ac. Bil. 39 (1875) 375-.
- and hydrostatics. *Grusintzew, A. P.* Fschr. Mth. (1899) 734-.
- kinetic. *Delsaulx, (le rév. père) J.* Brux. S. Sc. A. 12 (1888) (Pt. 2) 105-.
- Laplace's. *Pessuti, G.* Mod. S. It. Mm. 14 (1809) 87-.
- (simplification). *Kries, F.* Gehlen J. 9 (1810) 104-.
- *Knight, T.* Nicholson J. 28 (1811) 155-.
- *Brunacci, V.* Brugnattelli G. 9 (1816) 7-, 127-, 163-, 241-, 343-.
- (Brunacci). *Petit, A. T.* A. C. 4 (1817) 54-.
- *Rayleigh, (Lord).* Ph. Mg. 16 (1883) 309-.
- *Worthington, A. M.* Ph. Mg. 16 (1883) 339-.
- *Mensbrugghe, G. van der.* J. de Ps. 8 (1889) 83-.
- mathematical. *Petit, A. T.* Par. Éc. Pol. J. 16^e cah. (1813) 1-.
- *Rudberg, F.* Stockh. Ak. Hndl. (1819) 153-; (1822) 25-.
- *Résal, H. A.* Liouv. J. Mth. 7 (1881) 341-.
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- molecular action. *Valson, C. A.* [1864-70] (xii) Isère S. Bil. 7 (Livr. 3 & 4) (1867) 253-, 463; (viii) A. C. 20 (1870) 361-; C. R. 70 (1870) 1040-.
- Poisson's. *Link, H. F.* Pogg. A. 25 (1832) 270-; 27 (1833) 193-.
- and principle of virtual velocity. *Boltzmann, L.* A. Ps. C. 141 (1870) 582-.
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- thermodynamic. *Waals, J. D. van der.* Amst. Ak. Vh. (Sect. 1) 1 (1893) No. 8, 56 pp.; Arch. Néerl. 28 (1895) 121-.
- (van der Waals's). *Sutherland, W.* Z. Ps. C. 17 (1895) 536-.
- (— — —). *Bakker, G.* Z. Ps. C. 28 (1899) 708-; 34 (1900) 168-.
- (Molecular potential function of van der Waals.) *Bakker, G.* Amst. Ak. Vs. 8 (1900) 223-; Amst. Ak. P. 2 (1900) 163-.
- (Potential function $\phi(r) = \frac{Ae^{-gr} + Be^{gr}}{r}$ and $\phi(r) = \frac{A \sin(qr + \alpha)}{r}$) and potential function of van der Waals.) *Bakker, G.* Amst. Ak. Vs. 8 (1900) 308-; Amst. Ak. P. 2 (1900) 247-.
- Young-Laplace. *Weinstein, B.* A. Ps. C. 27 (1886) 544-.
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- —, theory. *Jäger, G.* Wien Ak. Sb. 99 (1891) (Ab. 2a) 679-.
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- , ground-, theoretical investigation of motion. *Slichter, C. S.* U. S. Gl. Sv. Rp. (1897-98) (Pt. 2) 295-.
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- Wave, capillary. *Langton, J.* Cn. J. 2 (1857) 96-; Nt. 5 (1872) 241-.

- Waves on surface of mercury. *Faye, H. A. É.* C. R. 58 (1864) 565-.
- , velocity of propagation, influence of capillarity. *Koláček, F. A. Ps. C. 5* (1878) 425-; 6 (1879) 616.
- Wetting surfaces of various bodies, experiments. *Degen, A. F. E. Pogg. A. 38* (1836) 449-.

0310 Osmosis. Osmotic Pressure.

(See also Chemistry 7155.)

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- Graham, T. C. R. 53* (1861) 275-; *Phil. Trans.* (1861) 183-.
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- Favrot, C. (vi Add.) N. Cim.* 18 (1863) 151-.
- Jahn, J. N. Živa* (1863) 56-.
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- Graham, T. C. R. 63* (1866) 937-.
- Dubrunfaut, —. C. R. 63* (1866) 994-.
- and absorption of gases by colloid septa. *Graham, T. Phil. Trans.* 156 (1866) 399-.
- of arable soil. *Petermann, A. Brux. Ac. Bil.* 3 (1882) 74-.
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- and dialysis, electro-capillary phenomena. *Bequerel, A. C. C. R. 66* (1868) 766-.

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- Cima, A., & Matteucci, —. A. C. 13* (1845) 63-.
- Buchheim, —. Roser u. Wunderlich Arch.* 12 (1853) 217-.
- L'Hermite, —. C. R. 39* (1854) 1177-; *A. C. 43* (1855) 420-.
- Dubrunfaut, —. C. R. 63* (1866) 838-.
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- Dubrunfaut, —. C. R. 63* (1866) 994-.
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- , *Hoffmann, C. E. E. (vi Add.) Btr. An. Pl.* 2 (1860) 59-.

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- and formation of cells. *Traube, M.* [1866] *Arch. An. Pl.* (1867) 87-, 129-.
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- — — — — (von Sömmerring). *Geiger, P. L. (vi Add.) Mg. Phm.* 10 (1825) 43-.
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- Osmosis of alcohol through gutta-percha. *Guebard, A. As. Fr. C. R.* 8 (1879) 410-.
- and its applications. *Dubrunfaut, —. C. R.* 41 (1855) 834-.
- applied to oenology. *Carpenè, A.* [1873] (xii) *St. Sp. Ag. It.* 2 (1874) 149-.

- Osmosis as basis of persistent suspension. *Skey, W.* [1878] *N. Z. I. T.* 11 (1879) 485-.
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- , influence of flow of liquid, porosity of membrane, etc., on phenomena. *Wibel, F.* *Hamb. Nt. Vr. Ab. 7 (Ab. 2)* (1883) 57-.
- , — pressure. *Pico, V.* *Rv. Sc.-Ind.* 23 (1891) 185-, 253-.
- of liquids through animal membranes. *Flusin, G.* *C. R.* 131 (1900) 1308-.
- — — caoutchouc membrane. *Flusin, G.* *C. R.* 126 (1898) 1497-.
- in plant and animal cells. *Struve, H.* [1875-76] *St. Pét. Ac. Sc. Bil.* 21 (1876) 243-; 22 (1877) 533-.
- — cells. *Traube, M.* *D. Nf. Tbl.* (*1874) 191-.
- — —. *Reinke, J.* *Bt. Ztg.* 33 (1875) 425-.
- — —. *Traube, M.* *Bt. Ztg.* 36 (1878) 241-, 657-, 673-, 689-.
- through precipitated membranes. *Tammann, G. A. Ps. C.* 34 (1888) 299-.
- of salts and constitution of solutions. *Enklaar, J. E.* *Arch. Néerl.* 17 (1882) 232-.
- , theory. *Liebig, J. von.* *Lieb. A.* 121 (1862) 78-.
- , —. *Nagy, I.* [1885] *Mag. Tud. Ak. Etk. (Termt.)* 15 (1886) No. 14, 1-; *Mth. Nt. B. Ung.* 3 (1884-85) 66-.
- , — and uses. *Dubrunfaut, —.* *Les Mondes* 14 (1867) 650-.
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- equilibrium. *Gouy, —, & Chaperon, G. A. C.* 13 (1888) 120-.
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- and gravity. *Gouy, —, & Chaperon, G. J. de Ps.* 8 (1889) 44-.
- experiments with living membranes. *Vries, H. de.* *Z. Ps. C.* 2 (1888) 415-.
- force. *Graham, T.* *Phil. Trans.* (1854) 177-.
- of dilute solutions. *Vries, H. de.* *C. R.* 97 (1883) 1083-.
- investigations. *Baranetzky, J. A. Ps. C.* 147 (1872) 195-.
- —. *Pfeffer, W. A. Ps. C. Beibl.* 2 (1878) 182-.
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- Planck, M.* *Z. Ps. C.* 6 (1890) 187-.
- Rodger, J. W.* [1892] *Nt.* 47 (1892-93) 103-.
- Pickering, S.* [1892] *Nt.* 47 (1892-93) 175-.
- Naccari, A.* *Rm. R. Ac. Linc. Rd.* 2 (1893) (Sem. 1) 237-.
- Magnanini, G.* *Rm. R. Ac. Linc. Rd.* 2 (1893) (Sem. 1) 416-.
- Naccari, A.* *Rm. R. Ac. Linc. Rd.* 2 (1893) (Sem. 2) 136-.
- Hoff, J. H. van't.* *Rv. Sc.* 1 (1894) 577-.

- Poynting, J. H.* *Ph. Mg.* 42 (1896) 289-.
- Whetham, W. C. D.* *Nt.* 54 (1896) 571-.
- Poynting, J. H.* [1896] *Nt.* 55 (1896-97) 33.
- Speyers, C. L.* *Am. C. S. J.* 20 (1898) 579-.
- of albuminous liquids, determination by lowering of freezing point. *Hamburger, H. J.* *Rec. Tr. C. P.-Bas* 13 (1894) 67-.
- and analogy between solutions and gases. *Hoff, J. H. van't.* *Z. Ps. C.* 1 (1887) 481-.
- of blood. *Eijkman, C.* *Virch. Arch.* 143 (1896) 448-.
- causes, and simplicity of laws of dilute solutions. *Sutherland, W.* *Ph. Mg.* 44 (1897) 493-.
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- — — plants, determination of atomic weight by. *Schreber, K.* [1894] *N.-Vorp. Mt.* 26 (1895) 161-.
- of concentrated solutions. *Ewan, T.* *Z. Ps. C.* 31 (1899) 22-.
- and contraction coefficient of saline solutions. *Monti, V.* *Rv. Sc.-Ind.* 25 (1893) 122-.
- dependence on affinity between solvent and solute. *Jakovkin, A. A.* *Rs. Ps.-C. S. J.* 29 (C.) (1897) 649-.
- of dextrine and gum, molecular masses determined by. *Linebarger, C. E.* *Am. J. Sc.* 43 (1892) 426-.
- dilute solutions (sugar). *Ponsot, A. C. R.* 125 (1897) 867-; *Par. S. C. Bil.* 19 (1898) 9-.
- —. *Ponsot, A. C. R.* 128 (1899) 1447-.
- and dissociation and electrolysis. *Bettel, W.* *S. Afr. C. Mtl. S. J.* 2 (1899) 64-.
- — —. *Oettingen, A. von.* *S. Afr. C. Mtl. S. P.* 2 (1897-99) 543-, 556-.
- electrolytic dissociation. *Armstrong, H. E.* [1896] *Nt.* 55 (1896-97) 78-.
- —. *Traube, J.* *Berl. B.* 31 (1898) 154-.
- estimation of alterations during electrolysis. *Mott, —.* [1895] *Z. Elektch.* (1895-96) 86-.
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- (Nernst), and definition of osmotic pressure. *Brown, C.* *Edinb. R. S. P.* 22 (1900) 439-.
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- — — and electric conductivity. *Reicher, L. T.* *Mbl. Nt.* (1888) 108-.
- — — of solutions. *Dieterici, C.* *A. Ps. C.* 52 (1894) 263-.
- heat of solution, theory. *Dieterici, C. A. Ps. C.* 45 (1892) 207-, 589-.
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- in mixtures of 2 solvents. *Nernst, W.* *Z. Ps. C.* 11 (1893) 1-.

- molecular weight determinations from. *Ladenburg*, A. Berl. B. 22 (1889) 1225-.
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- *Hoff*, J. H. van't. Z. Ps. C. 5 (1890) 174-.
- *Nasini*, R. Rm. R. Ac. Linc. Rd. 6 (1890) (Sem. 1) 175-.
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- and partial pressure of mixed liquids. *Guglielmo*, G. Rm. R. Ac. Linc. Rd. 1 (1892) (Sem. 1) 294-.
- produced by seeds absorbing water. *Gréhant*, N. Par. S. Bl. Mm. 40 (1888) (C. R.) 850-; 41 (1889) (C. R.) 230-.
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- of salts in solution. *Adie*, R. H. C. S. J. 59 (1891) 344-.
- and semipermeable films. *Gibbs*, J. W. Nt. 55 (1896-97) 461-.
- membrane. *Kelvin*, (Lord). Edinb. R. S. P. 21 (1897) 323-.
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- and surface tension, relation between. *Arrhenius*, S. Z. Ps. C. 3 (1889) 115-.
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- — —, and kinetic gas theory. *Boltzmann*, L. Z. Ps. C. 6 (1890) 474-; 7 (1891) 88-.
- — —, proof. *Rayleigh*, (Lord). Nt. 55 (1896-97) 253-.
- — — —, — (Rayleigh). *Donnan*, F. G. [1897] Nt. 57 (1897-98) 53-.
- , and hypothesis of electrolytic dissociation. *Crompton*, H. C. S. J. 71 (1897) (Pt. 2) 925-.
- , molecular. *Fuchs*, K. Exner Rpm. 27 (1891) 176-.
- , and nature of solutions. *Pickering*, S. U. L. Ps. S. P. 10 (1890) 354-; Ph. Mg. 29 (1890) 490-.
- and thermodynamics of solutions. *Schiller*, N. N. Rs. Ps.-C. S. J. 30 (Ps.) (1898) 159-; A. Ps. C. 67 (1899) 291-.
- vapour pressure. *Noyes*, A. A., & *Abbot*, C. G. [1896] Z. Ps. C. 23 (1897) 56-.
- — —, relation between. *Noyes*, A. A. Z. Ps. C. 35 (1900) 707-.
- — — of solutions. *Raoult*, F. M. C. R. 105 (1887) 857-.
- variance. *Trevor*, J. E. J. Ps. C. 1 (1896-97) 349-.

- Osmotic properties of cell, effect of different groups. *Overton*, E. Zf. Vjschr. 41 (1896) (Festschr., Th. 2) 383-.
- Permeability of membranes, and applicability to dialysis. *Zott*, A. A. Ps. C. 27 (1886) 229-.
- — precipitated membranes. *Tammann*, G. Göt. Nr. (1891) 213-.
- — — — (Tammann). *Meerburg*, J. H. Z. Ps. C. 11 (1893) 446-.
- — — — red corpuscles, and isotonic coefficients. *Hamburger*, H. J. Amst. Ak. Vs. M. 7 (1890) 15-.
- — tiles. *Raddi*, A. Rv. Sc.-Ind. 26 (1894) 169-, 179-.
- Porous bodies, passage of alcoholic liquors through. *Gal*, H. C. R. 95 (1882) 844-; 96 (1883) 338-.
- plate, mixing of liquids through. *Jerichau*, E. B. Pogg. A. 34 (1835) 613-.
- Semipermeable membranes and diffusion. *Walden*, P. Z. Ps. C. 10 (1892) 699-.
- —, nature. *Mijers*, J. Rec. Tr. C. P.-Bas 17 (1898) 177-.
- —, preparation. *Kononov*, D. P. Rs. Ps.-C. S. J. 31 (C.) (1899) 153-; C. Ztg. 23 (1899) 336.
- Septum permeable to water but not to air. *Thomson*, (Sir) W. B. A. Rp. (1880) 488-.
- Solutions, theory. *Andrews*, L. W. [1894] Iowa Ac. Sc. P. 2 (1895) 13-.

0320 Diffusion of Gases, Liquids, and Solids. Effusion. Transpiration. (See also Chemistry 7155.)

Apparatus employed by Graham in his researches. *Roberts-Austen*, W. C. Nt. 14 (1876) 511-.

DIFFUSION.

- Fick*, A. Pogg. A. 94 (1855) 59-.
- Guillaume*, —. Neuch. Bl. 4 (1856-58) 235-.
- Hoffmann*, H. Pogg. A. 117 (1862) 263-.
- Jahn*, J. N. Živa (1863) 56-.
- Dubrunfaut*, —. C. R. 63 (1866) 838-; 66 (1868) 354-.
- Luyes*, Y. de. J. Phm. 9 (1869) 139-, 191-.
- Joulin*, L. C. R. 90 (1880) 741-; A. C. 22 (1881) 398-.
- Dixon*, W. A. C. N. 60 (1889) 164.
- Anderssohn*, A. Bresl. Schl. Gs. Jbr. (1890) (Ab. 2) 61-.
- coefficient, variation with temperature. *Heen*, — de. Brux. S. Sc. A. 8 (1884) (Pt. 1) 69.
- coefficients, determination. *Gribojedov*, S. Rs. Ps.-C. S. J. 25 (Ps.) (1893) 36-; J. de Ps. 3 (1894) 233.
- in cylinder under action of gravity. *Des Coudres*, T. A. Ps. C. 55 (1895) 213-.
- equation, integration. *Boltzmann*, L. Münch. Ak. Sb. 24 (1895) 211-.
- equations, Kirchhoff's, reduction. *Farkas*, G. Mth. Termt. Étis. 16 (1898) 201-; Mth. Nt. B. Ung. 16 (1899) 97-.

0320 Diffusion of Gases

- and evaporation. *Odling, W. R. I. P. 7* (1873) 155-.
- experiments. *Beyerinck, M. W. Z. Ps. C. 3* (1889) 110-.
- graphic recorder. *Regnard, P. Par. S. Bl. Mm. 41* (1889) (C. R.) 14-.
- and the kinetic theory. *Maxwell, J. C. Nt. 8* (1873) 298-.
- phenomena. *Hoppe-Seyler, F. [1866] Md. C. Us. 1* (1866-71) 1-.
- , *Wöhler, F. D. C. Gs. B. 4* (1871) 10-.
- , evaporation and solution. *Stefan, J. Wien Ak. Sb. 98* (1890) (Ab. 2a) 1418-.
- phenomenon. *Lenzsen, E. Erdm. J. Pr. C. 85* (1862) 416-.
- produced by temperature differences, demonstration. *Abegg, R. Z. Ps. C. 26* (1898) 161-.
- static, of gases and liquids in relation to assimilation of carbon and translocation in plants. *Brown, H. T. & Escombe, F. Phil. Trans. (B) 193* (1900) 223-.
- theory. *Dupré, A., & Dupré, P. C. R. 62* (1866) 1072-.
- , *Nernst, W. Z. Ps. C. 2* (1888) 613-.
- , *Bose, E. Z. Ps. C. 29* (1899) 658-.
- , *Wiedeburg, O. Z. Ps. C. 30* (1899) 586-.

DIFFUSION OF GASES.

- Dalton, J. [1803] Manch. Ph. S. Mm. 1* (1805) 259-.
- Onion, W. Chemist 5* (1844) 112-.
- Thomson, T. S. Ph. Mg. 25* (1844) 51-; *27* (1845) 346-; (vr Add.) *25* (1844) 282-.
- Broek, J. H. van den. Utr. Scheik. Oz. 5* (1851) 489-.
- Lang, V. von. Wien Sb. 63* (1871) (Ab. 2) 604-.
- Wróblewski, Z. (XII) Kosmos (Lw.) 3* (1878) 8-.
- Moutier, J. Par. S. Phlm. Bl. 5* (1881) 136-.
- Boltzmann, L. [1882-83] Wien Ak. Sb. 86* (1883) (Ab. 2) 63-; *88* (1884) (Ab. 2) 835-.
- Waltz, K. A. Ps. C. 17* (1882) 201-, 351-.
- Gross, G. [1889] A. Ps. C. 40* (1890) 424-.
- Toepler, M. A. Ps. C. 58* (1896) 599-.
- Brillouin, M. [1899-1900] A. C. 18* (1899) 433-; *Sc. Abs. 4* (1901) 880-.
- Air and carbon dioxide, variability of coefficient of diffusion between. *Hausmaninger, V. Wien Ak. Sb. 86* (1883) (Ab. 2) 1073-.
- , diffusion through water. *Barus, C. Am. J. Sc. 9* (1900) 397-.
- , moist and dry, diffusion between. *Dufour, L. C. B. 78* (1874) 961-; *Laus. S. Vd. Bl. 13* (1874-75) 165-, 608-.
- , —, —, —, —. *Reusch, F. E. von. A. Ps. C. 152* (1874) 365-.
- , —, —, — (Dufour). *Kundt, A. A. Ps. C. 2* (1877) 17-.
- , passage of one kind into another through interposing substances. *Priestley, J. Am. Ph. S. T. 5* (1802) 14-.
- , — through porous bodies with very small pressure differences. *Christiani, A. Arch. An. Pl. (Pl. Ab.)* (1882) 112-.
- Apparatus for demonstration. *Dvordák, V. Nt. 48* (1893) 79.
- — —. *McLeod, H. Nt. 48* (1893) 104.

Diffusion of Gases 0320

- Atmolytic. *Tegetmeier, W. B. Intell. Obs. 4* (1864) 414-.
- Atmolytic action of membrane of hen's eggs. *Rodendorf, A. A. Rs. Ps.-C. S. J. 31* (C.) (1899) 482-; *C. Ztg. 23* (1899) 658-.
- flow of gases. *Christiansen, C. A. Ps. C. 41* (1890) 565-.
- Building materials, porosity. *Märcker, M. A. Lindw. 58* (1871) 65-.
- — —. *Lang, C. Z. Bl. 11* (1875) 313-.
- Caoutchouc, permeability to gases. *Peyron, —. C. R. 13* (1841) 820-.
- , porosity, dialysis of gas. *Payen, A. C. R. 63* (1866) 533-.
- Carbon dioxide, diffusion through liquids. *Stefan, J. Wien Ak. Sb. 77* (1878) (Ab. 2) 371-.
- , — — porous walls. Permeability of building materials for gases. *Maercker, M. H. (XII) Lindw. Jb. 6* (1877) (Suppl. 1) 1-.
- Carbonic oxide, passage through cast iron stoves. *Coulier, —. J. Phm. 8* (1868) 246-.
- Cement pores, laws of flow of gases through, uses in conduction of coal gas. *Viard, —. [1851] A. C. 43* (1855) 314-, 482-.
- Coefficients, dependence on temperature. *Obermayer, A. von. Wien Ak. Sb. 81* (1880) (Ab. 2) 1102-.
- , gases in water. *Hüfner, G. A. Ps. C. 60* (1897) 134-.
- Colloidal membranes, passage of gases through. *Barthélemy, A. C. R. 77* (1873) 427-.
- Constants, gases in liquids, dependence on viscosity of liquid. *Wróblewski, S. von. [1878] A. Ps. C. 7* (1879) 11-.
- Dialysis and absorption of gases by colloid septa. *Graham, T. Phil. Trans. 156* (1866) 399-.
- Diffusion through absorbing substances. *Wróblewski, S. von. A. Ps. C. 158* (1876) 539-.
- — —. *Karlovsky, G. Termt. Köz. 18* (1886) 369-, 409-.
- — caoutchouc. *Aronstein, L., & Sirks, —. Z. C. 2* (1866) 260-.
- — —. *Kayser, H. A. Ps. C. 43* (1891) 544-.
- — —. *Arsonval, — d'. C. R. 128* (1899) 1545-.
- — gelatin. *Hagenbach, A. A. Ps. C. 65* (1898) 673-.
- — homogeneous solids. *Sainte-Claire Deville, (H. non) C. J. C. R. 59* (1864) 102-.
- — hydrophane of Czernowitza. *Hüfner, C. G. A. Ps. C. 16* (1882) 253-.
- — liquid films. *Pranghe, J. A. Ps. C. Beibl. 2* (1878) 202-.
- — in liquid, viscous and solid substances, laws. *Wróblewski, Z. (XII) Kosmos (Lw.) 3* (1878) 95-, 151-, 199-, 247-; (XI) *A. Ps. C. 2* (1877) 481-.
- — and occlusion of gases. *Carteighe, M. Phm. J. 3* (1873) 870-.
- — through porous bodies. *Matteucci, C. C. R. 57* (1863) 251-.
- — without porous partition. *Loschmidt, J. Wien Sb. 61* (1870) (Ab. 2) 1367-; *62* (1870) (Ab. 2) 468-.

- Diffusion through porous partition. *Hansemann, G.* A. Ps. C. 21 (1884) 545-.
- — —, theory. *Kirchhoff, G.* A. Ps. C. 21 (1884) 563-.
- and pressure of gases. *Bloxam, J. C.* Br. Met. S. P. 2 (1865) 371-.
- , — question whether glass is impenetrable for gases. *Quincke, G. H.* A. Ps. C. 160 (1877) 118-.
- — separation of gases. *Graham, T.* QJ. Sc. (1829) (Pt. 2) 74-.
- through walls of soap bubbles. *Müller, F. C. G.* Berl. B. 7 (1874) 1401-, 1762-; *Osnab. Jbr.* 2 (1875) 19-.
- — water and agar jelly. *Hüfner, G.* Z. Ps. C. 27 (1898) 227-.
- Dynamical theory. *Stefan, J.* Wien Sb. 65 (1872) (Ab. 2) 323-.
- Effect on temperature. *Dufour, L.* [1873] (ix) Laus. S. Vd. Bl. 12 (1874) 349-.
- Experiment, lecture-. *Winkelmann, A.* A. Ps. C. 27 (1886) 479-.
- , —. *Biltz, H.* Z. Ps. C. 9 (1892) 152-.
- , —. *Kirkland, J. B.* Aust. As. Rp. (1892) 265-.
- , —. *Cundall, J. T.* [1898] C. S. P. 14 (1899) 40-, xxxv.
- Experiments. *Benigar, J.* Wien Sb. 62 (1870) (Ab. 2) 687-.
- . *Obermayer, A. von.* Wien Ak. Sb. 85 (1882) (Ab. 2) 147-, 748-; 87 (1883) (Ab. 2) 188-; 96 (1888) (Ab. 2) 546-.
- Graham's discoveries. *Odling, W.* [1867] R. I. P. 5 (1869) 12-.
- Hydrogen, passage through iron. *Bellati, M., & Lussana, S.* Ven. I. At. (1889-90) 1173-; (1890-91) 987-.
- , — palladium septum. *Ramsay, W. L.* Ps. S. P. 13 (1895) 172-; Ph. Mg. 38 (1894) 206-.
- , — solid bodies. *Louyet, P.* Brux. Ac. Bil. 15 (1848) (pte. 2) 297-.
- Law. *Graham, T.* [1831] Edinb. R. S. T. 12 (1834) 222-.
- . *Hovorth, H. H.* [1874] Manch. Lt. Ph. S. P. 14 (1875) 51-.
- , Graham's. *Thomson, T. S.* Ph. Mg. 4 (1834) 321-.
- , —. *Boussinesq, J. C.* R. 67 (1868) 319-.
- , —, consequences. *Poggendorff, J. C.* Pogg. A. 28 (1833) 347-.
- Method of investigation, new. *Lang, V. von.* Wien Sb. 61 (1870) (Ab. 2) 288-.
- Migration and siphoning of gases. *Bellamy, F. C. R.* 83 (1876) 669-.
- Mixed gases. *Wretschko, A.* Wien Sb. 62 (1870) (Ab. 2) 575-.
- , —, molecular motion. *Thomsen, J. D. C.* Gs. B. 4 (1871) 595-.
- Molecular mobility of gases. *Graham, T.* Phil. Trans. (1863) 385-; C. R. 57 (1863) 181-.
- Movement engendered by diffusion. *Sainte-Claire Deville, E. H. C. R.* 90 (1880) 18-.
- Movements of gases under influence of gravity. *Wanklyn, J. A.* Ph. Mg. 22 (1861) 211-.
- * Penetration of gases. *Mitchell, J. K.* Am. J. Md. Sc. 13 (1833) 100-.
- Penetration into red-hot earthenware pipes. *Laucerenburgh, A., Deimann, —, Troostwyk, — van, & Vrolijk, —.* Scherer J. C. 4 (1800) 1-.
- Penetrativeness of gases and liquids. *Mitchell, J. K.* Am. J. Md. Sc. 7 (1830) 36-.
- Perfectly elastic gases of constant temperature, diffusion in space. *Meissel, E.* [1872] Arch. Mth. Ps. 55 (1873) 225-.
- Physics of smell. (Presidential address, Math. and Phys. Sect.) *Ayrton, W. E.* B. A. Rp. (1898) 767-.
- Platinum, hot, diffusion of hydrogen through. *Sainte-Claire Deville, H., & Troost, L. C. R.* 56 (1863) 977-.
- , permeation by gases. *Randall, W. W.* Am. C. J. 19 (1897) 682-.
- Poroscope. *Christiani, A.* (xii) Berl. Ps. Gs. Vh. 1 (1882) 10-.
- Rapid diffusion, case. *Pettenkofer, M. von.* Münch. Sb. (1872) 263-.
- Separation of gases by diffusion, theoretical considerations. *Rayleigh, (Lord).* Ph. Mg. 42 (1896) 493-.
- Thermodiffusion, gaseous. *Merget, A.* C. R. 78 (1874) 884-.
- , — (Merget). *Kundt, A.* A. Ps. C. 2 (1877) 17-.
- , —, in cast-iron. *Merget, A.* As. Fr. C. R. (1877) 311-.
- , —, experiments. *Merget, A.* [1879] Bordeaux S. Sc. Mm. 3 (1880) xxviii-.
- , —, of moist pulverulent bodies. *Merget, A.* As. Fr. C. R. (1875) 354-.
- , —, new observation. *Merget, A.* [1877] Lyon S. Ag. A. 10 (1878) xl-.
- Vapour, mercury. *Merget, A.* [1879] Bordeaux S. Sc. Mm. 3 (1880) xix-.
- Vapours, diffusion through porous cells. *Puluj, J.* Wien Ak. Sb. 75 (1877) (Ab. 2) 401-, 639-.
- and gases. *Winkelmann, A.* A. Ps. C. 22 (1884) 1-, 152-.
- Walls of vessels, influence on movement and composition of gases which penetrate them. *Sainte-Claire Deville, H. C. R.* 52 (1861) 524-.
- Water vapour in atmosphere. *Jungk, C. G.* A. Ps. C. 130 (1867) 1-.
- — —. *Boltshauser, G. A.* Catania At. Ac. Gioen. 5 (1871) 157-.
- , —, diffusion coefficient in air, hydrogen and carbon dioxide. *Guglielmo, G.* Tor. Ac. Sc. At. 18 (1882) 93-.
- , —, imperviousness of valves of air-pump to. *Laspeyres, E. A. H.* A. Ps. C. 2 (1877) 478-.
- Work produced by diffusion, apparatus to illustrate. *Woodward, C. J.* L. Ps. S. P. 5 (1884) 317-; Ph. Mg. 16 (1883) 375-.

DIFFUSION OF LIQUIDS.

- Graham, T.* [1849] Phil. Trans. (1850) 1-, 805-; (1851) 483-.
- Beilstein, F.* Lieb. A. 99 (1856) 165-.
- (Beilstein.) *Fick, A.* Lieb. A. 102 (1857) 97-.

- Voit, E. A. Ps. C. 130 (1867) 227-, 393-.
 May, J. Carl Rpm. 11 (1875) 185-.
 Johanniszanz, A. [1876] A. Ps. C. 2 (1877) 24-.
 Stefan, J. [1878-79] Wien Ak. Sb. 78 (1879) (Ab. 2) 957-; 79 (1879) (Ab. 2) 161-.
 Weber, H. F. Zür. Vjschr. 23 (1878) 325-.
 Long, J. H. [1879] Ph. Mg. 9 (1880) 313-, 413-.
 Coleman, J. J. Glasg. Ph. S. P. 18 (1887) 196-; Ph. Mg. 23 (1887) 1-.
 Gabriel, S. C. Ztg. 11 (1887) 476.
 Wiedeberg, O. A. Ps. C. 41 (1890) 675-.
 Albuminous liquids in contact with distilled water. *Commaille, A.* Mm. Md. Mil. 27 (1871) 467-.
 Apparat. *Coleman, J. J.* Edinb. R. S. P. 14 (1888) 374-; 15 (1889) 249-.
 Application to analysis. *Graham, T. C. R.* 53 (1861) 275-; Phil. Trans. (1861) 183-.
 — of photometry. *Wróblewski, Z.* (xii) Krk. Ak. (Mt.-Prz.) Rz. & Sp. 8 (1881) 154-, xxxix-; (xi) A. Ps. C. 13 (1881) 606-.
 Coefficient of sodium chloride. *Marini, L.* Rm. R. Ac. Linc. Rd. 4 (1895) (Sem. 2) 135-.
 Coefficients, determination. *Niemöller, F. A.* Ps. C. 47 (1892) 694-.
 —, solvents other than water, temperature variation. *Heen, P. de.* Brux. Ac. Bil. 19 (1890) 197-.
 Constants, estimation for salt solution into pure solvents. *Simmler, R. T., & Wild, H.* Pogg. A. 100 (1857) 217-, 660.
 Diffusion through cracks in glass. *Fischer, N. W.* Pogg. A. 10 (1827) 481-.
 — in cylindrical vessels. *Beez, R.* Z. Mth. Ps. 10 (1865) 358-.
 — equilibrium of salt solution not at uniform temperature. *Horstmann, A.* [1879] Heidl. Nt. Md. Vh. 2 (1880) 313-.
 — figures. *Martini, T.* [1877-89] Nt. 17 (1878) 87-; (xii) Rv. Sc.-Ind. 10 (1878) 24-; (x) N. Cim. 9 (1881) 156-; Ven. I. At. (1888-89) 823-.
 — of liquids and absorption by solids. *Cantoni, G.* Mil. I. Lomb. Rd. 1 (1864) 183-.
 — through membranes. *Schunacher, W.* Pogg. A. 110 (1860) 337-.
 — and osmosis. *Kryszinski, S.* Jena. Sb. (1884) 22-.
 — through porous diaphragms. *Brücke, E.* Pogg. A. 58 (1843) 77-.
 Electric phenomena. *Gerich, A.* (xii) N. Rs. S. Nt. Mm. 8 (No. 1) (1882) 35 pp.
 Experiment, lecture-. *Vries, H. de.* [1884] Mbl. Nt. (1882-84) 118-; Arch. Néerl. 20 (1886) 36-.
 —, remarkable. *Börnstein, R.* Berl. Ps. Gs. Vh. (1888) 9-.
 Fresh water, diffusion into sea water. *Thoulet, J. C. R.* 112 (1891) 1068-.
 Law. *Vernon, H. M.* C. N. 62 (1890) 275-.
 —, and new diffusimeters. *Umov, N.* Rs. Ps.-C. S. J. 23 (Ps.) (1891) 335-.
 Mercury, passage through lead. *Henry, J.* [1839] Am. Ph. S. P. 1 (1840) 82-.
 Metals and alloys, solution and diffusion in mercury. *Humphreys, W. J.* C. S. J. 69 (1896) 1679-.
 — in mercury, diffusion constants. *Meyer, G.* A. Ps. C. 61 (1897) 225-; 64 (1898) 752-.
 — — —, — and solution. *Humphreys, W. J.* C. S. J. 69 (1896) 243-.
 — — —, — — — (Humphreys). *Roberts-Austen, —.* C. S. P. 12 (1897) 219-.
 Microhydrophorus (instrument for transfusion experiments, etc.). *Gregorio, A. de.* [1892] Palermo Ac. At. 3 (1895) (Sc. Nt.) 48 (ter)-.
 Molecular diffusion. *Chevrier, G.* (xii) Metz Ac. Mm. 49 (Pt. 2) (1869) 207-.
 — force, influence. *Wróblewski, Z.* [1881] (xii) Krk. Ak. (Mt.-Prz.) Rz. & Sp. 9 (1882) 245-, xvii-.
 Movement engendered by diffusion. *Sainte-Claire Deville, E. H.* C. R. 90 (1880) 18-.
 Organic and inorganic compounds. *Scheffer, J. D. R.* [1881-83] Amst. Ak. Vs. M. 17 (1882) 312-; 19 (1884) 89-; Arch. Néerl. 18 (1883) 325-.
 Penetrativeness of gases and liquids. *Mitchell, J. K.* Am. J. Md. Sc. 7 (1830) 36-.
 Salts, acid solutions of mixtures of, experiments. *Hinteregger, F.* Berl. B. 12 (1879) 1619-.
 —, diffusion during evaporation of solutions. *Fusiniere, A.* A. Sc. Lomb. Ven. 6 (1836) 241-.
 — in solution. *Long, J. H.* [1879] A. Ps. C. 9 (1880) 613-.
 — — —. *Schuhmeister, J.* Wien Ak. Sb. 79 (1879) (Ab. 2) 603-.
 — — —. *Enklaar, J. E.* Utr. Prv. Gn. Aant. (1881) 32-.
 — — —, coefficient of diffusion, temperature variation. *Heen, P. de.* Brux. Ac. Bil. 8 (1884) 219-.
 — — —, diffusion, regularity. *Sachse, R.* C. CB. 5 (1874) 237-.
 — — —, simultaneous. *Marignac, J. C. G. de.* C. R. 78 (1874) 1523-; Arch. Sc. Ps. Nt. 50 (1874) 89-.
 — — —, in water. *Beez, —.* Schlömilch Z. 4 (1859) 212-; 7 (1862) 327-.
 Solutions, aqueous. *Scheffer, J. D. R.* Z. Ps. C. 2 (1888) 390-.
 — — —. *Arrhenius, S.* Sk. Nf. F. (1892) 358-.
 —, dilute, effect of initial concentration. *Kawalki, W.* A. Ps. C. 59 (1896) 637-.
 — of unequal temperature. *Ludwig, C.* Wien SB. 20 (1856) 539.
 —, viscous. *Eckhard, C.* (vi Add.) Btr. An. Pl. 3 (1863) 51-.
 Substances in solution. *Abegg, R.* Stockh. Öfv. (1892) 517-.
 — — —. *Arrhenius, S.* [1892] Stockh. Ak. Hndl. Bh. 18 (Afd. 1) (1893) No. 8, 52 pp.; Z. Ps. C. 10 (1892) 51-.
 — — —. *Wiedeberg, O.* Z. Ps. C. 10 (1892) 509-.
 — — —. *Pickering, S. U.* Ph. Mg. 35 (1893) 127-.

Substances in solution, apparatus for measuring diffusion. *Griffiths, A. L.* Ps. S. P. 16 (1899) 443-; Ph. Mg. 47 (1899) 530-.

Water, diffusion through indiarubber. *Lundie, R. A.* Edinb. R. S. P. 22 (1900) 258-.

DIFFUSION OF SOLIDS.

Colson, A. C. R. 94 (1882) 26-.

Carbon. *Violle, J. C. R.* 94 (1882) 28-.

Gold, in solid lead. *Roberts-Austen, (Sir) W.* [1900] R. S. P. 67 (1901) 101-.

Impalpable powder, into solid body. *Marsden, R. S.* Edinb. R. S. P. 10 (1880) 712-.

Metals, inter-diffusion. *Des Coudres, T. D.* Nf. Vh. (1890) (Th. 2) 54-.

—, solid and fluid. *Roberts-Austen, W. C.* Phil. Trans. (A) 187 (1897) 383-.

—, —, — fluids, properties common to. *Roberts-Austen, W. C.* [1886] R. I. P. 11 (1887) 395-.

Solids, inter-diffusion. *Colson, A. C. R.* 93 (1881) 1074-.

Sulphides, diffusion through steel. *Campbell, E. D.* Am. C. J. 18 (1896) 707-.

EFFUSION.

of gases. *Graham, T. B. A.* Rp. (1845) (pt. 2) 28; Phil. Trans. (1846) 573-; (1849) 349-.

— —, *Neyreneuf, V.* C. R. 90 (1880) 1487-; 92 (1881) 713-.

— —, *Mitinskij, A. I.* Rs. Ps.-C. S. J. 30 (Ps.) (1898) 206-; J. de Ps. 9 (1900) 57.

— —, laws. *Sandrucci, A.* Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 2) 209-.

— —, lecture experiment. *Freer, P. C. Z.* Ps. C. 9 (1892) 669-.

— — (air) at different pressures through different orifices and tubes. *Magrini, L.* Mil. At. I. Lomb. 1 (1858) 333-.

— — through small orifice at different temperatures. *Timofejew, W. Z.* Ps. C. 6 (1890) 586-.

— — — — in thin wall. *Segnitz, E.* Pogg. A. 111 (1860) 474-.

— hydrogen. *Osann, G.* Erdm. J. Pr. C. 18 (1839) 486-.

velocities of efflux, specific heats and mean squares of velocity for gases, relations. *Franchis, G. de.* Rm. R. Ac. Linc. Rd. 1 (1885) 203-, 884.

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Faraday, M. A. C. 5 (1817) 298-; QJ. Sc. 7 (1819) 106-.

Graham, T. B. A. Rp. (1845) (pt. 2) 28; Phil. Trans. (1846) 573-; (1849) 349-.

Air, effect of temperature. *Guthrie, Francis.* L. Ps. S. P. 2 (1879) 246-; Ph. Mg. 5 (1878) 433-.

— at different pressures, flow through granular materials. *Tufts, F. L.* [1900] N. Y. Ac. A. 13 (1900-01) 503-.

Air, velocity. *Zwaardemaker, H.* [1900] Ch. Pl. 14 (1901) 385-.

Dimensional properties of matter in gaseous state. *Reynolds, O.* [1879] Phil. Trans. 170 (1880) 727-.

Thermal transpiration. *Reynolds, O.* R. S. P. 30 (1880) 300-.

Vapours. *Meyer, L.* Berl. B. 11 (1878) 206-; A. Ps. C. 7 (1879) 497-.

— *Meyer, L., & Schumann, O.* Berl. B. 14 (1881) 593-; A. Ps. C. 13 (1881) 1-.

— *Stuedel, V.* A. Ps. C. 16 (1882) 369-.

— *Meyer, L.* A. Ps. C. 16 (1882) 394-.

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Girard, P. S. Par. Mm. de l'I. (1813-15) 249-; Par. Mm. Ac. Sc. 1 (1816) 187-, 260-.

Lehot, C. J. Gilbert A. 65 (1820) 64-.

Poiseuille, J. L. M. Par. S. Phlm. PV. (1838) 1-; C. R. 11 (1840) 961-, 1041-; 12 (1841) 112-; Par. Mm. Sav. Étr. 9 (1846) 433-.

(Poisuille.) *Regnault, V.* C. R. 15 (1842) 1167-.

Poiseuille, J. L. M. C. R. 24 (1847) 1074-; A. C. 21 (1847) 76-.

Mathieu, É. C. R. 57 (1863) 320-.

(Poisuille.) *Boussinesq, J.* C. R. 65 (1867) 46-.

Tait, P. G. [1873] (xi) Edinb. R. S. P. 8 (1875) 208-.

Guerout, A. C. R. 78 (1874) 351-; 81 (1875) 1025-; 83 (1876) 1291-.

Nagy, J. Regéczy. [1883] (xii) Mag. Tud. Ak. Étk. (Term.) 13 (1884) (No. 7) 1-; Mth. Nt. B. Ung. 1 (1882-83) 232-.

Colson, A. C. R. 113 (1891) 740-.

Chemical composition, transpiration in relation to. *Graham, T. B. A.* C. R. 53 (1861) 774-; Phil. Trans. (1861) 373-.

Effect of temperature. *Guerout, A.* C. R. 79 (1874) 1201-.

Evaporation and transpiration, influence of electricity. *Wirtz, W.* A. Ps. C. 37 (1889) 516-.

Mercury. *Warburg, E.* A. Ps. C. 140 (1870) 367-.

— *Villari, E.* Bologna Ac. Sc. Mm. 6 (1875) 487-.

Microrheometer, apparatus for measuring rate of transpiration. *Hannay, J. B.* [1878] Phil. Trans. 170 (1879) 275-.

—, Hannay's, viscosity of water determined by. *Barnett, R. E.* R. S. P. 56 (1894) 259-.

Passage through filters, capillary tubes, etc. *Brunhes, J.* [1879] Toul. Ac. Sc. Mm. 3 (1881) (App.) 161 pp.

Poiseuille's law, deviations from. *Wetzstein, G.* A. Ps. C. 68 (1899) 441-.

—, lecture demonstration. *Röntgen, W. C.* A. Ps. C. 20 (1883) 268-.

Salt solutions. *Schulze, F.* C. CB. 3 (1872) 705-.

— *Hübener, T.* A. Ps. C. 150 (1873) 248-.

Use of transpiration in science and technology. *Loewenthal, J.* Fresenius Z. 10 (1871) 298-; 11 (1872) 43-.

0325 Viscosity of Fluids

0325 Viscosity of Fluids (Internal Friction). (See also Chemistry 7170.)

- Lundquist, C. G. Ups. Årsk. (1875) (Mth.) (No. 3) 26 pp.
 Wijkander, E. A. [1878] A. Ps. C. Beibl. 3 (1879) 8-.
 Slotte, K. F. Helsingf. Öfv. 32 (1890) 116-.
 Mützel, K. A. Ps. C. 43 (1891) 15-; 44 (1891) 787.
 Brodmann, C. A. Ps. C. 45 (1892) 159-.
 Slotte, K. F. Helsingf. Öfv. 37 (1895) 11-.
 Change of order of viscosity on passing from fluid to solid. Barus, C. Ph. Mg. 29 (1890) 337-.
 Damping of oscillations by air. Sang, E. Edinb. R. S. P. 16 (1890) 181-.
 — — in measuring instruments, by air. Töpler, A. A. Ps. C. 149 (1873) 416-.
 — — of solids in fluids. Klemenčič, I. [1881] Wien Ak. Sb. 84 (1882) (Ab. 2) 146-.
 Fluids in corresponding states. Haas, M. de. Amst. Ak. Vs. [2] (1894) 126-; 3 (1895) 62-.
 Measure, absolute, for viscosity. Obermayer, A. von. Carl Rpm. 15 (1879) 682-.

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- Margules, M. Wien Ak. Sb. 83 (1881) (Ab. 2) 588-.
 Redwood, B. S. C. In. J. 5 (1886) 121-; 6 (1887) 412.
 Mills, E. J. S. C. In. J. 5 (1886) 148-.
 McGill, A. [1894] Cn. R. Sc. 6 (1896) 153-.
 Guye, P. A., & Friderich, L. Par. S. C. Bl. 19 (1898) 164-.
 correction for ends of tubes. Couette, M. J. de Ps. 9 (1890) 560-.
 improvements. Kissling, R. Z. Angew. C. (1896) 601-.
 and influence of magnetisation and electrification. König, W. A. Ps. C. 25 (1885) 618-.
 method. Meyer, O. E. A. Ps. C. 43 (1891) 1-; 44 (1891) 787.
 —, efflux. Hagenbach, E. Basel Vh. 2 (1860) 532-.
 —, Maxwell's. Schmidt, T. S. A. Ps. C. 16 (1882) 633-.
 — of oscillating discs. Grossmann, L. [1880] A. Ps. C. 16 (1882) 619-.
 — oscillations. Meyer, O. E. [1887] Münch. Ak. Sb. 17 (1888) 343-; Bresl. Schl. Gs. Jbr. (1887) 173-.

Viscosimeters.

- Babcock, S. M. [1886] J. Anal. C. 1 (1887) 151-.
 Engler, C. Z. Angew. C. (1892) 725-.
 Lange's. Scheurer, F. Mulhouse S. In. Bl. 66 (1896) 57-.
 for oils. W., V. Rv. Sc.-Ind. 18 (1886) 210-.

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- for oils. Engler, C., & Künkler, A. Dingler 276 (1890) 42-; 279 (1891) 115-.
 —. Žukovskij, N. E. Mosc. S. Sc. Bl. 73 (No. 1) (1891) 25-; Fsch. Ps. (1891) (Ab. 1) 262.
 — (lubricating). Künkler, A. Dingler 290 (1893) 281-.
 simple. Wendriner, M. Z. Angew. C. (1894) 545-.
 —. Kissling, R. Z. Angew. C. (1894) 642.
 standards. Engler, C. Dingler 286 (1892) 210-.
 for sugar manufacture. Dupont, F. Z. Vr. Rübenzuckin. 47 (1897) (Th. 2) 926-.
 torsion-. Doolittle, O. S. Am. Eng. & Railroad J. 67 (1893) 583-.

- Oil and air, friction between. Markovits, S. Wien Ak. Sb. 100 (1891) (Ab. 2a) 785-.
 Pendulums, motion, effect of viscosity. Stokes, G. G. [1850] Camb. Ph. S. T. 9 (1856) [8]-.
 Physico-chemical investigation, new method. Hanmay, J. B. Glasg. Ph. S. P. 11 (1879) 484-.
 Resistance and viscosity. Rennie, G. Phil. Trans. (1831) 423-.
 Theory. Meyer, O. E. Crelle J. Mth. 78 (1874) 130-; 80 (1875) 315-.
 Variation with chemical composition. Handl, A., & Pfibram, R. [1878-81] Wien Ak. Sb. 78 (1879) (Ab. 2) 113-; 80 (1880) (Ab. 2) 17-; 84 (1882) (Ab. 2) 717-.
 — density. Warburg, E., & Babo, C. H. L. von. A. Ps. C. 17 (1882) 390-.
 — temperature. Barus, C. Am. J. Sc. 44 (1892) 255.
 — — and chemical composition. Graetz, —. D. Nf. Tbl. (1887) 83.
 — — —, empirical formulæ. Duff, A. W. Ps. Rv. 4 (1897) 404-.
 — — —, Rosencranz's observations. Meyer, O. E. A. Ps. C. 2 (1877) 387-.
 — — velocity. Élie, B. J. de Ps. 1 (1882) 224-.

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- Faraday, M. A. C. 5 (1817) 298-.
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 Meyer, O. E., & Springmühl, F. [1872] A. Ps. C. 148 (1873) 526-.
 Friction at a distance. Govi, G. Tor. At. Ac. Sc. 5 (1869-70) 199-.
 —, ethereal. Stewart, B. B. A. Rp. 43 (1873) (Sect.) 32-.
 —, —. Hicks, W. M. Camb. Ph. S. P. 2 (1876) 422-.
 Frictional or viscous resistance in the ether. Rowland, H. A., Gilbert, N. E., & McJunckin, P. C. J. H. Un. Cir. [19 (1899-1900)] 60.
 Gases at high exhaustions. Crookes, W. [1881] Phil. Trans. 172 (1882) 387-.
 — — —, decrement of arc of oscillating plate. Stokes, G. G. [1881] Phil. Trans. 172 (1882) 435-.
 — — — temperatures. Barus, C. Am. J. Sc. 35 (1888) 407-; A. Ps. C. 36 (1889) 358-.

- Heating of rotating disc *in vacuo*. *Stewart, B., & Tait, P. G.* R. S. P. 14 (1865) 90, 339-; 15 (1867) 290-; 21 (1873) 309-.
- — — — — (Stewart and Tait). *Meyer, O. E.* A. Ps. C. 135 (1868) 285-; 136 (1869) 330-.
- — — — — (Meyer). *Stewart, B., & Tait, P. G.* (xi) A. Ps. C. 136 (1869) 165-.
- Molecular force, and viscosity of gases. *Sutherland, W.* Ph. Mg. 36 (1893) 507-.
- Theory. *Boltzmann, L.* Wien Ak. Sb. 81 (1880) (Ab. 2) 117-; 84 (1882) (Ab. 2) 40-, 1230-.
- Variation with molecular volume. *Jäger, G.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 447-; 109 (1900) (Ab. 2a) 74-.
- — — — — temperature. *Obermayer, A. von.* Wien Ak. Sb. 73 (1876) (Ab. 2) 433-.
- — — — — *Wiedemann, E. E. G.* Arch. Sc. Ps. Nt. 56 (1876) 277-.
- — — — — (gases and vapours). *Schumann, O.* A. Ps. C. 23 (1884) 353-.
- — — — — *Breitenbach, P.* A. Ps. C. 67 (1899) 803-.
- — — — — *Rayleigh, (Lord).* [1900] R. S. P. 67 (1901) 137-.
- Very rarefied gas, apparatus for demonstrating friction in. *Kundt, A.* A. Ps. C. 158 (1876) 568-, 660.

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- Air. *Schneebeil, H.* Arch. Sc. Ps. Nt. 14 (1885) 197-.
- — — — — experiments. *Murray, J. E.* [1890] Glasg. Ph. S. P. 22 (1891) 199-.
- — — — — and other gases. *Maxwell, J. C.* Phil. Trans. 156 (1866) 249-.
- — — — — measurement. *Tomlinson, H.* [1886] Phil. Trans. 177 (1887) 767-, 795-.
- — — — — *Stokes, G. G.* [1886] Phil. Trans. 177 (1887) 786-.
- — — — — (Pendulums, effect of rotation of ball on logarithmic decrement.) *Stokes, G. G.* [1886] Phil. Trans. 177 (1887) 789-.
- — — — — *Fabry, C., & Perot, A.* C. R. 124 (1897) 281-; A. C. 13 (1898) 275-.
- — — — — Maxwell's method. *Meyer, O. E.* A. Ps. C. 143 (1871) 14-.
- — — — — by oscillations. *Braun, W., & Kurz, A.* Carl Rpm. 18 (1882) 569-; 19 (1883) 343-.
- — — — — *Meyer, O. E.* Carl Rpm. 18 (1882) 697-.
- — — — — *Kurz, A.* Exner Rpm. 19 (1883) 605-.
- — — — — passage through porous bodies with very small pressure differences. *Christiani, A.* Arch. An. Pl. (Pl. Ab.) (1882) 112-.
- — — — — variation with temperature. *Obermayer, A. von.* Wien Ak. Sb. 71 (1875) (Ab. 2) 281-.
- — — — — *Holman, S. W.* [1876-86] Am. Ac. P. 12 (1877) 41-; 21 (1886) 1-.
- — — — — *Heen, P. de.* Brux. Ac. Bil. 16 (1888) 195-.
- Argon and helium. *Rayleigh, (Lord).* Nt. 52 (1895) 533; R. S. P. 59 (1896) 198-.
- — — — — variation with temperature. *Rayleigh, (Lord).* R. S. P. 66 (1900) 68-.

- Hydrogen, variation with moisture. *Rayleigh, (Lord).* R. S. P. 62 (1898) 112-.
- Mercury vapour. *Noyes, A. A., & Goodwin, H. M.* [1896] Am. Ac. P. 32 (1897) 225-.
- — — — — variation with temperature. *Koch, S.* A. Ps. C. 19 (1883) 857-.
- Steam at high temperatures. *Cantone, M.* Rm. R. Ac. Linc. Mm. 19 (1884) 253-.

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- Heen, P. de.* Brux. Ac. Bil. 45 (1878) 798-.
- Marangoni, C.* (xii) Rv. Sc.-Ind. 11 (1879) 144-, 188-.
- Pagliani, S., & Battelli, A.* Tor. Ac. Sc. At. 20 (1885) 607-, 845-.
- Pagliani, S., & Oddone, E.* Tor. Ac. Sc. At. 22 (1886-87) 314-.
- Graetz, L.* A. Ps. C. 34 (1888) 25-.
- Perry, J. L.* Ps. S. P. 12 (1894) 236-; Ph. Mg. 35 (1893) 441-.
- Jones, O. G. L.* Ps. S. P. 13 (1895) 49-; Ph. Mg. 37 (1894) 451-.
- Petroff, N.* St. Pét. Ac. Sc. Bil. 5 (1896) 365-.
- Bibliography, 1800-1889. *Gee, W. W. H.* Manch. Lt. Ph. S. Mm. & P. 3 (1890) 123-.
- Definition. *Hagenbach-Bischoff, E.* Arch. Sc. Ps. Nt. 34 (1895) 377-.
- Elastic after-effect and viscosity. *Roiti, A.* N. Cim. 3 (1878) 5-.
- Electrolytes, solutions. *Euler, H.* Z. Ps. C. 25 (1898) 536-.
- Elements. *Pacher, G.* Ven. I. At. (1897-98) 516-.
- Figures of viscosity. *Isael, A.* Brux. S. Blg. Gl. Bil. (1889) (Mém.) 450-.
- Fluidity measurer, theory. *Heyer, —.* [1893] St. Gal. B. (1893-94) 93-.
- Kinetic theory. *Jäger, G.* Wien Ak. Sb. 102 (1893) (Ab. 2a) 253-.
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- — — — — *Thorpe, T. E., & Rodger, J. W.* C. S. J. 71 (1897) (Pt. 1) 360-.
- — — — — and solutions. *Lees, C. H.* [1900] L. Ps. S. P. 17 (1901) 460-.
- — — — — viscosity, temperature and concentration. *Noack, K.* A. Ps. C. 27 (1886) 289-.
- Liquids above their boiling points. *Heydeweller, A.* Bresl. Schl. Gs. Jbr. (1896) (Ab. 2a) 1-; A. Ps. C. 59 (1896) 193-.
- — — — — in an electric field. *Pacher, G., & Finazzi, L.* Ven. I. At. (1899-1900) (Pt. 2) 389-.
- — — — — at same temperature and some at different temperatures, measurement of viscosity. *Urc, A.* B. A. Rp. (1839) (Pt. 2) 22-.
- Measurement. *Couette, M.* C. R. 107 (1888) 388-; A. C. 21 (1890) 433-.
- — — — — experimental. *Vautier, T.* A. C. 15 (1888) 289-.
- — — — — instruments. *McGill, A.* Cn. R. S. P. & T. 1 (1895) (Sect. 3) 97-.
- — — — — by rate of flow from capillary tube. *Wilberforce, L. R.* Ph. Mg. 31 (1891) 407-.
- — — — — torsional vibrations. *König, W.* A. Ps. C. 32 (1887) 193-.

Navier's equations, verification. *Couette*, —. Par. S. Ps. Sé. (1889) 60-, 108-.

Organic liquids and their aqueous solutions, specific viscosity. *Traube*, J. Berl. B. 19 (1886) 871-.

Rate of flow from capillary tube, influence of electricity. *Langer*, C. Exner Rpm. 25 (1889) 461-.

— — — of viscous liquids, application of graphic methods. *Vautier*, T. A. C. 15 (1888) 433-.

Rigidity. *Schwedoff*, T. [1889-1900] Par. S. Ps. Sé. (1889) 122-; Sc. Abs. 4 (1901) 353.

— and viscosity. *Schwedoff*, T. Par. S. Ps. Sé. (1889) 134-, 186-.

Salt solutions. *Brückner*, H. A. Ps. C. 42 (1891) 287-.

— — —. *Moore*, B. E. Ps. Rv. 3 (1896) 321-.

— — —. *Massoulier*, P. C. R. 130 (1900) 773-.

— — — and their mixtures. *Kanitz*, A. Z. Ps. C. 22 (1897) 336-.

— — —, mixtures, relation to state of ionisation. *Barnes*, J. [1899] N. Scotia I. Sc. P. & T. 10 (1903) 113-.

Solutions. *D'Arcy*, R. F. Ph. Mg. 28 (1889) 221-.

—, *Jäger*, G. Wien Ak. Sb. 103 (1894) (Ab. 2a) 251-; Mh. C. (1894) 254-.

—, anhydrous. *Smoluchowski*, M. von. Wien Ak. Sb. 102 (1893) (Ab. 2a) 1136-.

—, aqueous. *Reyher*, R. Z. Ps. C. 2 (1888) 744-.

—, — dilute. *Arrhenius*, S. Z. Ps. C. 1 (1887) 285-.

—, —, at temperature of maximum density. *Pacher*, G., & *Finazzi*, L. Ven. I. At. (1899-1900) (Pt. 2) 1033-.

—, viscosity, and variation of viscosity of water with temperature. *Slotte*, K. F. A. Ps. C. 20 (1883) 257-.

Supercooled liquids. *Tammann*, G. Z. Ps. C. 28 (1899) 17-.

Superficial viscosity. *Marangoni*, C. (x) N. Cim. 5 & 6 (1871) 239-.

— — —. *Luvini*, G. (xii) Rv. Sc.-Ind. 4 (1872) 262-.

— — — (Marangoni). *Plateau*, J. A. F. Brux. Ac. Bil. 34 (1872) 404-; 48 (1879) 106-.

Variation with chemical composition. *Thorpe*, T. E., & *Rodger*, J. W. [1894-96] Phil. Trans. (A) 185 (1895) 397-; (A) 189 (1897) 71-.

— — — —. *Thorpe*, T. E. [1898] R. I. P. 15 (1899) 641-.

— — — density. *Warburg*, E., & *Sachs*, J. A. Ps. C. 22 (1884) 518-.

— — — pressure. *Röntgen*, W. C. A. Ps. C. 22 (1884) 510-.

— — —. *Cohen*, R. A. Ps. C. 45 (1892) 666-.

— — — temperature. *Heen*, P. de. Brux. Ac. Bil. 7 (1884) 248-; 11 (1886) 29-.

— — — vapour pressure. *Heen*, P. de. Brux. Ac. Bil. 10 (1885) 251-.

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— — —. *Brodmann*, C. A. Ps. C. 48 (1893) 188-.

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Acetic acid, pure, and in solution. *Noack*, K. A. Ps. C. 28 (1886) 666-.

Benzene and ethyl ether above their boiling point. *Heydweiller*, A. A. Ps. C. 55 (1895) 561-.

Bromine, variation with temperature. *Kann*, L. Wien Ak. Sb. 106 (1897) (Ab. 2a) 431-.

Chromates, solutions. *Slotte*, K. F. A. Ps. C. 14 (1881) 13-.

Gelatin solution, viscosity and electrolytic resistance. *Griffiths*, A. Manch. Lt. Ph. S. Mm. & P. 41 (1897) ix-.

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—, a periodic damping applied to viscosity measurement. *Riecke*, E. A. Ps. C. 51 (1894) 156-.

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Mercury. *Umant*, A. N. Cim. 3 (1896) 151-.

— and amalgams, viscosity and electrical conductivity. *Schweidler*, E. (*Ritter*) von. Wien Ak. Sb. 104 (1895) (Ab. 2a) 273-.

—, variation with temperature. *Koch*, S. A. Ps. C. 14 (1881) 1-.

Methyl chloride between boiling point and critical point. *Haas*, M. de. Amst. Ak. Vs. [2] (1894) 123-.

Oils, variation with temperature. *Garvanoff*, J. G. Wien Ak. Sb. 103 (1894) (Ab. 2a) 873-.

Saponine solution, superficial viscosity of films. *Mensbrugge*, G. van der. Brux. Ac. Bil. 29 (1870) 368-.

Sulphur, fused. *Pisati*, G. Palermo G. Sc. Nt. 12 (1877) (Pt. 1) 33-.

Water. *Geoffroy*, L. C. R. 88 (1879) 573-.

— — —. *Mallock*, A. R. S. P. 45 (1889) 126-.

— — —. *Pacher*, G. Ven. I. At. (1898-99) (Pt. 2) 785-.

—, discharge from pipes, influence of temperature. *Baumgartner*, G. A. Ps. C. 153 (1874) 44-.

—, — — —, — — — (Baumgartner). *Meyer*, O. E. A. Ps. C. 153 (1874) 619-.

—, — at different temperatures. *Mair*, J. G. I. CE. P. 84 (1886) 424-.

—, "drag" upon water at low velocities. *Haughton*, S. B. A. Rp. (1879) 275-.

—, — — — —, and of air upon air. *Haughton*, S., & *Reynolds*, J. E. [1880] Ir. Ac. P. 3 (1883) 277-.

—, measurement of viscosity by efflux method. *Knibbs*, G. H. N. S. W. R. S. J. 29 (1895) 77-; 30 (1897) 186-.

—, — — — — *Hannay's* microrheometer. *Barnett*, R. E. R. S. P. 56 (1894) 259-.

—, variation with temperature. *Gerstner*, F. J. von. Gilbert A. 5 (1800) 160-.

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- Absorption and colloids. *Bemmelen, J. M. van.* Z. Anorg. C. 13 (1897) 233-; 18 (1898) 14-, 98-.
- , Isothermals of colloidal iron oxide. *Bemmelen, J. M. van.* Z. Anorg. C. 20 (1899) 185-.
- Colloid films, spiral cracks formed during drying. *Rhumbler, L.* Ps. Z. 1 (1900) 41-.
- , metallic solutions, nature. *Stoeckl, K., & Vanino, L.* Z. Ps. C. 30 (1899) 98-.
- , —, (Stoeckl & Vanino). *Zsigmondy, R.* Z. Ps. C. 33 (1900) 63-.
- , —, — (Zsigmondy). *Stoeckl, K., & Vanino, L.* Z. Ps. C. 34 (1900) 378-.
- , solutions. *Bredig, G., & Coehn, A.* Z. Ps. C. 32 (1900) 129-.
- , —, coagulation. *Stark, J. A.* Ps. C. 68 (1899) 618-.
- , —, speed. *Linebarger, C. E.* Am. C. S. J. 20 (1898) 375-.
- , —, freezing. *Ijubawin, N.* Berl. B. 22 (1889) (Ref.) 727-.
- , —, gold. *Zsigmondy, —.* Z. Elektch. (1897-98) 546-.
- , —, nature. *Barus, C., & Schneider, E. A.* Z. Ps. C. 8 (1891) 278-.
- , —, —. *Linebarger, C. E.* Am. J. Sc. 43 (1892) 218-.
- , —, physical behaviour. *Lüdeking, C. A.* Ps. C. 35 (1888) 552-.
- , —, silver. *Capranica, S., & Carbonelli, E.* Genova S. Lig. At. 5 (1894) 279-.
- , —, stability. *Hardy, W. B.* Z. Ps. C. 33 (1900) 385-.
- , —, theory. *Kraft, F.* Berl. B. 29 (1896) 1334-.
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- Matter of space. *Morris, C.* Nt. 27 (1883) 349-; 28 (1883) 148-.
- Motion, communication in rationally distributed medium. *Marsilly, (le gén.) L. J. A. de C. de.* As. Fr. C. R. (1880) 140-.
- in infinite elastic solid, produced by body moving through same space. *Kelvin, (Lord).* [1900] *Edinb. R. S. P.* 23 (1902) 218-.
- of sphere in infinite elastic medium, and reaction of medium on sphere, theory. *Brillouin, —.* A. C. 2 (1894) 117-.
- Pressure of light energy, Maxwell-Bartoli's. *Lebedev, P.* Rs. Ps.-C. S. J. 32 (*Ps.*) (1900) 211-; Sc. Abs. 4 (1901) 485.
- Principles of mechanics; constitution of bodies; theory of perfect gases. *Boussinesq, J.* [1872] *Mntp. Mm. Ac. Sect. Sc.* 8 (1872-75) 109-; *Liouv. J. Mth.* 18 (1873) 305-.
- Properties of a medium, influence of obstacles arranged in rectangular order on. *Rayleigh, (Lord).* Ph. Mg. 34 (1892) 481-.
- Ray vibrations. *Faraday, M.* Ph. Mg. 28 (1846) 345-.
- — — — —, and atoms. *Whelpley, J. D.* *Silliman J.* 48 (1845) 352-; 2 (1846) 401-.
- Synthesis of the heavens and the earth. *Moigno, F. N. M.* C. R. 96 (1883) 1166-.
- Thermodynamics, cosmical. *Chase, P. E.* [1874] *Am. Ph. S. P.* 14 (1876) 141-.
- Undulations, primitive, velocity. *Chase, P. E.* Am. As. P. 23 (1874) (*Pt.* 1) 99-.
- Universal change, finality, question regarding one of the physical premises upon which it is based. *Preston, S. T.* Ph. Mg. 10 (1880) 338-.
- Universe, possibility of explaining past changes by causes at present in operation. *Preston, S. T.* J. Sc. 8 (1878) 360-.

0700 Dynamical Theories of Gravitation.

(See also Astronomy 1050.)

- Longo, A.* (vi *Adds.*) *Palermo Effem.* 5 (1833) 19-.
- Challis, J.* Ph. Mg. 18 (1859) 442-.
- Hoefer, L.* *Cosmos* 24 (1864) 67-.
- Lecoq de Boisbaudran, —.* C. R. 69 (1869) 703-.
- Vaschy, —.* J. de Ps. 5 (1886) 165-.
- Joly, J.* Nt. 51 (1894-95) 57-, 127, 223.
- Worthington, A. M.* [1894] *Nt.* 51 (1894-95) 79.
- Lodge, O. J.* [1894] *Nt.* 51 (1894-95) 154.
- Attraction, material, and gravity in particular, nature. *Robida, K.* [1870] (xii) *Kärnten Landms. Jb.* 10 (1871) 172-.
- , Newtonian, flux of mechanical energy for motion of bodies under. *Volterra, V.* *Tor. Ac. Sc. At.* 34 (1898) 238- or 366-, 601- or 805-; *N. Cim.* 10 (1899) 337-.
- — — — —, and natural phenomena. *Séguin, — (ainé).* *Moigno Cosmos* 18 (1861) 681-.
- — — — —, new method of symbolising. *Hamilton, (Sir) W. R.* *Ir. Ac. P.* 3 (1847) 344-.
- — — — —, theory, by Maxwell's method. *Gosiewski, W.* *Prace Mt.-Fiz.* 8 (1897) 178-; *Fschr. Ps.* (1898) (*Ab.* 1) 388-.
- — — — —, universal. *Laborde, —.* *Les Mondes* 55 (1881) 356-.
- — — — —, law. *Smythies, J. K. R. S. P.* 5 (1849) 831-.
- — — — —, and magnetism. *Maggi, P. G.* *Verona Mm. Ac. Ag.* 25 (1851) 131-.
- — — — —, — — — — —. *Sludskii, T. A.* (xvii) *Rec. Mth. (Moscou)* 3 (1868) (*Pt.* 2) 123-.
- Attractive force, origin. *Chase, P. E.* [1874] *Am. Ph. S. P.* 14 (1876) 111-.
- and repulsive forces, and action through a medium. *Tannery, P.* J. de Ps. 6 (1877) 242-.
- — — — —, generation by fluid pressures. *Tannery, P.* *Bordeaux S. Sc. Mm.* 2 (1878) 95-.

- Displacements in homogeneous medium due to small expansions or contractions. *Boussinesq, J. C. R.* 94 (1882) 1648-.
- Electromagnetic theory of the heavenly motions. *Behr, H. von.* [1846] (vi *Adds.*) Königsb. *Nw. Unterh.* 1 (1847) 213-.
- Falling motion, origin. *Morris, C. J. Sc.* 2 (1880) 367-.

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- Anon.* (vi 1166) *Sturgeon A. Electr.* 9 (1842) 317-.
- Buff, H.* *Zwolle Vooruitgang* 1 (1851) 131-.
- Walling, H. F.* *Am. J. Sc.* 40 (1865) 254-.
- Mackereth, T.* *Manch. Lt. Ph. S. P.* 20 (1881) 77-.
- Fabian, O.* (xii) *Kosmos (Lw.)* 7 (1882) 56-.
- Jarolimek, A.* [1883] *Wien Ak. Sb.* 88 (1884) (Ab. 2) 897-.
- Lorentz, H. A.* *Amst. Ak. Vs.* 8 (1900) 603-; *Amst. Ak. P.* 2 (1900) 559-.
- as absorption. *Isenkrahe, C. Z. Mth. Ps.* 37 (1892) (*Suppl.*) 161-.
- application of theory of images. *Lipschitz, R.* [1861] *Crelle J.* 61 (1863) 22-.
- attempts to explain. *Lindelöf, L. L.* *Helsingf. Öfv.* 12 (1870) 37-.
- — — *Tannery, P.* *Bordeaux S. Sc. Mm.* 5 (1890) 101-.
- cause (pamphlet by Vince). *Young, (Dr.) T.* [*Signed Dytiscus.*] *Nicholson J.* 19 (1808) 304-; 20 (1808) 276-.
- (*Dytiscus*). *Vince, S.* *Nicholson J.* 19 (1808) 344-.
- *Wakelin, T. B.* [1880] *N. Z. I. T.* 13 (1881) 122-.
- of laws. *Avenarius, M. P.* [1880] (xii) *Kiev S. Nt. Mm.* 6 (2) (1881) 63-.
- , and pendulum experiments. *Thompson, J. B. C. N.* 60 (1889) 295-.
- , — universal attraction. *Keller, É., & Keller, F. A. E. C. R.* 56 (1863) 530-.
- and cohesion. *Thomson, (Sir) W.* *Edinb. R. S. P.* 4 (1862) 604-.
- conservation of energy. *Brücke, E.* *Wien SB.* 25 (1857) 19-.
- — — *Young, (Rev.) G. P. Cn. J.* 14 (1875) 589-.
- dynamical explanation. *Preston, S. T.* *Wien Ak. Sb.* 87 (1883) (Ab. 2) 795-.
- — *Rysánek, A.* *Exner Rpm.* 24 (1888) 90-.
- theories, comparative review. *Preston, S. T. Ph. Mg.* 39 (1895) 145-.
- within Earth. *Nystrom, J. W.* *Franklin I. J.* 22 (1851) 205-.
- elasticity theory. *Beltrami, E.* *Mil. I. Lomb. Rd.* 17 (1884) 581-.
- electrical theory. *Leray, (l'abbé) —.* *Les Mondes* 22 (1870) 760-.
- — *Franklin, W. S.* *Science* 12 (1900) 887-.
- and electricity, possible relation. *Faraday, M.* [1850] *Phil. Trans.* (1851) 1-.
- the ether. *Dubois, E. A. Gén. Civ.* 3 (1864) 233-, 305-.
- — — *Finlay, C.* *Habana Ac. A.* 9 (*1872) 406-; 11 (*1874) 429-, 469-.

- Euler's theory. *Isenkrahe, C.* [1880] *Z. Mth. Ps.* 26 (1881) (*H.-lt. Ab.*) 1-.
- experiments. *Wakelin, T.* [1884] *N. Z. I. T.* 17 (1885) 407-.
- fallacy as to theory. *Alvord, B.* [1882] *Smiths. Misc. Col.* 25 (1883) Art. 2, 85-.
- (*Wash. Ph. S. Bl.* 5 (1883).)
- and heat. *Greguss, G.* [1870] (xii) *Mag. Tud. Ak. Étk. (Term.)* 2 (1872) (No. 5) 14 pp.
- —, alleged connection. *Schuller, A.* [1875] (xii) *Mag. Tud. Ak. Étk. (Term.)* 6 (1876) (No. 4) 8 pp.
- Huygens's hypothesis. *Anon.* (vi 230) *Bb. Un.* 24 (1823) 3-.
- hydrodynamical theory, model for. *Korn, A.* *Münch. Ak. Sb.* 27 (1898) 197-.
- hypotheses. *Croll, J.* *Ph. Mg.* 34 (1867) 449-.
- and inertia. *Fessenden, R. A.* *Science* 12 (1900) 325-.
- kinetic theories. *Taylor, W. B.* *Smiths. Rp.* (1876) 205-.
- theory, bearing on phenomena of cohesion and chemical action. *Preston, S. T. Ph. Mg.* 5 (1878) 297-.
- according to laws of thermodynamics. *Anderssohn, A.* *Z. Nw.* 10 (1874) 242-.
- Le Sage theory (ultramundane corpuscles). *Thomson, (Sir) W.* [1871] *Edinb. R. S. P.* 7 (1872) 577-.
- — — *Croll, J.* *Ph. Mg.* 5 (1878) 45-.
- — —, dynamical conditions applicable to. *Preston, S. T. Ph. Mg.* 4 (1877) 206-, 364-.
- — —, objection. *Farr, C. C.* [1897] *N. Z. I. T.* 30 (1898) 118-.
- Le Sage-Thomson theory, difficulties in. *Oliver, J. E.* *Am. As. P.* (1892) 88-.
- and light. *W...o.* *Baumgartner Z.* 5 (1837) 471-.
- —, cosmical relations. *Chase, P. E.* [1869] *Am. Ph. S. P.* 11 (1871) 103-.
- —, relative velocities. *Chase, P. E.* *Am. Ph. S. P.* 13 (1873) 148-.
- mechanical theory. *Kiaer, H. J.* *Christiania F.* (1892) No. 12, 30 pp.; *Fschr. Ps.* (1892) (Ab. 1) 209.
- — *Casalunga, —.* *As. Fr. C. R.* (1900) (Pt. 1) 138-.
- —, importance of experiments. *Preston, S. T. Ph. Mg.* 11 (1881) 391-.
- mechanism. *Odstrčil, J.* *Wien Ak. Sb.* 89 (1884) (Ab. 2) 485-.
- molecular attraction or chemical affinity referred to. *Libes, A. J. de Ps.* 54 (1802) 391-, 443-.
- and molecular attraction, identity. *Nobili, L. Brugnatelli G.* 10 (1817) 259-.
- — energy of matter. *Sutherland, A.* [1877] *Vict. R. S. T.* 14 (1878) 84-.
- nature of the ether, hypothesis. *Ball, W. W. R.* *Mess. Mth.* 21 (1892) 20-.
- nature and velocity, determination. *Fessenden, R. A.* *Science* 12 (1900) 740-.
- new theory. *Leray, (l'abbé) —.* *C. R.* 69 (1869) 615-.
- Newton's law, and the law of attraction. *Anderssohn, A. (sen.)* *Mt. Ostld.* 5 (1892) 71-.

physical theories. *Hall, T. P.* Iowa Ac. Sc. P. 3 (1896) 47-.

present position of our knowledge. *Mousson, A.* Zür. Vjschr. 14 (1869) 167-.

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—, — (Hüssler). *Lampe, E.* Exner Rpm. 23 (1887) 571-.

—, —, —, *Hüssler, J. W.* Exner Rpm. 23 (1887) 719-.

—, —, — (Lampe). *Hüssler, J. W.* Exner Rpm. 24 (1888) 60-.

—, —, — (Hüssler). *Favero, G. B.* Rm. R. Ac. Linc. Rd. 4 (1888) (Sem. 1) 310-.

—, —, — (Hüssler). *Lampe, E.* Exner Rpm. 24 (1888) 324-.

as secondary electric effect, theory. *Fessenden, R. A.* [1900] Sc. Abs. 4 (1901) 8-.

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—, —, —, *Preston, S. T.* Nt. 48 (1893) 103.

—, —, —, determination by Doppler's principle. *Mewes, R.* Dingler 315 (1900) 637-.

Gravitational permeability. *Austin, L. W., & Thuing, C. B.* Ps. Rv. 5 (1897) 294-.

Molecular physics, problem, contribution of astronomy to solution. *Pictet, R.* A. C. 25 (1882) 546-.

Newton and action at a distance. *Kirwan, C. de.* Rv. Quest. Sc. 33 (1893) 169-.

Potential energy. *Provenzali, F. S.* Rm. N. Linc. Mm. 4 (1888) 3-.

Quartz crystals, directive action. *Poynting, J. H., & Gray, P. L.* [1898] Phil. Trans. (A) 192 (1899) 245-.

Repulsion. *Heath, D. D.* Nt. 30 (1884) 490.

Solar and planetary systems, electrical hypothesis for. *Delta.* Elect. Rv. 42 (1898) 72-, 138-, 283-, 460-, 491-; 43 (1898) 655.

MEASUREMENT OF DYNAMICAL AND MECHANICAL QUANTITIES. ELASTICITY.

0800 General.

Accurate straight edges, manufacture. *Wadsworth, F. L. O.* Franklin I. J. 138 (1894) 1-.

Art of measuring. *Siemens, (Sir) C. W. V.* Nost. Eng. Mg. 15 (1876) 159-.

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Force (energy) and matter, persistence. *Dreher, E.* Emden Nf. Gs. Jbr. (1891-92) 37-.

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— research, present state. *Lehmann, C. F.* Z. Ethnl. 26 (1894) (188)-.

— studies. *Wild, H.* [I.] St. Pét. Ac. Sc. Mm. 18 (1872) (No. 8) 26 pp.; 23 (1877) (No. 8) 22 pp.

— in British Museum. *Lehmann, C. F.* Z. Ethnl. 23 (1891) (515)-.

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—, chapter in. *Grafstrom, E.* Am. Eng. & Railroad J. 72 (1898) 289-.

—, progress of science in. *Harkness, W.* Smiths. Misc. Col. 33 (1888) Art. 4, xxxix (bis)-. (Wash. Ph. S. Bll. 10 (1888).)

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— — (testing planeness of surfaces). *Rogers, W. A.* Am. Mer. S. P. 14 (1892) 128-.

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0805 Theory of Measurement (combination of observations). Harmonic Analysis. Units and Dimensions. Standards of Measurement.

THEORY OF MEASUREMENT (COMBINATION OF OBSERVATIONS).

(See Mathematics 1630.)

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Harmonic analyser. *Thomson, (Sir) W. R.* S. P. 27 (1878) 371-.

- Harmonic analyser, new. *Henrici, O.* Gött. Nr. (1894) 30-; L. Ps. S. P. 13 (1895) 77-; Ph. Mg. 38 (1894) 110-.
- , reading amplitude and epoch directly. *Sharp, A.* L. Ps. S. P. 13 (1895) 89-; Ph. Mg. 38 (1894) 121-.
- , simple form. *Yule, G. U.* L. Ps. S. P. 13 (1895) 403-; Ph. Mg. 39 (1895) 367-.
- analysers, new. *Hess, A.* Éclair. Elect. 4 (1895) 385-.
- New method. *Sharp, A.* L. Ps. S. P. 13 (1895) 599.
- Polar-planimeter method. *Finsterwalder, S.* Z. Mth. Ps. 43 (1898) 85-.
- Wave motion. *Lindelöf, L. L.* [1873] Helsingf. Öfv. 16 (1874) 86-.
- C. G. S. system, metric units of force, energy and power, larger than units of. *Thomson, (Prof.) Jas.* B. A. Rp. (1876) (Sect.) 32-.
- — — units. *Preece, W. H.* Elect. 21 (1888) 701-.
- Constants and units, report. *Guillaume, C. E.* B. A. Rp. (1892) 165-.
- , universal natural. *Thiesen, M.* D. Ps. Gs. Vh. (1900) 116-.
- Dimensional equations and change of units. *Shaw, W. N.* Camb. Ph. S. P. 5 (1886) 137-.
- , homogeneity in. *Clavenad, C. C. R.* 115 (1892) 470-.
- , — (Clavenad). *Vaschy, —.* C. R. 115 (1892) 597-.
- , and nomenclature. *Thomson, (Prof.) Jas.* B. A. Rp. (1878) 451-.
- , use. *Peddie, W.* Edinb. Mth. S. P. 9 (1891) 30-; 11 (1893) 7.
- Dimensions method, application to proof of physical theorems. *Neesen, F. A.* Ps. C. 7 (1879) 329-.
- of physical quantities. *Winter, W.* Exner Rpm. 21 (1885) 775-.
- — —. *Raverot, É.* Lum. Élect. 23 (1887) 101-; 36 (1890) 601-.
- — —, relation to directions in space. *Williams, W.* L. Ps. S. P. 11 (1892) 357-; Ph. Mg. 34 (1892) 234-.
- — —, suppressed. *Rücker, A. W.* [1888] L. Ps. S. P. 10 (1890) 37-; Ph. Mg. 27 (1889) 104-.
- — —, systems of, and laws of action. *Rovida, A.* Lum. Elect. 52 (1894) 601-.
- — —, theory. *Pietzker, F.* D. Nf. Vh. (1898) (Th. 2, Hälfte 1) 30-.
- , theory. *Sluginov, N. P.* (xii) Rs. Ps.-C. S. J. 16 (Ps., Pt. 1) (1884) 49-, 238-; Fsch. Ps. (1884) (Ab. 1) 28-.
- , —. *Abraham, H.* J. de Ps. 1 (1892) 516-.
- , —. *Schreiber, A.* J. de Ps. 8 (1899) 613-.
- of μ and κ . *Fessenden, R. A.* Am. As. P. (1899) 115-; Ps. Rv. 10 (1900) 1-, 83-.
- — — (Fessenden). *P., W. A.* Elect. Rv. 46 (1900) 898-.
- Dynamical units (B. A. rep., 1873). *Everett, J. D.* B. A. Rp. 43 (1873) 222-.
- —. *Smith, R. H.* Nt. 36 (1887) 53.
- —, absolute, system. *Rovida, A.* Rv. Sc.-Ind. [24 (1892)] 153-.
- Electrical units and definitions. *Basso, G.* It. S. Met. An. 5 (1890) 131-.
- Elements of physical work:—*vis viva*, force, etc. *Nyström, J.* W. Franklin I. J. 48 (1864) 325-.
- Energetics. *Ostwald, W.* Leip. Mth. Ps. B. 43 (1891) 271-; 44 (1892) 212-.
- Fundamental units. *Mendenhall, T. C.* Am. S. CE. T. 30 (1893) 120-.
- in absolute systems, change. *Malagoli, R.* Éclair. Elect. 11 (1897) 535-.
- — — —. *Brylinski, E.* Éclair. Elect. 12 (1897) 60-.
- Gaussian units. *Abria, O.* [1882] Bordeaux S. Sc. Mm. 5 (1883) 15-.
- Germany, system of units for. *Anon.* (VI 626) Hann. Z. Archt. Vr. 6 (1860) 481-.
- Bahia, M. B.* Arg. S. Ci. A. 29 (1890) 97-, 259-; 30 (1890) 21-, 81-, 161-, 241-.
- Absolute and gravitation systems. *Slate, F.* Nt. 44 (1891) 445.
- units. *Bohn, C.* [1882] A. Ps. C. 18 (1883) 346-; 20 (1883) 690-.
- (Bohn). *Volkman, P.* A. Ps. C. 19 (1883) 245-; 21 (1884) 516-.
- , Moon, *W. B. A. Rp.* (1891) 580; Tel. J. 28 (1891) 549-.
- , *Kistjakovskij, V.* Rs. Ps.-C. S. J. 25 (Ps.) (1893) 81-; J. de Ps. 3 (1894) 237.
- and measurement in mechanics. *Kiel, —.* Bonn Niedr. Gs. Sb. (1896) 80-.
- , reduction to fundamental units of time and length. *Sahulka, J.* Elekttech. Z. 11 (1890) 459-.
- , system. *Sundell, A. F.* [1881] Helsingf. Acta 12 (1883) 351-.
- , —. *Volkman, P.* A. Ps. C. 16 (1882) 481-.
- , —. *Lehmann, O.* Karlsruhe Nt. Vr. Vh. 13 (1900) (Ab.) 365-.
- , —, and dimensions of physical quantities. *Krebs, —.* Czgt. Opt. 10 (1889) 7-.
- , —, electrical units. *Géraldy, F.* Lum. Élect. 5 (*1881) 181-, 216-.
- , systems. *Szarvady, G.* Lum. Élect. 14 (1884) 321-, 375-, 413-.
- , —. *Boulanger, J.* Lum. Élect. 16 (1885) 3-.
- , —. *Winter, W.* Exner Rpm. 24 (1888) 471-.
- Algebraic symbols in applied mathematics. *Lodge, O. J.* Nt. 43 (1891) 513.
- — — —. *Macaulay, W. H.* Nt. 43 (1891) 558.
- C. G. S. and centimeter dyne second system of units, and a gravitational experiment. *Fessenden, R. A.* Science 22 (1893) 339-.
- — — system. (Correction of statements in Everett's book.) *Tittmann, O. H.* Nt. 45 (1892) 581.
- — — — (Tittmann). *Everett, J. D.* Nt. 45 (1892) 581-.
- — —, fundamental units. *Stok, — van der.* Batav. Ntk. Ts. 47 (1887) 588-.
- — —, metre in. *Torre, M.* Rv. Sc.-Ind. 22 (1890) 252-.

- Homogeneity of formulæ. *Ledieu, A. C. H.* C. R. 96 (1883) 1692-.
- and physical equations. *Clavenad, —.* Gén. Civ. 23 (1893) 176-.
- in physical formulæ. *Bertrand, J. C. R.* 86 (1878) 916-.
- , reciprocity. *Ledieu, A. C. H.* C. R. 96 (1883) 1834-.
- M. K. S. system of units. *Rogers, F. J. Ps. Rv.* 11 (1900) 115-.
- Magnetic, gravitational and luminous force. *Chase, P. E.* [1875] Am. Ph. S. P. 14 (1876) 607-.
- quantities, dimensions. *Hospitalier, É.* [1887] Elect. 20 (1888) 163-.
- Mass and force units. *Newcomb, S.* Science 2 (*1883) 493-.
- Micrometric unit (micron μ). *Cornet, —.* [1880] Brux. S. Blg. Mer. Bl. 6 (*1882) cxvii-.
- Natural system of units. *Hauff, J. K. F.* Bode As. Jb. (1813) 223-.
- Nature, units of. *Stoney, G. J.* [1881] Dubl. S. Sc. P. 3 (1883) 51-.
- Notation for units. *Didion, I.* Metz Mm. Ac. 17 (1835-36) 227-.
- — —. *Macfarlane, —.* Cn. I. P. 3 (1886) 81-.
- Ostwald's system of units, and surface tension. *Schreiber, K.* Ps. Z. 1 (1900) 75-, 165-.
- Physical quantities, mathematical classification. *Maxwell, J. C. L.* Mth. S. P. 3 (1869-71) 224-.
- Reduction of units to a single dimension. *Budde, E. A.* Ps. C. 20 (1883) 161-.
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- , systems. *Pionchon, J.* Bordeaux S. Sc. Mm. 2 (1891) 1-.
- , theory. *Ledieu, A. C. H.* C. R. 95 (1882) 1328-; 96 (1883) 986-.
- , —. *Szarvady, G.* Lum. Élect. 23 (1887) 401-.
- Value of physical constants in different systems. *Malagoli, R.* Rv. Sc.-Ind. 29 (1897) 269-.
- The watt and horse-power. *Preece, W. H.* Elect. 13 (1884) 473.
- Weight, mass, and dynamical units. *Hayward, R. B.* Nt. 35 (1887) 604-.
- , —, force, units. *Greenhill, A. G.* Nt. 35 (1887) 486-.
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- — — — —. *Robinson, T. R.* *As. S. Mm.* 5 (1833) 125-.
- — — — —. *Förster, W.* *Berl. Mb.* (1867) 239-.

- and atmospheric pressure. *Hipp, M.* [1877] *Neuch. S. Sc. Bil.* 11 (1879) 152-, 159-.
- atmospheric pressure compensation. *Carlini, F.* *Brugnattelli G.* 8 (1825) 338-.
- — — — —. *Robinson, T. R. B. A. Rp.* (1843) (pt. 2) 17-, 102.
- — — — —. *Kröger, A.* *As. Nr.* 62 (1864) 279-; 68 (1867) 327-.
- — — — —. *Airy, (Sir) G. B. Ph. Mg.* 41 (1871) 482.
- — — — —. *Denison, E. B.* *As. S. M. Not.* 33 (1873) 122-, 294-.
- — — — — (Denison's). *Robinson, T. R.* *As. S. M. Not.* 33 (1873) 295-.
- — — — —. *Redier, A. C. R.* 83 (1876) 1174-.
- — — — —. *Gulbransen, P. F.* *Belfast NH. S. Rp. & P.* (1890-91) 87-.
- — — — — error. *Webster, R.* *As. S. M. Not.* 33 (1873) 296-.
- Breguet's Arago, D. F. J.* (vi *Adds.*) *Par. Bur. Long. An.* (1824) 152-.
- at Buda-Pest Polytechnic. *Kruspér, I.* [1885] *Mth. Term. Ét. s.* 4 (1886) 19-; *Mth. Nt. B. Ung.* 4 (1885-86) 18-.
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- church-, illumination. *Bryson, R.* *Edinb. N. Ph. J.* 33 (1842) 293-.
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- Döhler, J. F. A.* *Gilbert A.* 7 (1801) 318-.
- Benzenberg, J. F.* *Voigt Mg.* 4 (1802) 697-.
- Kater, H.* *Nicholson J.* 20 (1808) 214-.
- Ward, H.* *Nicholson J.* 21 (1808) 53-.
- B., R.* *Nicholson J.* 33 (1812) 217-.
- Reid, A. A. C.* 85 (1813) 183-.
- Ermerins, J. G.* *Leijd. A. Ac.* (1818-19) 22 pp.
- Hill, G. J. D.* (vi *Adds.*) *Lund Phys. Sällsk.* Årsb. (1823) 77-.
- Berlinger, I.* *Wien Jb. Pol. I.* 6 (1825) 14-.
- Herapath, W.* *Tilloch Ph. Mg.* 65 (1825) 374-.
- Zecchini-Leonelli, —.* *Wien Jb. Pol. I.* 6 (1825) 53-.
- Kraijenhoff, H. E.* *Hall Bij.* 7 (1832) 351-.
- Forman, W.* *Dingler* 55 (1835) 331-.
- Jones, W. G.* *Silliman J.* 38 (1840) 274-.
- Meikle, H.* *Edinb. N. Ph. J.* 41 (1846) 385-.
- Laugier, P. A. E. C. R.* 25 (1847) 415-.
- Smith, J. L. C. R.* 83 (1876) 202; *Am. J. Sc.* 12 (1876) 106-.
- Weber, R.* *Neuch. S. Sc. Bil.* 15 (1886) 169-.
- Nippoldt, W. A. Z.* *Instk.* 16 (1896) 44-.
- Butenschön, G.* *Cztg. Opt.* 18 (1897) 61.
- Faddegon, J. M.* *Cg. Int. Chron.* (1900) 13-.
- application of property of circle in construction. *Giulio, C. I.* [1848] *Tor. Mm. Ac.* 11 (1851) 187-.
- Baily's.* *Bryson, R.* *Edinb. N. Ph. J.* 38 (1845) 220-.

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—, of lead and iron. *Benzenberg, J. F.* Voigt Mg. 4 (1802) 787-.

—, new. *Nicholson, W.* Nicholson J. 3 (1800) 205-.

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—, *Baily, F.* As. S. Mm. 1 (1822) 381-.

—, *Encke, J. F.* As. Nr. 10 (1833) 119-.

—, *Böhm, J. G.* Wien SB. 26 (1857) 345-.

—, *Balázs, M.* Termt. Közl. 25 (1893) (Suppl.) 47-.

—, *Riefler, S.* Z. Instk. 13 (1893) 88-.

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—, —. *Walker, C. V.* As. S. M. Not. 21 (1861) 72-, 160-.

—, —. *Hefner-Alteneck, F. von.* Nt. 48 (1893) 445-.

—, —, of turret clocks. *Kesel, G.* Czlg. Opt. 13 (1892) 249-.

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Gardner, H. D. Nt. 20 (1879) 345-.

Williot, —. [1881] Rv. Sc. 2 (1882) 417-.

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Hirsch, A. Neuch. S. Sc. Bll. 14 (1884) 1-.

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- — friction. *Sang, E.* *Edinb. N. Ph. J.* 19 (1835) 129-.
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- — magnet. *Harvey, G.* *Edinb. J. Sc.* 6 (1827) 288-.
- — magnetic action. *Ellis, W.* *Ph. Mg.* 25 (1863) 325-.
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- —, Galileo's. *Schaik, W. C. L. van.* *Z. Instk.* 7 (1887) 350-, 428.
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- — —, Campiche. *Dary, G.* [1900] *Sc. Abs.* 4 (1901) 95-.
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- — — wood. *Baily, F.* *Tilloch Ph. Mg.* 65 (1825) 41-.
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- —, electric. *Ritchie, F. J.* [1878] *Sc. S. Arts T.* 10 (1883) 30-.
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- , —, Paris. *Tresca, H. É. C. R. 90 (1880) 660-*.
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- , universal. *Böhm, J. G. Prag Sb. (1862) 57-*.
- , wooden suspension, used in Alps and Pyrenees. *Stanley, O. Edinb. N. Ph. J. 11 (1831) 281-*.
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- , chronometer-, applied to clocks. *Riefler, S. Dingler 276 (1890) 356-*.
- , clock-, with constant impulse. *Ainmiller, H. Dingler 260 (1886) 212-*.
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- , —, —. *Vulliamy, B. L. QJ. Sc. 14 (1823) 334-*; *16 (1823) 1-*.
- , —, new. *Whitelaw, D. Edinb. Ph. J. 8 (1823) 27-*.
- , —, —. *Airy, G. B. As. S. M. Not. 5 (1839-43) 221-*.
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- , —, and free pendulum. *Appel*, *D.* Z. Instk. 12 (1892) 19-, 165.
- , —, — (Appel). *Westphal*, *A.* Z. Instk. 12 (1892) 164-.
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- , —, detached. *Young*, *C. A.* Spet. It. Mm. 6 (1877) (App.) 73-.
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- , chronometer-. *Rodanet*, *A. H.* Cg. Int. Chron. (1900) 34-.
- , —, classification. *Ditisheim*, *P.* Cg. Int. Chron. (1900) 40-.
- , clock-. *Wagner*, *J.* Par. Bll. S. Encour. 46 (1847) 3-.
- , —, *Denison*, *E. B.* [1848] Camb. Ph. S. T. 8 (1849) 633-.
- , —, *Fulton*, *J.* Silliman J. 11 (1851) 406-.
- , —, *Bloxam*, *J. M.* [1853] As. S. Mm. 22 (1854) 103-; 27 (1859) 61-.
- , compensations, etc., of clocks and chronometers, modern. *Antoine*, *E.* Cg. Int. Chron. (1889) 43-.
- Globe time-piece. *Allison*, *B.* Philad. T. 5 (1802) 82-.
- History of time-measurement. *Golfarelli*, *I.* Firenze Ac. Georg. At. 21 (1898) 287-.
- Horoscope, Eble's, theory (movable sundial). *Radau*, *R.* Les Mondes 8 (1865) 588-.
- Metronomes, construction. *Bruno*, *F. F. de.* Moigno Cosmos 7 (1855) 363-.
- Pendulum, electric motor. *Higgs*, *R. W. H. P.* [1876] Nt. 15 (1877) 98.
- , — precision-, Neuchâtel Observatory. *Favarger*, *A.* Lum. Élect. 20 (1886) 206-.
- , — regulator for. *Bourbouze*, —. C. R. 83 (1876) 482-.
- , free, as time standard. *Mendenhall*, *T. C.* Am. J. Sc. 43 (1892) 85-.
- , Helmholtz, modification. *Kleiner*, *A.* Arch. Sc. Ps. Nt. 8 (1899) 375-.
- Phenomena of the time-infinitesimal. *Nichols*, *E. L.* Am. As. P. (1893) 57-.
- Phonic wheel for regulating synchronism of motion. *La Cour*, *P.* C. R. 87 (1878) 499-; (xm) Sk. Nt. Môt. F. (1880) 133-; Tel. J. 21 (1887) 331-, 359-, 529.
- Physical experiments, time measurements in. *Aldini*, *G.* Bologna Mm. I. It. 1 (pte. 2) (1806) 487-.
- Rotation time, absolute measurement. *Prytz*, *K.* A. Ps. C. 43 (1891) 638-.
- — of axis and vibration time of tuning fork, ratio. *Prytz*, *K.* A. Ps. C. 43 (1891) 652-.
- , —, and periodic time of tuning fork, measurement. *Jones*, *J. V.* L. Ps. S. P. 10 (1890) 97-; Ph. Mg. 27 (1889) 349-.
- Small intervals, measurement. *Pouillet*, *C. S. M.* C. R. 19 (1844) 1384-.
- , —, *Tygna*, *E.* Rio Obs. Rv. (1886) 105-.
- , —, apparatus. *Aldini*, *G.* Bb. Un. 51 (1832) 77-.
- , —, —. *Hankel*, *W. G.* Leip. B. 18 (1866) 46-.
- , —, —. *Gieseler*, *E.* Bonn Niedr. Gs. Sb. (1875) 304-.
- , —, —; duration of electroscopic double refraction and magnetic rotation. *Abraham*, *H.*, & *Lemoine*, *J.* Par. S. Ps. Sé. (1899) 155-; A. C. 20 (1900) 264-.
- , —, —, electrical. *Sabine*, *R.* Ph. Mg. 1 (1876) 337-.
- , —, —, photographic. *Stein*, *S. T.* Wien Pht. Cor. 14 (1877) 183-, 277-.
- , —, —, *Mareschal*, *G.* Gén. Civ. 20 (1891-92) 152-.
- , —, —, *Lavergne*, *G.* Gén. Civ. 21 (1892) 381-.
- Sundial, azimuthal. *Decante*, —. Rv. Mar. et Col. 46 (1875) 222-.
- , cylindrical, Mâcon. *Mayette*, —. Mâcon Ac. A. 5 (1885) 401-.
- , horizontal. *Donovan*, *M.* Ir. Ac. P. 7 (1858) 111-.
- , — elliptic, Dijon, 1827. *Perret*, *A.* N. A. Mth. 15 (1856) 399-.
- , —, —, —. *Dumay*, —. [1899] Dijon Ac. Sc. Mm. 7 (1901) xix-.
- , new. *Decohorne*, —. C. R. 113 (1891) 481.
- , portable. *Viala*, *E.* Mntp. Ac. Sc. Mm. 5 (1861-63) 155-.
- , — (Sonnerring). *Karsten*, *G.* [1893] Schl.-Holst. Nt. Vr. Schr. 10 (1895) 66-.
- , universal, Sharp's. *Robinson*, *T. R.* B. A. Rp. (1849) (pt. 2) 34.
- Sundials. *Littrow*, *J. J. von.* Baumgartner Z. 9 (1831) 148-.
- , adjustment. *Patterson*, *R.* [1817] Am. Ph. S. T. 1 (1818) 333-.
- , construction. *Franceaur*, *L. B.* Gergonne A. Mth. 8 (1817-18) 233-; 9 (1818-19) 91-.
- , —, graphical. *Kahrer*, *G.* Wien Jbr. Ober-Realsh. Inn. Stadt 5 (1863) 1-.
- , —, new method. *Servier*, —. Rv. Sc. 49 (1892) 366-.
- , globes for. *Avit*, —. Le Puy A. S. Ag. (1827) 189-.
- Telechronometer. *Ungerer*, —. Cg. Int. Chron. (1889) 189-.
- Telephonic time-transmitter. *Harrington*, *M. W.* Science 1 (*1883) 302-.

- Temperature and time, measurement, analogy. *Macgregor, J. G.* [1887] *N. Scotia I. Sc. P. & T.* 7 (1890) 20-.
- Time determination in study of relative gravitation. *Saija, G.* *Spet. It. Mm.* 28 (1900) 65-.
- regulation, with alternating currents. *Bohmeyer, C.* *Elekttech. Z.* 8 (1887) 503-.
- signals, correction of errors in distribution. *Grubb, (Sir) H.* [1898] *Dubl. S. Sc. P.* 9 (1899-1902) 37-.
- , electric. *Carhart, H. S.* *Science* 3 (1884) 401.
- , —, method of making. *Mell, P. H. (jun.)* *Science* 2 (*1883) 823.
- , —, ——. *M.* *Science* 3 (1884) 59.
- , — telegraphy. *Hirsch, A.* *Neuch. Bll.* 6 (1861-63) 373-.
- Watch with ball bearings for balance, trials. *Maillard-Salin, —.* *Cg. Int. Chron.* (1900) 63-.
- , rocking, rates of, and gravitational pendulum. *Barus, C.* *Ph. Mg.* 50 (1900) 595-.
- Watches, compensation curb. *Scott, J. Nicholson* *J.* 11 (1805) 19-.
- , ——. *Hardy, W.* *Nicholson J.* 20 (1808) 138-.
- , magnetised. *Lewis, W. T.* *Franklin I. J.* 143 (1897) 60-.
- , mainspring, theory. *Young, Alex.* *Franklin I. J.* 24 (1852) 344-.
- , Paillard palladium alloys in. *Houston, E. J.* *Am. Ph. S. P.* 25 (1888) 129-.
- , Paillard's non-magnetic balance and hairspring. *Houston, E. J.* *Franklin I. J.* 125 (1888) 238-.
- and other time-pieces, influence of magnetism. *Varley, S.* *Tilloch Ph. Mg.* 1 (1798) 16-.
- , trains. *Pearson, W.* *Nicholson J.* 5 (1802) 46-.

0810 Measurement of Mass and Density. Balance.

(See also Chemistry 7115.)

MASS.

- Francke, A.* *Hann. Archt.-Vr. Z.* 20 (1874) 539-.
- Air, weight of litre. *Broch, O. J.* *Par. Poids et Mes. Tr. Mm.* 1 (*1881) A. 49-.
- , —, —, and density of gases. *Leduc, A.* *C. R.* 117 (1893) 1072-.
- , —, — (Regnault); water, density at 4° C. and at 0° C. *Kohrausch, R.* *Pogg. A.* 98 (1856) 178-.
- , —, — millilitre. *Marek, W. J.* *Par. Poids et Mes. Tr. Mm.* 1 (*1881) D. 26-.
- Carbon dioxide in air of weighing room. *Dobrochotov, A.* *Rs. Ps.-C. S. J.* 29 (*Ps.*) (1897) (*App.*) 85-.
- Coins, system of adjusting to standard in weight. *Smith, J. T.* *Madras Eng. Rp.* 2 (1846) 205-.

- Electricity, application to weighing. *Decharme, C.* *Lum. Elect.* 19 (1886) 15-.
- , free, influence on exact weighing. *Ekman, F. L.* *Stockh. Öfv.* 17 (1860) 279-.
- Gas weighed by Aristotle. *Erman, P.* *Gilbert A.* 16 (1804) 385-.
- Gases, weights, new method of determining. *Potter, J.* [1827] *Manch. Ph. S. Mm.* 5 (1831) 195-.
- Kilogramme, comparison of types, weighing observations. *Broch, O. J.* *Par. Poids et Mes. Tr. Mm.* 4 (1885) 1-.
- , standard III, volume. *Broch, O. J.* *Par. Poids et Mes. Tr. Mm.* 4 (1885) 23-.
- , —, weighings. *Dumas, J. B., et alii.* *Par. Poids et Mes. Tr. Mm.* 4 (1885) 1-.
- Metallic globules, minute, method of finding weight without balance. *Byrne, O.* (*vt Adds.*) *Chemist* 5 (1844) 241-.
- Pendulum, weighing by means of. *Fuchs, K.* *Exner Rpm.* 26 (1890) 634-.
- Water, cubic decimetre, mass. *Fabry, C., Macé de Lépinay, J., & Pérot, A.* *C. R.* 129 (1899) 709-.
- , —, weight. *Wild, H.* *A. Cons. Arts et Mét.* 10 (*1873) 106-.
- , —, —. *Mendéléeff, D.* *R. S. P.* 59 (1896) 143-.
- , —, —. *Chappuis, —.* *Par. Poids et Mes. PV.* (1897) 125-.
- , —, —. *Guillaume, C. É.* *Par. Poids et Mes. PV.* (1899) 143-.
- , — foot, weight. *Haily, R. J.* *Par. S. Phlm. Bll.* 1 (1791) 39-.
- , — inch, weight. *Kupffer, A. T.* *Erdm. J. Pr. C.* 22 (1841) 62-.
- , distilled, cubic decimetre, mass at maximum density. *Macé de Lépinay, J.* *C. R.* 120 (1895) 770-; 122 (1896) 595-; *Par. S. Ps. Sé.* (1896) 191-; *A. C.* 11 (1897) 102-.
- , —, —, weight at maximum density. *Wild, H.* [1870] *St. Pét. Ac. Sc. Bll.* 15 (1871) 58-.
- , —, — inch, weight. *Chaney, H. J.* [1892] *Phil. Trans. (A)* 183 (1893) 331-.
- , —, —, —, and specific gravity of air. *Rice, E. W. M.* *Thomson A. Ph.* 13 (1819) 339-; 14 (1819) 73-.
- , true weight. *Studer, J. G.* *Gilbert A.* 13 (1803) 122-.
- , weight, experiment. *Svanberg, J.* *Stockh. Ak. Hndl.* (1825) 1-; *Q. J. Sc.* 22 (1827) 152-.
- Weighing, accurate. *Schuster, A.* *Manch. Lt. Ph. S. Mm. & P.* 7 (1893) 74-.
- , —. *Mendéléeff, D.* *Rs. Ps.-C. S. J.* 29 (*Ps.*) (1897) (*App.*) 1-; *J. de Ps.* 6 (1897) 613-.
- in air, correction. *Fontana, A.* *N. Cim.* 3 (1896) 324-.
- , art of. *Hansteen, C. N.* *Mg. Ntvd.* 6 (1851) 1-.
- , correction for buoyancy of air when volume is unknown. *Cooke, J. P.* *Am. Ac. P.* 18 (1883) 55-.
- , corrections. *Rühlmann, R.* *Carl Rpm.* 4 (1868) 177-.
- , —. *Bauer, K. L.* *Carl Rpm.* 4 (1868) 323-; 5 (1869) 332-.

- Weighing, corrections (Bauer). *Rühlmann, R.* Carl Rpm. 5 (1869) 320-.
- , direct determination of weight of displaced air. *Richarz, F.* Berl. Ps. Gs. Vh. (1886) 83 (*bis*)-.
- , limits of accuracy in ordinary. *Folkard, C. W.* C. N. 29 (1874) 20.
- , theory, formulae, constants and tables. *Marek, W. J.* Par. Poids et Mes. Tr. Mm. 3 (1884) D. 53-.
- in water, methods and results. *Marek, W. J.* Par. Poids et Mes. Tr. Mm. 1 (*1881) D. 43-; 2 (*1883) D. 58-; 3 (1884) D. 75-.
- Weighings, reduction. *Seidel, L., & Steinheil, —.* Münch. Gelehrte Az. 26 (1848) 301-.
- , to vacuum. *Schottländer, P.* Z. Ps. C. 16 (1895) 458-.
- , — — —. *Salomon, F.* Z. Angew. C. (1896) 529-.
- Weights, accuracy. *Dibbitts, H. C.* (xii) Mbl. Nt. 9 (1879) 120-.
- , best series. *Krönig, A. A.* Ps. C. 122 (1864) 593-.
- , correction-. *Verbeek, A. T. H.* Arch. Mth. Ps. 62 (1878) 333-.
- , new, description. *Prieur, C. A.* A. C. 20 (1797) 274-.
- , proposed new form. *Séquier, A., & Delamornière, —.* C. R. 44 (1857) 531-.
- , small, estimation. *McMayer, A.* Silliman J. 25 (1858) 39-.
- , variation by minute amounts. *Brown, J. A.* [1867] Edinb. R. S. P. 6 (1869) 167-.

DENSITY.

- Littleton, N. L.* Md. Ps. J. 40 (1818) 269-.
- Schiff, H.* Lieb. A. 107 (1858) 59-.
- Tilden, W. A.* C. N. 38 (1878) 300-.
- Krebs, G.* Carl Rpm. 17 (1881) 661-.
- Lermantov, V. V.* Rs. Ps.-C. S. J. 17 (Ps.) (1885) 56-; J. de Ps. 5 (1886) 91.
- Sollas, W. J.* Nt. 43 (1891) 404-.
- Neufville, R. de.* Frkf. a. M. Ps. Vr. Jbr. (1891-92) 41.
- Hallock, W.* [1900] N. Y. Ac. A. 13 (1900-01) 476.
- Absolute density. *Sluginov, N. P.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 36-.
- Air, influence on density determinations and accuracy of weighings. *Demichel, A. A.* C. Anal. 3 (1898) 300-.
- Densities should be compared with that of water at maximum density. *Core, J. R.* Thomson A. Ph. 7 (1816) 234.
- Density and specific gravity. *Lamy, A.* Lille Mm. S. (1853) 9-.
- Errors in determination. *Rose, G.* Pogg. A. 73 (1848) 1-.
- Practical rules for exact determination. *Kohlrausch, R.* Marb. Schr. 8 (1857) 1-.
- Thomson, T.* Thomson A. Ph. 15 (1820) 232-; 16 (1820) 161-, 241-.
- Hare, R.* Silliman J. 16 (1829) 293-.
- Regnault, V.* C. R. 20 (1845) 975-.
- Wagner, A. (Chem.)* Carl Rpm. 12 (1876) 60-.
- Chancel, G.* C. R. 94 (1882) 626-.
- Goldschmidt, H., & Meyer, V.* Berl. B. 15 (1882) 137-.
- Agamennone, G.* Rm. R. Ac. Linc. Rd. 1 (1885) 105-.
- Lux, F.* Fresenius Z. 25 (1886) 3-.
- Rayleigh, (Lord).* R. S. P. 43 (1888) 356-; 50 (1892) 448-; 53 (1893) 134-.
- Cooke, J. P.* Am. Ac. P. 24 (1889) 202-.
- Joly, J.* Dubl. S. Sc. P. 6 (1888-90) 534-.
- Geronzi, B.-T.* Rv. Sc.-Ind. 23 (1891) 228-.
- Moissan, H., & Gautier, H.* C. R. 115 (1892) 82-; A. C. 5 (1895) 568-.
- Mestlans, M.* C. R. 117 (1893) 386-.
- Fresenius, W.* [1900] Nass. Vr. Jb. 54 (1901) XLII-.
- Air. *Agamennone, G.* Rm. R. Ac. Linc. Rd. 1 (1885) 111-.
- , densimeter for. [Barilli, G.] *Filopanti, Q.* Bologna Rd. (1867) 83-.
- Apparatus. *Schlesing, T. (fils)* C. R. 126 (1898) 220-; 476-.
- for rapid determination. *Mestlans, —.* Par. S. Phln. Bll. 4 (1892) (C.R., No. 20) 2.
- Barothermometer. *Salomon, F.* Z. Angew. C. (1892) 45-.
- Bunsen's method, improvement. *Mendenhall, T. C.* Am. As. P. (1875) (Pt. 1) 112-.
- Correction for moisture. *Apjohn, Jas. B. A.* Rp. (1831-32) 570-.
- Dasymeter and air-pyrometer of Siebert and Dürr. *H.* Oestr. Z. Brgw. 41 (1893) 291-.
- for furnace gases. *Hauß, —.* Z. Vr. Rübenczuckin. 43 (1893) 399-.
- Gas and vapour densities. *Regnault, V. A.* C. 63 (1861) 45-.
- — — —. *Bunsen, R. W.* A. C. Phm. 14f (1867) 273-.
- — — —. *Mohr, C. F.* Bonn Sb. Niedr. Gs. (1869) 73-.
- — — —, manometric estimation. *Müller, F. C. G.* Z. Angew. C. (1890) 513-.
- Gas-baroscope. *Bodländer, G.* Berl. B. 27 (1894) 2263-; Z. Angew. C. (1894) 425-.
- Gases at high temperatures. *Crafts, J. M.* C. R. 90 (1880) 309-.
- Immersed solids, measurement by. *Fitzgerald, G. F.* Dubl. S. Sc. P. 4 (1885) 481-.
- Influence of deformation of bulb. *Agamennone, G.* Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 1) 30-.
- Manometric method. *Recknagel, G. A.* Ps. C. 2 (1877) 291-.
- Permanent gases. *Meyer, V.* Berl. B. 13 (1880) 2019-.
- Pitch of pipes, measurements by. *Jahoda, R.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 803-.
- Pressure of column of gas, apparatus for density of gases by measurement of. *Edelmann, M. T.* Carl Rpm. 17 (1881) 261-.
- Simple gases. *Zenneck, L. H.* Baumgartner Z. 3 (1835) 145-.

DENSITY OF GASES.

- Thomson, T.* Thomson A. Ph. 1 (1813) 177-.
- Gay-Lussac, L. J.* A. C. 1 (1816) 218-.
- Berzelius, J. J., & Dulong, P. L.* A. C. 15 (1820) 386-.

DENSITY OF LIQUIDS.

- Ramsden, J. A. C. 13 (1792) 243-.
- Strecker, Alex. (viii) Rpm. Phm. 25 (1827) 422-.
- Fownes, G. Phm. J. 2 (1843) 652-.
- Reischauer, C. [G.], & Vogel, A. Münch. Gelehrte Az. 44 (1857) 436-.
- Tate, T. Ph. Mg. 17 (1859) 254-.
- Sigl, J. Rpm. Phm. 6 (1869) 234-.
- Sprengel, H. A. Ps. C. 150 (1873) 459-.
- Wright, C. R. A. S. C. In. J. 11 (1892) 297-.
- Zaloziecki, R. Z. Angew. C. (1896) 552-.
- Alcoholic solutions, Tralles's investigations. Windisch, K. Berl. Gsndhamt. Arb. 9 (1894) 1-.
- Alcoholometer, Atkins's. Fletcher, J. Nicholson J. 2 (1802) 276-.
- Alcoholometers. Knoblauch, H. Halle Sb. Nf. Gs. (1859) 8-.
- Jacobi, H. St. Pét. Ac. Sc. Bll. 7 (1864) 320-.
- Müller, J. A. Par. S. C. Bll. 7 (1892) 492-.
- , Atkins's system. Jacobi, H. St. Pét. Ac. Sc. Bll. 7 (1864) 438-.
- , tables for. Tralles, J. G. Gilbert A. 38 (1811) 349-.
- Apparatus. Amat, L. Par. S. C. Bll. 45 (1886) 482-.
- Weber, L. Bresl. Schl. Gs. Jbr. (1888) 83-.
- for liquids at temperatures other than atmospheric. Hannay, J. B. C. S. J. 12 (1874) 203-.
- , new. Zambelli, L. [1888] Ven. I. At. (1888-89) 147-.
- , —. Salomon, W. N. Jb. Mn. (1891) (Bd. 2) 214-.
- , —. Lefebvre, M. Brux. S. Sc. A. 20 (1896) (Pt. 1) 108-.
- Aerometric glasses, Wackenroder's, experiments with. Schrön, H. L. F. (xii) Arch. Phm. 79 (1842) 269-; 81 (1842) 124-.
- standard, necessity of common. Rubrom, M. Baumgartner Z. 7 (1840) 21-.
- Baroscope for beet juice. Frič, J. Z. Zuckin. Böhm. 17 (1892-93) 98-.
- Blood, new method for. Haycraft, J. B. [1891] Edinb. R. S. P. 18 (1892) 251-.
- Closed space, liquid in. Stankart, F. J. Amst. Vs. Ak. 5 (1871) (Ntk.) 175-; Arch. Néerl. 6 (1871) 217-.
- Densimeter, form. Chistoni, C. Mil. I. Lomb. Rd. 12 (1879) 318-.
- , Geissler's. Lefebvre, M. Czlg. Opt. 18 (1897) 174-.
- of liquid columns. Bertin, A. Erlenmeyer Z. 5 (1862) 33-; Strasb. S. H. Nt. Mm. 5 (Livre 2 & 3) (1862) 22 (bis)-.
- — —. Thury, —. [1892] Arch. Sc. Ps. Nt. 29 (1893) 102-.
- , pneumatic. Michaelis, H. (xii) Z. Instk. 3 (1883) 268-.
- Densiscope, differential. Zantedeschi, F. Wien SB. 19 (1856) 237-.
- Density bottle. Campanile, F. N. Cim. 5 (1897) 183-.

- Density bottle for liquids spontaneously inflammable in contact with air. Tribe, A. Ph. Mg. 46 (1873) 308-.
- — — tropical climates. Warden, C. J. H. C. N. 60 (1889) 236-.
- Determination of densities to 4 and 5 figures. Wackenroder, H. W. F. (xii) Arch. Phm. 124 (1853) 129-, 257-.
- Differential method of determination. Dittmar, W. C. N. 44 (1881) 51.
- Dilute aqueous solutions. Kohlrausch, F., & Hallwachs, W. Gött. Nr. (1893) 350-; A. Ps. C. 53 (1894) 14-, 1092.
- solutions. Kohlrausch, F. A. Ps. C. 56 (1895) 185-, 788.
- Efflux, density determined by rate of. Mohr, C. F. Pogg. A. 113 (1861) 156-.
- Glass beads, graduation, for densities of fluids. Ferguson, W. Dubl. J. Md. C. Sc. 2 (1833) 11-.
- Height of fluid columns, measurement by. Bohn, C. Exner Rpm. 22 (1886) 402-.

Hydrometers.

- Speer, W. Tilloch Ph. Mg. 14 (1802) 151-, 229-.
- Barré, J. A. J. de Ps. 57 (1803) 433-.
- Hare, R. Silliman J. 11 (1826) 115-.
- Marozeau, —. J. Phm. 16 (1830) 482-.
- Roster, G. Sperm. 26 (1870) 59-.
- Hirsch, B. (xii) Arch. Phm. 209 (1876) 107-.
- (Werner.) Hirsch, B. (xii) Arch. Phm. 211 (1877) 16-.
- Casamajor, P. C. N. 37 (1878) 241-, 267-; 38 (1878) 3-.
- Plato, —. D. Nf. Vh. (1893) (Th. 2, Hälfte 1) 23-.
- accuracy. Demichel, A. Mulhouse S. In. Bll. 70 (1900) 277-.
- accurate, for any temperature. O'Toole, (Rev.) H. Dubl. S. Sc. P. 8 (1893-98) 753-.
- for alcohol and brandy, proposal by Commission. Stampfer, S. Wien SB. (1849) (Ab. 2) 304-.
- and alcoholometers, modification. Wildenstein, R. Fresenius Z. 1 (1862) 162-.
- barometric. Pillet, J. As. Fr. C. R. (1885) (Pt. 2) 246-.
- Baumé's. Bordier, M. Bll. Phm. 4 (1812) 151-.
- Neumann, A. Baumgartner Z. 3 (1835) 372-.
- Pemberton, H. Am. J. Phm. 18 (1852) 1-.
- Baudin, —. C. R. 68 (1869) 932-.
- Coulier, —. Mm. Md. Mil. 23 (1869) 368-.
- Chandler, C. F. Wash. Nat. Ac. Mm. 3 (Pt. 1) (1885) 63-.
- , for calculating quantity of sugar in solutions. Treviranus, L. G. Dingler 70 (1838) 36-; 74 (1839) 421-.
- , comparison of scale with density. Wigner, G. W. Anal. 5 (1880) 138-.
- , verification. Almeida, J. C. d', Berthelot, —, & Coulier, —. J. Phm. 18 (1873) 257-; C. R. 77 (1873) 970-.
- Beck's. Zenneck, L. H. Baumgartner Z. 2 (1833) 244-.

- Beck's, use instead of hydrostatic balance for liquids, theory to be applied in. *Trautwein, J. B. Lieb. A. 25* (1838) 337-.
- comparison of densities by various. *Gerlach, G. T. Dingler 198* (1870) 313-.
- constant volume. *Ruau, L. C. R. 45* (1857) 442-.
- construction and uses, with tables. *San Martino, G. B. da. Verona Mm. S. It. 7* (1794) 79-.
- and their correction. *Weinstein, B. Z. Ps. C. 7* (1891) 71-.
- correction and forms. *Guglielmo, G. Rm. R. Ac. Linc. Rd. 8* (1899) (*Sem. 2*) 341-; *9* (1900) (*Sem. 1*) 9-.
- for temperature variation. *Casamajor, P. Mon. Sc. 19* (1877) 862-.
- of corvette "Witjaz," investigations with. *Makarov, S. O. Rš. Ps.-C. S. J. 23* (*Ps.*) (1891) 324-; *J. de Ps. 1* (1892) 400-.
- for densities to .0001. *Planiádvá, J. N. Baumgartner Z. 2* (1833) 41-.
- which slightly exceed that of water. *Fellenberg, L. R. von. [1858] Bern Mt. (1859) 1-*.
- Derham's. *Anon. Nt. 37* (1888) 497-.
- Dicas's Liverpool. *Pile, W. H. Am. Phm. As. P. 9* (1860) 216-.
- differential. *Fuchs, P. Z. Angew. C. (1898) 505-*.
- , of Fuchs. *Domke, —. Z. Angew. C. (1899) 370-*.
- Fahrenheit's, modification. *Niemann, J. H. Lieb. A. 2* (1832) 357-.
- , —; and new form of balance. *Guglielmo, G. Rm. R. Ac. Linc. Rd. 4* (1895) (*Sem. 1*) 77-; *Rv. Sc.-Ind. 27* (1895) 205-; *28* (1896) 70-.
- form (*drijfbalans*). *Harting, P. Utr. Aant. Prv. Gn. (1849) 6-*.
- glass, simple method of graduating. *Moore, C. Thomson A. Ph. 11* (1826) 261-.
- graduation, new method. *Pouillet, C. S. M. J. Phm. 36* (1859) 40-; *C. R. 56* (1863) 888-.
- Imperial Normal-Standard Commission on. *Kaiserl. Normal-Aichungs-Commission. Z. Angew. C. (1890) 382-*.
- improvements. *Arnim, L. A. von. Gilbert A. 1* (1799) 412-.
- , *Meissner, P. T. Trommsdorff J. Phm. 22* (1813) 3-.
- inaccuracy. *Roster, G. Sperim. 25* (1870) 265-.
- influence of capillarity. *Langberg, C. (viii) Ps. Mdd. (1858) 1-*; (*iii*) *Pogg. A. 106* (1859) 299-.
- — —. *Jacobi, H. [1871] St. Pet. Ac. Sc. Mm. (Rs.) 20* (*1872) (*App. No. 4*) 97 pp.; *St. Pet. Ac. Sc. Mm. 17* (1872) (*No. 5*) 70 pp.
- — —. *Duclaux, E. J. de Ps. 1* (1872) 197-.
- — —. *Coulier, —. J. Phm. 23* (1876) 175-.
- — —. *Mensbrugge, G. van der. Brux. Ac. Bll. 16* (1888) 31-.
- — — and pressure of air. *Stamkart, F. J. Amst. Vs. Ak. 1* (1866) (*Ntk.*) 320-; *Arch. Néerl. 1* (1866) 355-.
- influence of dirt on surface. *Marangoni, C. (xii) Rv. Sc.-Ind. 12* (1880) 55-.
- international. *Spence, F. C. N. 55* (1887) 240-.
- invisible. *Parragh, G. Termt. Közl. 21* (1889) 121; *Fschr. Ps. (1889) (Ab. 1) 339*.
- manufacture. *Körner, F. Erdm. J. Tech. C. 5* (1829) 331-.
- modification. *Foord, G. [1871] Vict. R. S. T. 10* (1874) 113-.
- modulus. *Waller, E., & Hathaway, N. Sch. Mines Q. N. Y. 6* (1885) 153-.
- new. *Richter, J. B. Berl. Gs. Nt. Fr. N. Schr. 3* (1801) 329-.
- , *Lavigne, —. Mntp. Rec. Bll. 4* (1811) 199-.
- , *Alexander, —. Pogg. A. 70* (1847) 137-.
- , *Sedlacek, J. A. Ps. C. 158* (1876) 650-.
- , *Dahm, G. Dingler 228* (1878) 235-.
- , *Handl, A. Wien Ak. Sb. 92* (1886) (*Ab. 2*) 433-; *101* (1892) (*Ab. 2a*) 896-.
- , *Láska, W. Z. Instk. 9* (1889) 176.
- (modification of *Láska's*). *Aubel, E. van. Par. S. Ps. Sé. (1893) 235-*.
- , *Lezé, R. Rv. Sc. 52* (1893) 220-.
- , *Lohnstein, T. Z. Instk. 14* (1894) 164-.
- , *Vandevyter, L. N. Arch. Sc. Ps. Nt. 34* (1895) 409-.
- , *Sandrucci, A. N. Cim. 6* (1897) 25-.
- normal. *Baumhauer, E. H. von. Pogg. A. 113* (1861) 639-; *Arch. Néerl. 1* (1866) 338-.
- origin. *Salverte, E. A. C. 27* (1798) 113-.
- reading. *Marangoni, C. Rm. R. Ac. Linc. Rd. 5* (1889) (*Sem. 1*) 657-.
- scale. *Witz, G. As. Fr. C. R. (1884) (Pt. 2) 132-*.
- , arbitrary. *Piccini, A. (xii) Rv. Sc.-Ind. 6* (1874) 249-.
- of equal divisions. *Gerlach, G. T. Fresenius Z. 5* (1866) 185-.
- with 2 scales. *Planiádvá, J. N. Baumgartner Z. 2* (1833) 38-.
- scales. *Rauter, G. Z. Angew. C. (1897) 215-*.
- , adoption of uniform and invariable. *Witz, G. As. Fr. C. R. (1883) 355-*.
- , comparison. *Müller, (Dr.) J. Lieb. A. 31* (1839) 81-.
- , —. *Gerlach, G. T. Fresenius Z. 4* (1865) 1-.
- , construction and testing. *Schrön, H. L. F. (xii) Arch. Phm. 83* (1843) 1-.
- for densities of liquids and volume of the kilogramme. *Jeannel, J. Bordeaux J. Md. 4* (1859) 31-.
- , graduation, new mode. *Ricard, —. Caen Tr. (1811) 124-*.
- , — — —. *Smith, D. B. [1825] Philad. Coll. Phm. J. 2* (1831) 9-.
- , — and testing. *Neumann, A. Baumgartner Z. 5*, (1837) 76-.
- for sea water. *Schülck, A. Z. Nw. 68* (1895) 437-.
- — —. *Thoulet, J. Rv. Mar. et Col. 124* (1895) 696-.
- — —, table for reduction of observations. *Tittmann, O. H. U. S. Coast Geod. Sv. Bll. No. 18* (1890) 175-.

siphon-, to find temperature of water at maximum density. *Meikle, H.* Tilloch Ph. Mg. 68 (1826) 166-.

—, improved. *Meikle, H.* Ph. Mg. 4 (1828) 258-.

siphon used as. *Meikle, H.* Edinb. N. Ph. J. 2 (1827) 366-.

sources of error in using. *Fock, A.* Z. Ps. C. 2 (1888) 296-.

standard. *Göckel, H.* Z. Angew. C. (1899) 712-.

and stereometers. *Hachette, J. N. P.* A. C. 24 (1797) 333-.

with temperature correction scale. *Fuchs, P.* Z. Angew. C. (1899) 15-.

total immersion (Pisati system). *Reggiani, N.* Km. R. Ac. Linc. Rd. 6 (1890) (Sem. 1) 99-.

—, *Warrington, A. W. B. A.* Rp. (1898) 791; Ph. Mg. 48 (1899) 498-.

—, variable inclination and reflection hydrometers. *Guglielmo, G.* Km. R. Ac. Linc. Rd. 9 (1900) (Sem. 1) 33-, 71-.

Twaddle's. *Dingler, E. M.* Dingler 67 (1838) 147-.

universal. *Lanier, —.* Bl. Phm. 4 (1812) 307-.

use. *Malý, F.* Z. Instk. 12 (1892) 61-.

for variable volume and constant weight. *Libert, —.* Finist. S. Sc. Bl. 6 (Fasc. 2) (1884) 50-.

Hydrometric measurements in glass vessels, temperature correction tables. *Fuchs, P.* Z. Angew. C. (1898) 745-, 909-.

Hydrometry. *Hassenfratz, J. H.* A. C. 26 (1798) 3-, 132-, 188-; 27 (1798) 118-; 28 (1798) 3-; 33 (1799) 3-.

— (Hassenfratz). *Schmidt, G. G.* Gilbert A. 4 (1800) 194-.

— *Descroizilles, —.* [1804] A. C. 58 (1806) 237-.

— *Bellani, A.* Mil. G. S. Inc. 1 (1808) 229-.

— *Delezenne, —.* Lille Tr. (1819-22) 48-.

— *Nobile, A.* [1829] Nap. At. I. Inc. 5 (1834) 79-.

— *Göckel, H.* Z. Angew. C. (1898) 867-.

— and the centigrade hydrometer. *Francaeur, L. B. C. R.* 14 (1842) 328-; Par. Bl. S. Encour. 41 (1842) 181-.

—, formulæ of Tadini and Eytelwein. *Franchini, P.* (vii) Bb. It. 5 (1842) 73-.

—, graphic representation in. *Meinecke, J. L. G.* (viii) Rpm. Phm. 5 (1819) 175-.

—, sliding rod in. *Hare, R.* Tilloch Ph. Mg. 67 (1826) 266-.

Instrument for density determinations. *Ham, F. C.* Gz. 2 (1844) 125-.

Liquid and gaseous carbon dioxide. *Heen, P. de.* Brux. Ac. Bl. 31 (1896) 379-.

— metals, density and thermal expansion of certain. *Vicentini, G., & Omodei, D.* [1887] Tor. Ac. Sc. At. 23 (1887-88) 38-.

— methane, oxygen and nitrogen. *Olszewski, K.* Krk. Ak. (Mt.-Prz.) Rz. 14 (1886) 181-, 197-; A. Ps. C. 31 (1887) 58-.

Liquids and bodies lighter than water. *Hockin, C., & Matthiessen, A.* Lb. 1 (1867) 189-.

— at their boiling points. *Schiff, R.* Berl. B. 14 (1881) 2761-.

— higher temperatures. *Schiff, R.* Berl. B. 18 (1885) 1538-.

Litrameter. *Hare, R.* (vi Add.) Ph. Mg. 4 (1828) 187-.

Manometer, densities by. *Schiff, H.* Lieb. A. 121 (1862) 82-.

Mercury, density at 0° C. *Volkman, P. A.* Ps. C. 13 (1881) 209-.

—, — in relation to barometric pressure. *Marek, W. J.* Par. Poids et Mes. Tr. Mm. 2 (* 1883) D. 18-.

Method, new. *Cagnassi, M.* (xii) Rv. Sc.-Ind. 11 (1879) 169-.

—, — *Sommerkorn, H.* Berl. B. 13 (1880) 143-.

—, — *Sandrucci, A.* Rv. Sc.-Ind. 19 (1887) 65-.

Oils. *Dudley, C. B., & Pease, F. N.* Am. Eng. & Railroad J. 69 (1895) 449-.

Pyknometer. *Boot, J. C. C.* Ztg. 20 (1896) 616-.

—, glass, with constant volume and precision adjustment. *Fuchs, P.* Z. Angew. C. (1898) 359-.

—, improved. *Voeller, F.* Z. Angew. C. (1891) 401-.

—, — *Squibb, E. R.* Am. C. S. J. 19 (1897) 111-.

— for light liquids. *Göckel, H.* Z. Angew. C. (1899) 1194-.

— measurements, temperature correction tables. *Fuchs, P.* Z. Angew. C. (1899) 25-.

—, small variation in. *Wiedemann, E. E. G.* A. Ps. C. 17 (1882) 983-.

—, Sprengel's, modification. *Minozzi, A.* Km. R. Ac. Linc. Rd. 8 (1899) (Sem. 1) 450-.

—, Wiedemann's, modification. *Schulze, R.* A. Ps. C. 28 (1886) 144-.

Refraction of light, instrument for measuring by. *Mojon, G.* Genova Mm. S. Md. 1 (1802) 49-.

Salinometer for measuring density of brine in marine steam boilers. *Russell, J. S.* Edinb. N. Ph. J. 34 (1843) 278-.

Sea water. *Buchanan, J. Y.* R. S. P. 23 (1875) 301-.

—, — *Makarov, S. O.* Rs. Ps.-C. S. J. 23 (Ps.) (1891) 30-; Nt. 44 (1891) 359-.

—, — *Anderson, W. S.* Sc. Gg. Mg. 10 (1894) 574-, 646-.

Variation of density produced by surface pressure in a liquid. *Monti, V.* Tor. Ac. Sc. At. 31 (1895) 150- or 194-.

Viscous and frothy liquids. *Genieser, A.* Z. Angew. C. (1890) 44-.

— substances. *Brühl, J. W.* Berl. B. 24 (1891) 182-, 2455-.

—, — *Scheibler, C.* Berl. B. 24 (1891) 357-.

Volumenometer, double, for liquids. *Marangoni, C.* N. Cim. 20 (1886) 112-; 6 (1897) 407-.

Water. *Stampfer, S.* Wien Jb. Pol. I. 16 (1830) 1-.

—, pure, volume and density. *Broch, O. J.* Par. Poids et Mes. Tr. Mm. 1 (* 1881) A. 59-.

DENSITY OF SOLIDS.

- Tralles, J. G.* Gilbert A. 27 (1807) 261-.
- Rau, A.* Ac. Cæs. Leop. N. Acta 9 (1818) 325-.
- Osann, G.* Pogg. A. 73 (1848) 605-.
- Laroque, F.* Toul. Mm. Ac. 6 (1850) 152-.
- Raimondi, A.* Pogg. A. 99 (1856) 639-.
- Dobbie, J. J., & Hutcheson, J. B.* Glasg. Ph. S. P. 15 (1884) 82-.
- Kleinstück, O.* Arch. Phm. 226 (1888) 166-; C. Ztg. 14 (1890) 233-.
- Leick, W.* N.-Vorp. Mt. 27 (1896) 96-.
- Negreanu, D.* Bucarest Ac. Rom. A. 22 (Pt. admin.) (1900) 72-.
- Absolute and specific weight of bodies in liquid.
- Mohr, C. F.* Pogg. A. 112 (1861) 420-.
- — — precipitates in liquids. *Fleck, H.* Pogg. A. 113 (1861) 160-.
- — — — — (Fleck's method).
- Mohr, C. F.* Pogg. A. 113 (1861) 655-.
- — — — — *Kahl, E.* Schlämilch Z. 7 (1862) 456-.
- Adhesion, determinations affected by. *Tinnermann, J.* Trommsdorf N. J. Phm. 26 (1833) (St. 2) 93-.
- Alloys. *Matthiessen, A.* C. S. J. 5 (1867) 201-.
- Apparatus. *Eckfeldt, J. R., & Dubois, W. E.* Silliman J. 22 (1856) 294-.
- *Fulton, H. B.* S. C. In. J. 11 (1892) 305-.
- , portable. *Richards, J. W.* Berg-Hm. Ztg. 58 (1899) 327-.
- for rapid determination. *Brown, M. W.* N. Eng. I. Mn. E. T. 36 (1887) 95-.
- Arabian determinations. *Wiedemann, E. E. G.* A. Ps. C. 20 (1883) 539-.
- Areometer, new (volumenometer). *Say, H.* A. C. 23 (1797) 1-.
- , Say's. *Arnim, L. A. von.* Gilbert A. 2 (1799) 238-.
- , —, improvement. *Miller, W. H.* Ph. Mg. 5 (1834) 203.
- Barley and Scotch bigg, new instrument for. *Keith, G. S.* Edinb. Ph. J. 5 (1821) 173-.
- Cement. *Piens, C.* Brux. A. Tr. Pbl. 3 (1898) 453-.
- Correction. *Osann, G.* Kastner Arch. C. 2 (1830) 58-, 271-.
- , error in certain. *Mach, E.* Carl Rpm. 7 (1871) 377.
- Crystals. *Berkeley, (Earl of).* B. A. Rp. (1898) 837-.
- Decomposable bodies. *Christomanos, A. C.* Berl. B. 10 (1877) 782-.
- Density bottle, measurement by. *Jenzsch, G.* Pogg. A. 99 (1856) 151-.
- for powders. *Louis, H.* S. C. In. J. 13 (1894) 322-.
- Flotation, determination of densities by. *Schaffgotsch, F. von.* Pogg. A. 116 (1862) 279-.
- Gold coinage. *Broch, O. J.* N. Mg. Ntvd. 21 (1876) 363-.
- in gold-silver alloys. *Louis, H.* [1893] Am. I. Mn. E. T. 22 (1894) 117-, 724-, 775.
- Gravimeter, new, for weight and density of solids. *Bustamante, J. M.* Edinb. J. Sc. 10 (1829) 207-.
- Hydrometer, differential, for powders. *Fuchs, P. Z.* Angew. C. (1898) 623-.
- , Nicholson's, improved. *Briffandon, —.* Lyon A. S. L. (1836) 15 pp.
- for solids. *Baumgartner, A. von.* Baumgartner Z. 1 (1826) 5-.
- — — *Buignet, —.* J. de Ps. 9 (1880) 93-.
- — — *Munroe, C. E.* Smiths. Misc. Col. 33 (1888) Art. 1, 26-. (Wash. Ph. S. Bll. 6 (1884).)
- — —, new form. *Failyer, G. H.* Kan. Ac. Sc. T. 11 (1889) 104.
- Ice. *Osann, G.* Kastner Arch. C. 1 (1830) 95-.
- , 0° to -20°. *Brunner von Wattenwyll, C.* A. C. 14 (1845) 369-.
- *Dufour, L.* Bb. Un. Arch. 8 (1860) 89-; 14 (1862) 5-.
- *Nichols, E. L.* Ps. Rv. 8 (1899) 21-.
- Insoluble substances. *Symons, W. H.* Phm. J. 19 (1889) 205-.
- Instrument for densities. *Dunnington, F. P.* C. N. 41 (1880) 154-.
- — and weights. *Fox, R. W.* Cornwall Pol. S. Rp. (1847) 19-.
- — —, without weights or calculation. *Adie, A.* Edinb. Mm. Wern. S. 3 (1817-20) 495-.
- , new, for solids, by measuring water displaced. *Baddeley, (Lt.).* Silliman J. 18 (1830) 263-.
- Masonry. *Reuss, G.* As. Fr. C. R. (1897) (Pt. 1) 184-.
- Method, new. *Lévy, A.* Quetelet Cor. Mth. 6 (1830) 208-.
- , — *Persoz, J.* Par. A. Cons. 5 (1864) 532-; C. R. 60 (1865) 405-.
- , — *Sonstadt, E. C.* N. 29 (1874) 127-.
- , rapid. *Lezè, R.* Gén. Civ. 4 (1883-84) 181.
- Minerals. *V., O.* Berg-Hm. Ztg. 48 (1889) 35-, 50-.
- , apparatus for minute fragments. *La Touche, T. D.* Nt. 53 (1895-96) 199.
- , —, new. *Pisani, F.* C. R. 86 (1878) 350-.
- Minute solids, density and mass. *Guglielmo, G.* Rm. R. Ac. Linc. Rd. 9 (1900) (Sem. 2) 261-.
- Organic solids. *Schröder, H.* Berl. B. 12 (1879) 561-, 1611-; 13 (1880) 1070-.
- Porous and friable substances. *Parize, [P.]* (xii) Finist. S. Sc. Bll. 4 (Fasc. 2) (1882) 45-; J. de Ps. 5 (1886) 222-.
- substances. *Reszow, N. A.* Fschr. Ps. (1889) (Ab. 1) 66.
- —, determination of density by enclosing in wax. *Aschauer, J. V.* Baumgartner Z. 4 (1837) 176-.
- Possible errors in determination. *Pierre, V.* (xii) Lotos 16 (1866) 22-.
- Powders. *Rüdorf, F.* Berl. B. 12 (1879) 249-.
- *Smeeth, W. F.* [1888] Dubl. S. Sc. P. 6 (1888-90) 61-.
- *Lenoble, E.* A. C. Anal. 3 (1898) 361-; 4 (1899) 44-.
- *Vandevyver, —.* A. C. Anal. 4 (1899) 2-.
- , apparatus for. *Lestie, J.* QJ. Sc. 21 (1826) 374-.
- — — *Bremer, G. I. W.* Rec. Tr. C. P.-Bas 17 (1898) 263-, 404-.

- Powders, heavy, small quantities. *Joly, J.* *Dubl. S. Sc. P. 5* (1886-87) 41-.
- Pyknometer. *Berkeley, (Earl of)*. [1895] *Mn. Mg.* 11 (1897) 64-.
- , modification. *Gintl, W. F.* *Fresenius Z.* 8 (1869) 122-.
- , —. *Kahlbaum, G. W. A.* *A. Ps. C.* 19 (1883) 378-.
- , physico-chemical. *Arpago, R.* *Rv. Sc.-Ind.* 25 (1893) 126-.
- PyknoSCOPE. *Zenneck, L. H.* *Kastner Arch.* *Ntl.* 14 (1828) 81-.
- Salts soluble in water. *Andreas, J. L.* *J. Pr. C.* 30 (1884) 312-.
- , —. *Retgers, J. W.* *Z. Ps. C.* 3 (1889) 289-; 4 (1889) 189-; 11 (1893) 323-.
- Seeds. *Wolfenstein, O.* (xii) *J. Lndw.* 23 (1875) 401-.
- Soluble substances. *Del Lupo, M.* (xii) *Rv. Sc.-Ind.* 13 (1881) 161-.
- , —, new method for. *Zehnder, L. A.* *Ps. C.* 29 (1886) 249-.
- Sprengel's apparatus, modification. *Sollas, —.* *Dubl. S. Sc. P. 5* (1886-87) 623-.
- Spring balance, densities by. *Creighton, H.* *Q. J. Sc.* 13 (1822) 257-.
- Substances with large pores. *Guyton de Morveau, L. B.* *A. C.* 60 (1806) 121-.
- Volumenometer. See *Areometer* (Say).
- Volumenometer. *Kopp, H. A. C.* 6 (1842) 380-.
- , —. *Raikow, P. C.* *Ztg.* 12 (1888) 525.
- , —. *Muraközy, K.* [1890] *Föl. Közl.* 21 (1891) 117-, 148-.
- , modified, application. *Kalecsinszky, S.* [1890] *Föl. Közl.* 21 (1891) 109-, 142-.
- , new. *Tschaplowitz [Chaplovits], F.* *Fresenius Z.* 18 (1879) 440-.
- , —. *Paalow, C. A.* *A. Ps. C.* 13 (1881) 332-; 14 (1881) 176.
- , —. *Muraközy, K.* *Termt. Közl.* 25 (1893) (*Suppl.*) 33-.
- , —. *Myers, J. E.* [1893] *L. Ps. S. P.* 12 (1894) 372-; *Ph. Mg.* 36 (1893) 195-.
- , —. *Oberbeck, A.* *A. Ps. C.* 67 (1899) 209-.
- for powders. *Schumann, C. C.* *Ztg.* 8 (1884) 1778-.
- , simple form. *Linebarger, C. E.* *Am. C. S. J.* 21 (1899) 435-.
- and weighing apparatus, description. *Ångström, K.* *Stockh. Öfv.* (1895) 643-; *Fschr. Ps.* (1895) (*Ab. 1*) 24-.
- Volumenometers, new. *Baumhauer, E. H. von.* *Arch. Néerl.* 3 (1868) 385-.
- Wood. *Anon.* (vi 1239) *Tilloch Ph. Mg.* 57 (1821) 366-.
- Yttrium, zirconium and erbium. *Meyer, S.* *Wien Ak. Sb.* 108 (1899) (*Ab. 2a*) 767-; *Mh. C.* (1899) 793-.
- DENSITY OF SOLIDS AND LIQUIDS.*
- Hare, R.* *Silliman J.* 11 (1826) 121-.
- Apparatus. *Nicol, W. W. J.* *C. N.* 47 (1883) 85-.
- , —. *Raikow, P., & Prodanow, N.* *C. Ztg.* 10 (1886) 1556.
- Areopyknometer with arbitrary scale. *Piccini, A.* (xii) *Rv. Sc.-Ind.* 11 (1879) 14-.
- Densimeter for solids and liquids. *Courtonne, H. J.* *de Ps. 5* (1896) 315-.
- , —, —, new. *Pâquet, E.* *Par. S. C. Bll.* 24 (1875) 51-.
- , —, —, —. *Machado, V.* *Lisb. J. Sc.* *Mth.* 6 (1878) 285-.
- Formula for density. *Almeida, C. A. M. de.* [1879] *Lisb. J. Sc. Mth.* 7 (1880) 20-.
- Gravimeter for solids and liquids. *Guyton de Morveau, L. B.* *Nicholson J.* 1 (1797) 110-.
- Hydrometer for solids and liquids. *Atkins, G.* *Tilloch Ph. Mg.* 31 (1808) 254-.
- , —, —, —. *Bieruliet, — van.* *Brux. S. So. A.* 14 (1890) (*Pt. 1*) 60-.
- Hydrostatic weighings. *Lummer, O.* *Berl. Ps. Gs. Vh.* (1887) 65 (*bis*)-.
- , capillary influence. *Macé de Lépinay, J.* *J. de Ps. 5* (1896) 266-.
- , difficulty. *Macé de Lépinay, J.* *J. de Ps. 5* (1886) 416-.
- Ice and sea-water, density and volumes. *Ashe, W. A.* *Science* 10 (1887) 24.
- Instrument, new. *Nicholson, W.* [1785] *Manch. Ph. S. Mm.* 2 (1789) 386-.
- Method of determination. *Gentilè, —.* *J. Phm.* 5 (1867) 401-.
- Pendulum, application. *Serra-Carpi, G. C. R.* 64 (1867) 659-.
- Pyknometer for volume and density of solids and liquids. *Bensemann, R.* *Epm. Anal. C.* 7 (1887) 19-.
- Volumenometer for solids and liquids. *Kopp, H.* *Lieb. A.* 35 (1840) 17-.

VAPOUR DENSITIES.

- Couerbe, J. P.* *Bordeaux Act.* (1840) 5-.
- Sainte-Claire Deville, [É.] H.* *C. R.* 56 (1863) 729-.
- Pfaundler, L.* *Innsb. Nt. Md. B.* 1 (1870) 40-.
- Croullebois, M.* *C. R.* 78 (1874) 496-.
- (*Croullebois.*) *Sainte-Claire Deville, É. H.* *C. R.* 78 (1874) 534-.
- (*Sainte-Claire Deville.*) *Croullebois, M.* *C. R.* 78 (1874) 805-.
- Brühl, J. W.* *Berl. B.* 9 (1876) 1368-.
- Hautefeuille, —, & Troost, —.* *C. R.* 83 (1876) 220-.
- Ciamician, G. L., & Goldschmiedt, G.* *Wien Ak. Sb.* 75 (1877) (*Ab. 2*) 431-.
- Meyer, V.* *Berl. B.* 10 (1877) 2068-; 11 (1878) 1867-.
- Sainte-Claire Deville, É. H.* *C. R.* 84 (1877) 1256-.
- (*Sainte-Claire Deville.*) *Wurtz, C. A.* *C. R.* 84 (1877) 1347-.
- Hofmann, A. W.* *Berl. B.* 11 (1878) 1684-.
- Troost, L. J.* *C. R.* 86 (1878) 331-, 1394-.
- Piccard, J.* *Berl. B.* 13 (1880) 1079-.
- Dewar, J., & Scott, A. B. A.* *Bp.* (1881) 597.
- Meyer, V.* *Berl. B.* 15 (1882) 2775-.
- Pawlewski, B.* (xii) *Kosmos (Lw.)* 8 (1883) 93-; (x) *Berl. B.* 16 (1883) 1293-.
- Meyer, V.* *Berl. B.* 19 (1886) 1861-.
- Nilson, L. F., & Pettersson, O. A. C.* 9 (1886) 554-.
- Schall, C.* *Berl. B.* 20 (1887) 1435-, 1759-; 21 (1888) 100-.
- Bott, W.* *C. S. P.* 4 (1888) 110.

- Richards, T. W. C. N. 59 (1889) 87-.
- Krause, A., & Meyer, V. Z. Ps. C. 6 (1890) 5-.
- Schall, C. Berl. B. 23 (1890) 919-, 1701-.
- Lunge, G., & Neuberg, O. Berl. B. 24 (1891) 729-.
- Schall, C. J. Pr. C. 50 (1894) 87-.
- Winkler, L. W. C. Ztg. 23 (1899) 627.
- acoustic method. Goldschmidt, H. Berl. B. 13 (1880) 768-.
- apparatus. Grabowski, A. A. C. Phm. 138 (1866) 174-.
- (in barometric vacuum). Hofmann, A. W. D. C. Gs. B. 1 (1866) 198-; 9 (1876) 1304-.
- , Bott, W., & Macnair, D. S. Berl. B. 20 (1887) 916-, 1617.
- , Dyson, G. C. N. 55 (1887) 88.
- , Macnair, D. S. C. N. 55 (1887) 289.
- , Harker, J. A. C. N. 62 (1890) 180.
- for determination by Gay-Lussac's method. Warren, C. M. [1866] Am. Ac. P. 7 (1868) 99-.
- , Grabowski's, modification. Pfaundler, L. D. C. Gs. B. 5 (1872) 575-.
- , Hofmann's, modification. Wichelhaus, H. D. C. Gs. B. 3 (1870) 166-.
- , —, —, Engler, C. Berl. B. 9 (1876) 1419-.
- , —, —, Muir, M. M. P., & Suguira, S. C. S. J. (1877) (2) 140-.
- , —, trough for. Easterfield, T. H. C. N. 60 (1889) 250-.
- in barometric vacuum. Brühl, J. W. Berl. B. 12 (1879) 197-.
- Dulong's method. Dumas, J. B. C. R. 78 (1874) 536-.
- Dumas's method, improved modification. Habermann, J. [1876] Wien Ak. Sb. 74 (1877) (Ab. 2) 423-.
- by gaseous displacement under varying pressure. Meunier, J. C. R. 98 (1884) 1268-.
- in glass vessels at boiling-point of selenium. Troost, L. J. C. R. 95 (1882) 30-.
- at high temperatures. Meyer, V., & Recklinghausen, M. von. Berl. B. 30 (1897) 1926-.
- —, of substances which attack mercury. Pfaundler, L. Berl. B. 12 (1879) 165-.
- history. Hofmann, A. W. Berl. B. 10 (1877) 962-.
- , Brown, J. T. B. A. Rp. (1879) 304-.
- Hofmann's method. Gabba, L. Mil. I. Lomb. Rd. 2 (1869) 50-.
- , Tilden, W. A. C. N. 37 (1878) 219.
- influence of shape of bulb. Biltz, H. Berl. B. 21 (1888) 2772-.
- of inorganic substances. Meyer, C., & Meyer, V. Berl. B. 12 (1879) 609-, 1282-.
- —, at very high temperatures. Meyer, C., & Meyer, V. Berl. B. 12 (1879) 1112-.
- at low temperatures, V. Meyer's method, modification. Perrenoud, P. Lieb. A. 187 (1877) 77-.
- V. Meyer's method. Smith, Watson. C. N. 39 (1879) 66-.
- —, Williams, C. G. C. N. 39 (1879) 110.
- —, —, Meyer, L. Berl. B. 13 (1880) 991-.
- V. Meyer's method. Ekstrand, A. G., & Pettersson, O. Berl. B. 13 (1880) 1185-.
- —, modified. Gudeman, E. Am. C. S. J. 12 (1890) 399.
- —, —, for use under reduced pressure. Richards, T. W. C. N. 59 (1889) 39-.
- —, —, possible cause of error in. Piccard, J. [1891] Laus. S. Vd. Bll. 27 (1892) 265-.
- —, —, simplified. Schwarz, H. Berl. B. 16 (1883) 1051-.
- —, —, (Schwarz). Meyer, V. Berl. B. 17 (1884) 1334-.
- Naumann's method. Horstmann, A. Berl. B. 11 (1878) 204-.
- of organic substances with high boiling points. Troost, L. J. C. R. 89 (1879) 351-.
- Pettersson and Ekstrand's method, modification. Schall, C. Berl. B. 18 (1885) 2068-.
- under reduced pressure. Malfatti, H., & Schoop, P. Z. Ps. C. 1 (1887) 159-.
- —, Meyer, V. D. Nf. Tbl. (1889) 220.
- —, Schall, C. Berl. B. 22 (1889) 140-; 23 (1890) 919-; 25 (1892) 1489-; J. Pr. C. 45 (1892) 134-; 62 (1900) 536-.
- —, apparatus for. Eykman, J. F. Berl. B. 22 (1889) 2754-.
- —, V. Meyer's method. Hoff, J. H. van't, & Romeny, J. (xii) Mbl. Nt. 8 (1878) 135-.
- saturated. Dupré, A. C. R. 54 (1862) 972-.
- , of liquids at different temperatures. Pérot, A. Nancy S. Sc. Bll. (1886) (Fasc. 20) xxxvii-.
- sources of error. Alexeev, W. Berl. B. 18 (1885) 2898-.
- —, —, in application of law of mixtures. Hautefeuille, —, & Troost, —. C. R. 83 (1876) 975-.
- steam, influence of hygroscopic character of glass on determination. Grimaldi, G., & Macaluso, D. Rm. R. Ac. Linc. T. 6 (1882) 264-.
- at all temperatures, apparatus for. Fairbairn, W. Manch. Ph. S. P. 1 (1857-60) 70-.
- of substances boiling above 440° and of those attacking mercury or Wood's metal. Meyer, C., & Meyer, V. Berl. B. 11 (1878) 2253-.
- —, below their boiling points. Demuth, R., & Meyer, V. Berl. B. 23 (1890) 311-.
- —, with high boiling points. Meyer, V. Berl. B. 9 (1876) 1216-.
- —, —, —, Klobukow, N. von. A. Ps. C. 22 (1884) 493-.
- —, —, —, —, under reduced pressure. La Coste, W. Berl. B. 18 (1885) 2122-.
- —, —, —, —, Schall, C. Berl. B. 20 (1887) 1827-, 2127-.
- —, low boiling points. Klobukow, N. von. A. Ps. C. 22 (1884) 465-.
- and temperature of experiment, simultaneous determination. Nilson, L. F., & Pettersson, O. Stockh. Ak. Hndl. Bh. 11 (1887) No. 6, 16 pp.
- in vapour of phosphorus pentasulphide. Knecht, W. [1879] Lieb. A. 202 (1880) 31-.
- of vapours which attack porcelain at red heat. Züblin, H., & Meyer, V. Berl. B. 12 (1879) 2204-.

of volatile liquids, at temperatures below boiling point. *Playfair, L., & Wanklyn, J. A.* Edinb. R. S. T. 22 (1861) 441-.

— water. *Ward, F. O.* C. N. 16 (1867) 15-, 38-, 50-.

at white heat, of elements and compounds. *Biltz, H., & Meyer, V.* Gött. Nr. (1889) 347-.

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Tralles, J. G. Gilbert A. 29 (1808) 442-; 30 (1808) 384-.

Peale, F. Franklin I. J. 14 (1847) 59-.

Wolsa, C. A. [1849] Helsingf. Acta 3 (1852) 413-.

Carl, P. Carl Rpm. 1 (1866) 7-.

accurate and convenient, new plan. *Lüdicke, M. A. F.* Gilbert A. 1 (1799) 123-.

— — large. *Mendelssohn, N.* Gilbert A. 29 (1808) 153-.

adjusting, for customs house officers and inspectors. *Hartig, T.* Dresden Sb. Isis (1871) 239-.

adjustment device for. *Green, F. T.* Am. C. S. J. 16 (1894) 699.

— of knife edges. *Gauss, C. F.* As. Nr. 14 (1837) 241-.

—, machine for. *Hasemann, H.* Z. Instk. 14 (1894) 50-.

aerometric, for density of air. *Potter, R.* Ph. Mg. 37 (1850) 81-.

aerostatic, for density of gases. *Lommel, E.* A. Ps. C. 27 (1886) 144.

analytical, damping arrangement. *Arzberger, F.* Lieb. A. 178 (1875) 382-.

—, —. *Geiger, —.* C. Ztg. 15 (1891) 476.

—, improvements. *Westphal, G.* Fresenius Z. 7 (1868) 294-.

apparatus for interchange of pans. *Classen, —.* Z. Instk. 15 (1895) 101-.

applications of principle. *Strait, H.* Silliman J. 27 (1835) 92-.

assay. *Botelho de Lacerda, C.* Lisb. Mm. Ac. Sc. 3 (1814) (pte. 2) 179-.

—, auxiliary. *Law, R. C. S. J.* 69 (1896) 526-.

—, improved. *Makins, G. H. C. S. J.* 6 (1854) 36-.

—, improvements. *Narci, C. P. T. J.* Mines 7 (1797-98) 455-.

—, recent. *Austin, L. S.* [1897] Colo. Sc. S. P. 6 (1897-1900) 34-.

automatic. *Weber, L.* [1893] Schl.-Holst. Nt. Vr. Schr. 10 (1895) 309.

— exchange of pans. *Stadthagen, H.* Z. Instk. 20 (1900) 206-.

axis correction, etc. *Brauer, E. A.* (xii) Z. Instk. 2 (1882) 385-.

beam, best form. *Kernot, W. C.* [1880-94] Vict. R. S. T. 17 (1881) 19-; Vict. R. S. P. 7 (1895) 141-.

—, improved. *Arzberger, J.* Gilbert A. 46 (1814) 294-.

—, influence of bending. *Pierre, V.* Prag Sb. (1862) 13-.

—, short (Schickert's). *Hartig, T.* Dresden Sb. Isis (1871) 56-.

—, —. *Sartorius, F.* C. Ztg. 9 (1885) 1299.

beams of aluminium. *Frerichs, F. T.* Lieb. A. 178 (1875) 365-.

—, Emery's support. *Schweirkus, G.* Z. Instk. 4 (1884) 261-.

— of steel, influence of magnetism. *Studer, J. G.* Gilbert A. 13 (1803) 122-.

chemical. *Dittmar, W.* (xii) Z. Instk. 1 (1881) 313-; 2 (1882) 63-.

—, *Hase, R.* Z. Angew. C. (1898) 736-.

—, effect of flexibility. *Proctor, B. S.* [1876] Newcastle C. S. T. 3 (1877) 183-.

—, new; theory of construction of balances. *Cooke, I. B.* Phm. J. 1 (1860) 360-.

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—, new methods. *Weber, W. E.* Gött. Cm. 8 (1832-37) (Ps.) 81-.

—, curve of accuracy. *Gallois, F. L. von.* Pogg. A. 116 (1862) 339-.

—, dead-beat. *Tait, P. G.* Edinb. R. S. P. 8 (1875) 490-.

—, delicate construction. *Campbell, Jhn.* Calc. J. NH. 2 (1842) 342-.

—, suggestions on use. *Rayleigh, (Lord).* B. A. Rp. (1883) 401-.

—, for delicate weighing. *Braddock, J.* Madras J. 2 (1835) 86-.

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—, for density determinations. *Roncalli, An.* (xii) Rv. Sc.-Ind. 6 (1874) 67-.

— — —. *Barnard, F. A. P.* Wash. Nat. Ac. Mm. 4 (Pt. 1) (1888) 203-.

— — —, new. *Thore, J.* Dax S. Borda Bll. (1887) 131-.

— — —, of gases. *Lux, F.* Fresenius Z. 26 (1887) 38-.

— — —, Lux's. *Anon.* C. N. 58 (1888) 4-.

— — —, new. *Lux, F.* Fresenius Z. 29 (1890) 13-.

— — —, solids and liquids. *Machado, V.* [1881] Lisb. J. Sc. Mth. 8 (1882) 97-.

— — —, liquids. *Westphal, G.* Fresenius Z. 9 (1870) 233-.

— — —, minerals and other solids heavier than water. *Parish, R.* Am. J. Sc. 10 (1875) 352-.

— — —, with double suspension. *Douklet, —.* A. Mines 9 (1836) 127-.

dynamical. *Buquoy, G. von.* Oken Isis (1824) 938-.

—, for elementary use. *Lineberger, C. E.* Am. C. S. J. 21 (1899) 31-.

—, estimation of small excesses of weight by, from time of vibration and angular deflection. *Poynting, J. H.* [1878] Manch. Lt. Ph. S. Mm. 7 (1882) 23-.

—, fish-rod. *Riddell, J. L.* Silliman J. 26 (1858) 71.

—, hydrostatic. *Fabroni, G.* Siena At. Ac. 9 (1808) 133-.

—, —. *Barré, J. A.* Orléans Bll. 4 (1812) 273-.

— (Barré). *Ampère, A. M.* Par. Bll. S. Encour. 13 (1813) 77-.

—, —. *Desbordeaux, A.* Caen Mm. Ac. (1849) 420-.

- hydrostatic. *Buchanan, J. Y. D. C. Gs. B.* 4 (1871) 338-.
- , accurate form. *Joly, J.* [1886] *Dubl. S. Sc. P.* 5 (1886-87) 347-.
- , and adjuncts. *Sartorius, F. Z. Instk.* 13 (1893) 388-.
- , for densities of liquids. *Autenrieth, O. Dingler* 159 (1861) 109-.
- , experimental verification of principle of. *Pâquet, É. J. de Ps.* 10 (1891) 340-.
- , extremely cheap and delicate. *Ritchie, W. Edinb. J. Sc.* 5 (1826) 118-.
- , modifications. *Sartorius, F. C. Ztg.* 9 (1885) 1374-.
- , new. *Gerland, B. W. S. C. In. J.* 17 (1898) 13.
- , use. *Hirn, G. A. A. Gén. Civ.* 2 (1863) (pte. 2) 113-, 153-.
- Kuhlmann's. Gerland, B. W. S. C. In. J.* 14 (1895) 551-.
- technical. *Gerland, B. W. S. C. In. J.* 12 (1893) 995-.
- limit of accuracy at present attainable. *Seidel, L. Münch. Sb.* (1867) (2) 231-.
- magnetic, for weights. *Fox, R. W. Sturgeon A. Electr.* 1 (1836-37) 494-.
- mercury. *Horner, J. K. Gilbert A.* 68 (1821) 101-.
- for metallurgical purposes. *Rinman, C. (sen.) Jern-Kont. A.* 3 (1819) 106-.
- method of using with great delicacy. *Poynting, J. H.* [1878] *R. S. P.* 28 (1879) 2-.
- modification. *Mohr, C. F. Pogg. A.* 25 (1832) 266-.
- Mohr's, densities determined by. *Demichel, —. A. C. Anal.* 5 (1900) 287-.
- , modification. *Guglielmo, G. Rv. Sc.-Ind.* 26 (1894) 177-.
- , and apparatus for volume of solids. *Guglielmo, G. Rm. R. Ac. Linc. Rd.* 3 (1894) (Sem. 2) 299-.
- must-, Oechsle, reliability. *Weigelt, C. H. C. CB.* 2 (1871) 604-.
- new. *Montu, —. Par. S. Phm. Bll.* 1 (1797) 108-.
- , *Tralles, J. G.* [1805] *Berl. Ab.* (1804-11) (*Mth.*) 65-.
- , *Joule, J. P. Manch. Lt. Ph. S. P.* 5 (1866) 145, 165.
- , *Mendelejeff, D. I. Les Mondes* 36 (1875) 335-.
- (Mendelejeff's). *Salleron, J. C. R.* 80 (1875) 378-.
- , *Jäger, H. Carl Rpm.* 13 (1877) 288-.
- , *Kruspér, I.* [1878] (xii) *Mag. Tud. Ak. Étk. (Mth.)* 6 (1879) (No. 6) 20 pp.; (x) *A. Ps. C. Beibl.* 4 (1880) 638-.
- , *Pellat, —. Par. S. Ps. Sé.* (1889) 93.
- (pondérateur). *Serrin, V. Par. S. Ps. Sé.* (1890) 106.
- arrangements for. *Bunge, P. Z. Instk.* 14 (1894) 131-.
- form. *Bunge, P. Carl Rpm.* 3 (1867) 269-.
- (Roberval). *Picart, A. C. R.* 96 (1883) 1782-; 97 (1883) 86-, 252.
- —. *Phillips, H. J. C. N.* 72 (1895) 16.
- new form, and its adjustment. *Girgensohn, T. St. Pét. Ac. Sc. Bll.* 5 (1839) 177-.
- forms, Nemetz's. *Pensky, B. Z. Instk.* 12 (1892) 221-; 14 (1894) 325.
- oscillation. *Stamkart, F. J. Amst. Vh.* 1 (1849) 63-.
- , *Mendeleeff, D. R. S. P.* 63 (1898) 454-.
- and equilibrium. *Thiesen, M. Par. Poids et Mes. Tr. Mm.* 5 (1886) 40 + xxxii pp.
- period, means for reducing. *Verbeek, A. Dingler* 304 (1897) 156-.
- —, theory. *Anon. Dingler* 307 (1898) 225-, 249-.
- platform. *Hoffmann, C. Pogg. A.* 64 (1845) 317-.
- , *Endlweber, J. Carl Rpm.* 15 (1879) 607-.
- of precision. *Sacré, É. Brux. Ac. Bll.* 12 (1845) 17.
- , *Arzberger, F. Brünn Vh.* 14 (1875) (*Ab.*) 157-.
- , *Redon, L. As. Fr. C. R.* (1878) 315-.
- , *Serrin, V. C. R.* 112 (1891) 1299, 1480.
- , *Leick, —. N.-Vorp. Mt.* 26 (1895) xvi.
- —, adjustments and suspensions. *Sauter, A. Cztg. Opt.* 15 (1894) 232-.
- —, Bunge's, theory. *Bunge, P. Cztg. Opt.* 5 (1884) 220-, 229-.
- —, construction and adjustment. *Schultze, P. Z. Instk.* 12 (1892) 97-.
- —, — verification, Brauer's methods. *Lermantov, V. V. (xii) Rs. C. Ps. S. J.* 9 (*Ps.*) (1877) [(Pt. 1)] 326-.
- —, direct reading, aperiodic. *Curie, P. C. R.* 108 (1889) 663-; *Par. S. Ps. Sé.* (1889) 218-.
- —, — —, Curie's. *Ledeboer, P. H. Lum. Élect.* 36 (1890) 161-.
- —, new arrestment. *Lannoy, S. de. Z. Instk.* 17 (1897) 261-.
- —, — construction. *Kruspér, I.* [1886] *Mth. Term. Ét.* 5 (1887) 70-; *Mth. Nt. B. Ung.* 5 (1886-87) 1-.
- —, optical apparatus for rapid weighing. *Collot, A. C. R.* 112 (1891) 99-.
- —, reading arrangement. *Spoerhase, W. Z. Instk.* 16 (1896) 167-.
- recent construction, description. *Bunge, P. Carl Rpm.* 16 (1880) 372-.
- reflection-. *Wartmann, É.* [1841] *Gen. Mm. S. Ps.* 11 (1846) 115-.
- , *Grassi, G. N. Cim.* 11 (1874) 195-, 217-.
- registering. *Sprung, A. Berl. Ps. Gs. Vh.* (1887) 13 (*bis*)-; *Z. Instk.* 8 (1888) 17-.
- Roman (or steel-yard). *Ferroni, P. Mod. S. It. Mm.* 17 (1815) 417-.
- (— —), ancient. *Commaille, A. J. Phm.* 44 (1863) 490-.
- (— —), improvements by Paul. *Pictet, M. A. J. Mines* 8 (1797-98) 671-.
- (— —), micrometric. *Bourcart, R.* [1888] *Mulhouse S. In. Bll.* 59 (1889) 31-.
- (— —), modification. *Hassenfratz, J. H. J. Mines* 8 (1798) 683-.

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- Roman (or steel-yard), new, report to *Bureau Consultatif des Poids et Mesures*. *Gatley*, —. *J. Mines* 8 (1797-98) 691-.
- (— —) and ordinary, levers used in construction and verification. *Desnanot*, —. *Auvergne A. Sc.* 26 (1853) 273-.
- (— —), theory. *Pickel, I.* *Münch. D.* (1814-15) 83-.
- scientific, construction and use. *Schwirkus, G.* *Z. Instk.* 7 (1887) 41-, 83-, 412-.
- sensitive and convenient, serving also as magnetometer. *Lampadius, W. A.* *Schweigger J.* 10 (1814) 171-.
- simple. *Black, Jos.* [1790] *Thomson A. Ph.* 10 (1825) 52-.
- substitution-. *Lohnstein, T. C.* *Ztg.* 20 (1896) 572-.
- sources of error. *Hennig, R.* *Z. Instk.* 5 (1885) 161-.
- spiral. *Cross, C. F.* *C. N.* 44 (1881) 101-.
- support. *Prony, R. de.* *A. C.* 36 (1800) 50-.
- tangential, direct reading of densities by. *Zenger, C. W.* [1871] *Prag Ab.* 5 (1872) 51 pp.
- temperature change in sensitiveness. *Middel, T. A.* *Ps.* 2 (1900) 115-.
- theory. *Rheinauer, J. A.* *Ps. C.* 133 (1868) 179-.
- (Rheinauer). *Müller, J. A.* *Ps. C.* 133 (*1868) 682-.
- (Müller). *Rheinauer, J. A.* *Ps. C.* 135 (1868) 355-.
- *Sludskii, T. A.* (xii) *Rec. Mth.* (Moscou) 4 (1869-70) (Pt. 2) 111-.
- *Aldis, W. S.* [1876] *Newcastle C. S. T.* 3 (1877) 151-, 161-.
- *Moors, B. P.* *N. Arch. Wisk.* 12 (1886) 216-.
- and use. *Schönemann, T.* *Grunert Arch.* 24 (1855) 264-.
- vacuum, Bunge's. *Marek, W.* *Par. Poids et Mes. P.V.* (*1881) 45-.
- , new. *Kruspér, S.* *Z. Instk.* 9 (1889) 81-.
- verification and correction. *L'Homme*, — *de.* *Le Pny S. Ag. A.* (1828) 174-.
- vibrationless support. *Marek, W.* *Z. Instk.* 9 (1889) 175-.
- and weighing. *Zech, P.* *Carl Rpm.* 5 (1869) 102-.
- , theory. *Thiesen, M. F.* (xii) *Z. Instk.* 2 (1882) 358-; 3 (1883) 81-.
- and weights. *Schwirkus, G.* (xii) *Z. Instk.* 1 (1881) 84-, 124; 2 (1882) 310-.
- and weights, etc. *Stas*, —. *Par. Poids et Mes. P.V.* (*1875-76) 87-.
- Balances and weights, report on those used by the Commission. *Chisholm, H. W. A.* *Cons. Arts et Mét.* 10 (*1873) 111-.
- Coins, machine for weighing. *Séguier, A. C.* *R.* 31 (1850) 188-.
- Gold bullion assay, new method of weighing for. *Foord, G.* [1875] *Vict. R. S. T.* 12 (1876) 93-.
- Grain, instrument for measuring. (Chondrometer.) *Ovenden*, —, & *Payne*, —. *Nicholson J.* 34 (1813) 198-.
- Scale, assorter's, and weighing machine, of Madras mint. *Smith, J. T.* *Madras Eng. Rp.* 2 (1846) 169-.

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- Scale-beam, construction. *Dearborn, B.* *Bost. Mtn. Am. Ac.* 3 (1809) 40-.
- Steel-yard, Aristotle's. *Cappelle, J. P. van.* *Amst. Ts. Nt. Wet.* (1810-11) 305-.
- Weigh-bridge. *Rose, W. N.* *Amst. Ts. Ws. Nt. Wet.* 1 (1848) 172-.
- , Guillaumin's. *Pr. Dingler* 269 (1888) 496-.
- , new. *Steinheil, C. A. von.* *Wien SB.* (1850) (Ab. 2) 398-.
- , theory. *Endlweber, J.* *Exner Rpm.* 21 (1885) 637-.
- , — and construction. *Mohr, C. F.* *Dingler* 78 (1840) 195-.
- Weighing, approximate, apparatus. *Hase, R.* *Cztg. Opt.* 19 (1898) 191.
- machine, compound (*bascule*), theory. *Moors, B. P.* *N. Arch. Wisk.* 3 (*1877) 33-, 97-.
- , Quintenz. *E...* *Crelle J.* 1 (1826) 157-.
- , — (or decimal). *Rühlmann*, —. *Dingler* 132 (1854) 255-.
- , —. *Rittershaus, T.* *Civing.* 21 (1875) 45-.
- , theory and description. *Schönemann, T.* *Wien D.* 8 (1854) (Ab. 2) 1-.
- machines. *Kent, W.* *Franklin I. J.* 126 (1888) 169-.
- , sensibility. *Schönemann, T.* [1852] *Wien D.* 5 (1853) 157-.
- , — (Schönemann). *Ettingshausen, A. von.* *Wien Sb.* 8 (1852) 442-.
- and recording machine, electrical. *McGarvey, E.* [1900] *Sc. Abs.* 4 (1901) 5.

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MEASUREMENT OF VELOCITY.

- Aerostat, apparatus for. *Leloup, J.* *Aér.* (1896) 123-.
- Apparent motions of objects. *Van Dyck, F. C.* (xii) *Am. Mer. J.* 3 (1882) 72-.
- Cycles. *Guérin, V.* *Rv. Sc.* 42 (1888) 112-.
- Difficulties in calculation. *Denny, W.* *Glasg. I. Eng. T.* 18 (1875) 193-.
- Electric sparks, photography by, application. *Hermite, G. C. R.* 106 (1888) 561-.
- Engineering purposes, measurement for. [*Hele*] *Shaw, H. S.* *I. CE. P.* 69 (1882) 364-.
- Explosive waves, chronographic measurements of velocity. *Smith, F. J.* *R. S. P.* 45 (1889) 451-.
- Indicating and recording apparatus, theory. *Hele Shaw, H. S.* [1884] *Bristol Nt. S. P.* 4 (1885) 130-.
- Indicator of velocity and distance, by resistance of air. (Velodometer.) *La Valette, H. de.* *Gén. Civ.* 27 (1895) 11-.
- Intermittent light, use in measuring rapid motions. *Hermite, G. C. R.* 103 (1886) 412-.
- Kinometer. *Jacquemier, R.* *Rv. Mar. et Col.* 58 (1878) 265-; 94 (1887) 351-.

- Pendulum, application. *Boucheporn*, —. C. R. 36 (1853) 831-.
- movements, velocity recorder in. *Lecarme, J., & Lecarme, L.* C. R. 124 (1897) 356.
- Photographic analysis of movements. *Marey*, —. J. de Ps. 3 (1884) 199-.
- methods. *Heun, K.* Z. Mth. Ps. 44 (1899) 18-.
- Pumping-engine velocity diagrams. *Baird, D.* Fed. I. Mn. E. T. 9 (1895) 138-.
- Rapid movements, especially periodic, observation. *Plateau, J. A. F.* Brux. Ac. Bll. 6 (1883) 484-.
- Recorder, new, and application to anemometry. *Griffiths, J. A.* N. S. W. R. S. J. 28 (1894) 281-.

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- Dolbear, A. E.* Am. J. Sc. 3 (1872) 248-.
- Schuller, A.* A. Ps. C. 146 (1872) 497-.
- Clarke, G. S., & McLeod, H.* R. S. P. 26 (1878) 157-.
- Jones, J. V.* Card. Nt. S. T. 20 (1889) 30.
- by centrifugal speed gauge. *Prytz, K.* Z. Instk. 11 (1891) 389-.
- counter, differential, mechanism and use. *Valesie*, —. C. R. 86 (1878) 1116-.
- , —, *Valesie's* (report). *Dupuy de Lôme*, —. C. R. 86 (1878) 1364-.
- , —, —, *Jourden, L.* [1881] Rv. Mar. et Col. 74 (1882) 55-.
- , for motors. *Gérard, A.* Brux. Ac. Bll. 47 (1879) 47-.
- of disks, etc. *Werner*, —. Berl. Pol. Gs. Vh. 22 (1861) 127-.
- indicator. *Bernardi, E.* Ven. I. At. 6 (1880) 773-.
- *Lambinet*, —. Rv. Mar. et Col. 81 (1884) 379-.
- *Samson, (le lt.) G.* Rv. Mar. et Col. 116 (1893) 39-.
- *Amster, A.* Arch. Sc. Ps. Nt. 32 (1894) 291-.
- *Tétot, V.* Rv. Mar. et Col. 128 (1896) 434-.
- , electric. *Anon.* Tel. J. 15 (1884) 469.
- , —. *Dary, G.* Sc. Abs. 1 (1898) 673.
- , —. *Browne, W. H. (jun.)* Sc. Abs. 2 (1899) 432.
- , electromagnetic. *Claude, G.* Sc. Abs. 1 (1898) 97-.
- , magnetic. *Deprez, M.* Lum. Élect. 3 (*1881) 407-.
- , pneumatic. *Rung, (Capt.) G.* Z. Instk. 6 (1886) 201-.
- for ships' screw propellers. *Campbell, (Sir) A., & Gooden, W. T.* L. Ps. S. P. 6 (1885) 147-; Ph. Mg. 18 (1884) 57-.
- — — —. *Drouet, (le lt.) G.* Rv. Mar. et Col. 118 (1893) 458-.
- indicators. *Richard, G.* Lum. Élect. 15 (1885) 258-, 295-; 34 (1889) 101-.
- , new. *Richard*, —. Cg. Int. Chron. (1889) 205-.
- means of producing constant. *Webster, A. G.* Am. J. Sc. 3 (1897) 379-.
- periods. *Prytz, K.* [1890] Kjøb. Dn. Vd. Selsk. Skr. 7 (1890-94) 35-.

- spiral goniometry in relation to. *Barus, C.* Am. J. Sc. 48 (1894) 1-.
- stroboscopic measurements. *Ettingshausen, A. von.* Carl Rpm. 12 (1876) 1-.
- tachometer. *Donkin, B.* Tilloch Ph. Mg. 38 (1811) 42-.
- *Thomas, A.* As. Fr. C. R. (1874) 154-.
- *Sartiaux, E.* Lum. Élect. 13 (1884) 340-.
- *Kás, A.* Oestr. Z. Brgw. 41 (1893) 471-.
- (*Vedovelli's*). *Thuillier, G.* Par. S. Ps. Sé. (1899) 50*.
- , differential. *Fuchs, K.* Elekttech. Z. 9 (1888) 300-.
- , electric. *Picou, R. V.* Lum. Élect. 29 (1888) 416-.
- , — hand. *Fessenden, R. A.* Sc. Abs. 3 (1900) 170-.
- , registering. *Anon.* Elekttech. Z. 7 (1886) 126-.
- testing and study. *Göpel, F.* Z. Instk. 16 (1896) 33-.
- and torsion, telephonic indicator. *Resio, C.* C. R. 94 (1882) 854-; Lum. Élect. 6 (*1882) 399-.
- variable, new system for imparting and recording. *Beaumont, M. W.* Elect. 17 (1886) 364-.
- variations, in motors. *Léauté, H.* Gén. Civ. 12 (1887-88) 163.
- , —. *Bourcart, R.* Mulhouse S. In. Bll. 63 (1893) 418-.
- , small. *Anthony, W. A.* Am. As. P. (1886) 118-.

- Running, instrument recording velocity. *Marey, E. J.* C. R. 104 (1887) 1582-.
- Seismic movement, velocity, and acceleration of wave-particle, determination, Indian observations, 1897, and formulæ. *Oldham, R. D.* I. Gl. Sv. Mm. 29 (1899) 344-.

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- Hamill, H.* Nicholson J. 14 (1806) 343-.
- Mayette, J.* Mâcon Ac. A. 6 (1888) 341-.
- currents, etc., instrument for. *Napier, J. R.* Glasg. Ph. S. P. 3 (1848-53) 350-.
- indicator. *Russell, J. S.* B. A. Rp. (1842) (pt. 2) 109.
- instrument for. *Hopkinson, F.* [1783-90] Am. Ph. S. T. 2 (1786) 159-; 3 (1793) 239-.
- *Cooke, J.* Nicholson J. 5 (1802) 48-, 265-.
- *Burney, J.* Nicholson J. 24 (1809) 57-.
- , —, and governor of engines. *Lambinet, E.* Rv. Mar. et Col. 95 (1887) 177-.
- , —, by log-line. *Newman, J.* QJ. Sc. 2 (1817) 90-.
- instruments for. *Brit. Ass. Comm.* B. A. Rp. (1879) 210-.
- *Gelcich, E.* Z. Instk. 4 (1884) 231-, 274.
- — — —. Pressure-log experiments. *Froude, W.* B. A. Rp. (1874) 255-.
- log. *Gould, C.* Gilbert A. 8 (1801) 474-.

- log. *Gelcich, E. Z. Instk. 5 (1885) 394*—.
- , *Baule, (le lt.) A. Rv. Mar. et Col. 112 (1892) 374*; 120 (1894) 116—.
- and anemometer and warning compass. *Fleuriais, G. Rv. Mar. et Col. 71 (1881) 433*—.
- , correction of errors. *Keller, F. A. E. (vi Add.) A. Hydrog. 14 (1858) 387*—.
- , electric. *Hubbard, S. Science 8 (1886) 256*—.
- , —. *Fleuriais, G. Rv. Mar. et Col. 100 (1889) 329*—.
- , —. *Le Goarant de Tromelin, (le lt.) G. Rv. Mar. et Col. 110 (1891) 302*—.
- , —, automatic. *Ricart Giralt, J. [1893] Barcel. Ac. Bl. 1 (1892-1900) 122*—.
- , —, on principle of Robinson cup anemometer. *Fleuriais, G. Rv. Mar. et Col. 63 (1879) 465*; C. R. 96 (1883) 1633—.
- , —, —. —. —. *Le Goarant de Tromelin, G. C. R. 96 (1883) 1441*—.
- , —, —. —. —. *Soulages, C. C. Lum. Élect. 14 (1884) 165*—, 260—.
- , —, hydrostatic. *Berthon, E. L. R. S. P. 5 (1850) 919*.
- logs, electric. *Richard, G. Lum. Élect. 21 (1886) 396*—.
- , pressure—. *Napier, J. R. [1872] Glasg. Ph. S. P. 8 (1873) 146*—.
- and velocity of wind. *Pâris, (le lt.) A. Rv. Mar. et Col. 87 (1885) 5*; 88 (1886) 78—.
- Steam-engine, piston, instrument for. *Tregaskis, R. Cornwall Pol. S. T. (1842) 118*—.
- Tables of velocities in metres per second. *Jackson, J. Mntp. S. Lang. Gg. Bl. 11 (1888) 451*—.
- Trains. *Fèvre, —. Par. A. Pon. Chauss. 12 (1886) 345*—.
- , *Haedenkamp, H. Grunert Arch. 6 (1845) 172*—.
- , *Steiner, F. Rv. Sc.-Ind. 16 (1884) 320*—.
- , *Hasler, G. Bern Mt. (1889) vi*—.
- , registering apparatus. *Desdovits, —. A. Pon. Chauss. (1900) (Trim. 2) 168*—.
- , —, electric. *Waldorp, H. Lum. Élect. 8 (*1883) 84*—.
- , —, —. *Frischen, C. Elekttech. Z. 7 (1886) 159*—.
- , tachometer for. *Deneil, —. A. Mines 2 (1852) 217*—.
- Tuning-forks, tests of variation by. *Göpel, F. [1900] Sc. Abs. 4 (1901) 318*—.
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- Acceleration, geometrical treatment. *Dobbs, W. J. Mth. Gz. 1 (1900) 201*—.
- and pressure meter. *Hrabowski, K. A. Ps. C. 56 (1895) 768*—.
- Atwood's machine. *Praag, L. S. van. Leijd. A. Ac. (1817-18) 24 pp*.
- , and apparatus for pendulum experiments. *Fischer, E. G. Gilbert A. 14 (1803) 1*—.
- , —, application. *Pfaundler, —. Innsb. Nt. Md. B. 14 (1884) xxiii*.
- , — and clock, new. *Baker, W. C. Ps. Rv. 11 (1900) 105*—.
- , —, determination of friction resistances in. *Bender, C. A. Ps. C. 149 (1873) 122*—.
- Atwood's machine, elasticity of cord in. *Bouniakowsky, V. [1831] St Pét. Ac. Sc. Mm. 2 (1833) 179*—.
- , —, fitting for. *Béquié, A. J. de Ps. 2 (1883) 323*—.
- , —, historical note. *Metz, G. G. de. Rs. Ps.-C. S. J. 28 (Ps.) (1896) 33*; J. de Ps. 6 (1897) 604.
- , —, influence of wheel. *Kulp, L. Arch. Mth. Ps. 54 (1872) 206*—.
- , —, measurement of gravity by. *Metz, G. G. de. Rs. Ps.-C. S. J. 27 (Ps.) (1895) 37*; Fsch. Ps. (1896) (Ab. 1) 255.
- , —, —. —. —. *Malagoli, R. Rv. Sc. Ind. 29 (1897) 275*; Spet. It. Mm. 28 (1900) 174—, 199—.
- , —, modification. *Dupré, —. Pogg. A. 58 (1843) 466*—.
- , —, —. *Poggendorff, J. C. Berl. B. (1853) 627*—.
- , —, —. *Monte, P. N. Cim. 11 (1860) 233*—.
- , —, —. *Poggendorff's. Barentin, W. [1873] Pogg. A. (Jubelbd.) (1874) 213*—.
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- , —, new. *Mönnich, P. Exner Rpm. 21 (1885) 31*—.
- , —, oscillations of weights. *Tait, P. G. [1881] Edinb. R. S. P. 11 (1882) 173*—.
- , —, self-registering. *Schreiber, K. N.-Vorp. Mt. 27 (1896) 99*; Z. Instk. 17 (1897) 204—.
- , —, utility. *Knappert, L. Leijd. A. Ac. (1817-18) 9 pp*.
- Fall of feather and coin, vacuum apparatus for demonstrating equal time of. *Lang, — von. Wien Az. 24 (1887) 256*—.
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- Falling bodies in air, paradox. *Schneebeli, H. A. Ps. C. 153 (1874) 466*—.
- , —, apparatus. *Bourbouze, —. C. R. 54 (1862) 52*—.
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- , —, —. *Pâquet, É. J. de Ps. 2 (1883) 226*—.
- , —, —. *Krass, M. Z. Instk. 4 (1884) 347*—.
- , —, —. *Randall, H. M., & Markey, W. A. Ps. Rv. 4 (1897) 64*—.
- , —, —, electric. *Waldner, H. A. Ps. C. 154 (1875) 597*—.
- , —, —, experiments. *Haswell, C. H. Franklin I. J. 24 (1852) 421*—.
- , —, —, formula for space described by. *Seze, S. A. N. Mg. Ntvd. 15 (1868) 180*—.
- , —, Galileo's experiments. *Thurot, C. J. de Ps. 3 (1874) 160*—.
- , —, —, idea. *Mansion, —. Brux. S. Sc. A. 18 (1894) (Pt. 1) 92*—.
- , —, —, law. *Ausfeldt, —. Voigt Mg. 4 (1802) 97*—.
- , —, —, graphical demonstration. *Müller, Hub. Sch. Nf. Gs. Vh. 52 (1868) 29*—.

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- Falling bodies, motion, with reference to change of gravity. *Grunert, J. A.* Pogg. A. 10 (1827) 457-.
- , Traversi's theories. *Marini, A. P.* Brescia Cm. (1816-17) 95-.
- , velocity, use of weighing-machine in determining. *Schönemann, T.* Berl. Mb. (1857) 159-.
- Gravity machine with one loose and two fixed pulleys. *Kosch, F.* Arch. Mth. Ps. 17 (1900) 113-.

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- E., J. P.* Franklin I. J. 4 (1829) 212-.
- Chronographs and apparatus for determining laws of motion. *Didion, I.* Fr. Cg. Sc. (1837) 549-.
- Energy of bodies moving with different velocities. *Treadwell, D.* Bost. Mm. Am. Ac. 8 (1863) 362-.
- , measure of work in theory of. *Moon, R.* Ph. Mg. 47 (1874) 291-.
- transmission, comparison of methods. *Lauriol, J.* Gén. Civ. 9 (1886) 313-, 343-.
- Kinetoscope, use in mechanics of slow motions. *Slichter, C. S.* Science 11 (1900) 535-.
- Solids, motion. *Delanges, P.* Verona S. It. Mm. 3 (1786) 1-.
- Watt's indicator, mathematical theory. *Le cornu, L.* C. R. 118 (1894) 1034-.

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- Ewart, P.* [1808] Manch. Ph. S. Mm. 2 (1813) 105-.
- (*Ewart.*) *Hodgkinson, E.* [1844] Manch. Ph. S. Mm. 7 (1846) 137-.
- Coste, —.* Les Mondes 22 (1870) 379-.
- Breton, P.* Les Mondes 22 (1870) 615-.
- Moore, R.* V. Nost. Eng. Mg. 16 (1877) 335-.
- Absolute units of force. *Johnson, W. W.* N.Y. Mth. S. Bll. 3 (1894) 197-.
- Attractive and repulsive forces. *Zöllner, F.* Leip. B. 21 (1869) 281-.
- Barometric vacuum, suggested use as spring of constant strength (*Cagniard de Latour.*) *Calligny, A. de.* C. R. 59 (1864) 1103-; 62 (1866) 800-.
- Bi- and tri-filar balances for absolute measurement. *Jaumann, G.* Wien Ak. Sb. 97 (1889) (Ab. 2a) 64-.
- Centrifugal forces. *Zamboni, G.* [1841] Ven. Mm. I. 1 (1843) 413-.
- Cotton-spinner, dynamic work. *Meugy, A.* A. Mines 14 (1848) 139-.
- Dynagraph, Dudley's, uses. *Dudley, P. H.* [1879] Wash. Ph. S. Bll. 3 (1880) 29-.

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- Regnier, E.* Par. Éc. Pol. J. cah. 5 (1798) 160-; Par. Bll. S. Encour. 16 (1817) 133-.
- Gordon, L.* Glasg. Ph. S. P. 1 (1841-44) 41-.
- Schinz, E.* Dingler 110 (1848) 242-.
- Richard, G.* Lum. Élect. 6 (*1882) 559-; 7 (*1882) 18-, 29-, 78-, 100-, 174-; 8 (*1883) 297-; 16 (1885) 366-; 27 (1888) 551-; 32 (1889) 260-; 41 (1891) 209-.
- Kapp, G.* Elect. 12 (1884) 13-, 33-, 79-, 103-, 151-, 224-, 345-, 538-; 13 (1884) 8-, 79-, 201-.
- Jamieson, —, & others.* Elect. 12 (1884) 139-, *et seq.*
- Bourcart, R.* Mulhouse S. In. Bll. 61 (1891) 282-.
- combined absorption and transmission. *Flather, J. J.* Am. As. P. (1898) 244-.
- and comparison of ships in matter of resistance. *Ledieu, A.* C. R. 100 (1885) 837-.
- — — — — (Ledieu). *Taurines, A.* C. R. 102 (1886) 1057-.
- — — — — (Taurines). *Ledieu, A.* C. R. 102 (1886) 1091-.
- coupling. *Perry, J., & Ayrton, W. E.* B. A. Rp. (1881) 553.
- Desdoutis's. *Dubost, F.* Lum. Élect. 12 (1884) 131-.
- direct reading, *Trouvé, Trouvé, G.* C. R. 110 (1890) 1326-.
- , —. *Anon.* Rv. Sc.-Ind. 23 (1891) 34-.
- dynamometric journal-bearing. *Rittinger, P.* Oestr. Z. Brgw. 4 (1856) 393-.
- for effort of traction or force of animate motors. *Morin, A.* Par. Bll. S. Encour. 36 (1837) 161-.
- or work developed by animate or inanimate motors. *Morin, A.* Fr. Cg. Sc. (1837) 583-.
- electric recording. *Resio, C.* C. R. 96 (1883) 1361-; Lum. Élect. 9 (*1883) 81-.
- and ergometers. *Richelmy, P.* Tor. At. Ac. Sc. 5 (1869-70) 17-.
- Fischinger's. *Buschkiel, C.* Elekttech. Z. 8 (1887) 386-.
- friction-. *Barrois, T.* Lille Mm. S. (1827-28) 114-.
- *Thomson, J.* (vi Add.) B. A. Rp. (1855) (pt. 2) 209-.
- *Mayer, J. R. von.* D. Nf. Tbl. (*1869) 63-.
- *Guigon, —.* [1882] I. Égypt. Bll. 3 (*1883) 14-.
- *Menges, C. L. R. E.* 's Gravenh. I. Ing. Ts. (1886-87) (Verg.) 81-.
- *Beaumont, W. W.* I. CE. P. 95 (1889) 1-.
- *Rigaut, A.* Lum. Élect. 36 (1890) 610-.
- *Goss, W. F. M.* Elect. Rv. 37 (1895) 98-, 125-, 158-.
- , and belt-. *Froude, W.* (vi Add.) ME. I. P. (1858) 92-.
- , direct reading. *Jimels, C.* Gén. Civ. 17 (1890) 375-.
- , Prony's (for revolving shaft). *Prony, R. de.* A. C. 19 (1821) 165-.

- friction-, Prony's. *Saint-Léger*, — de. A. Mines 12 (1837) 67-.
- , — (Saint-Léger). *Poncelet, J. V. C. R.* 4 (1837) 678-.
- , —. *Poncelet, J. V. C. R.* 4 (1837) 885-.
- , —. *Passot*, —. Fr. Cg. Sc. 8 (1840) 31-.
- , —. *Morris, E. Franklin I. J.* 5 (1843) 225-.
- , —. *Pigeon, G. Lyon Ac. Sc. Mm.* 2 (1847) 507-.
- , —. *Grandvoininnet, J. A. Gén. Civ.* 2 (1863) 170-.
- , —. *Tresca, H. C. R.* 58 (1864) 273-.
- , —. *Kretz*, —. C. R. 58 (1864) 459-; Par. Éc. Norm. A. 2 (1873) 55-.
- , —, arranged for evaluation of torque. *Hillairet*, —. C. R. 109 (1889) 798-.
- , —, modifications. *Garnier, F. A. Mines* 12 (1837) 247-.
- , —, reversed. *Wellner, G. Dingler* 223 (1877) 130-.
- , — and Welter's combined. *Hachette, J. N. P. J. Gén. Civ.* 11 (1846) 153-.
- , —. *Raffard. Soubeyran, A.* [1885] Gén. Civ. 8 (1885-86) 68-.
- , —. *Ventre*, —. [1886] I. Egypt. Bll. 7 (1887) 50-.
- , —, run by circulation of water. *Riccò, A.* (xii) Rv. Sc.-Ind. 12 (1880) 443-.
- , —, self-regulating. *Carpentier, J. C. R.* 89 (1879) 950-.
- , —, for small motors. *Maréchal, C. Éclair.* Élect. 11 (1897) 210-.
- , —. *Thiabaud. Bernardi, E. Ven. I. At.* (1884-85) 1355-.
- of "Hirondelle." *Albert, (Prince de Monaco).* Par. S. Gg. C. R. (1889) 98-.
- improved. *Tatham, W. P. Franklin I. J.* 82 (1881) 321-; 84 (1882) 401-.
- integrating. *Richard, G. Lum. Élect.* 16 (1885) 366-.
- , —. *Raffard*, —. Par. S. Ps. Sé. (1887) 173-.
- , —, of Meeze and Vernon-Boys. *Richard, G. Lum. Élect.* 14 (1884) 11-.
- at International Exhibition. *Guerout, A. Lum. Élect.* 4 (*1881) 290-, 307-, 341-, 356-, 373-.
- Morin's. *Trépied, C. Lum. Élect.* 1 (*1879) 85-.
- new. *Cagniard-Latour, C. C. R.* 4 (1837) 899-.
- , —. *Froude, W. Bath S. J.* 5 (1857) 216-.
- , —. *Richard, G. Lum. Élect.* 8 (*1883) 297-.
- Newcastle. *Amos, C. E. Ag. S. J.* 1 (1865) 204-.
- optical. *Latchingoff, M. Lum. Élect.* 3 (*1881) 447-.
- Poncelet's, profile of springs. *Léauté, H. Liouv. J. Mth.* 9 (1883) 245-.
- for power of screws of ships. *Froude, W. I. ME. P.* (1877) 237-.
- rotation, Frémont. *Desquiens, F. Gén. Civ.* 21 (1892) 260-.
- , —. *Richard. Gouilly, A. Gén. Civ.* 20 (1891-92) 395-.
- at Royal Technological Institute, Stockholm. *Nystrom, J. W. Franklin I. J.* 49 (1865) 392-.
- Ruggles's. *Eliot, C. W.* [1866] Am. Ac. P. 7 (1868) 65-.
- for small motors. *Hoskin, J. Franklin I. J.* 131 (1891) 489-.
- , —, steam engines (Macnaught). *Combes, C. A. Mines* 16 (1839) 519-.
- suitable for physiological inquiries. *Henry, C. C. R.* 121 (1895) 716-.
- Tatham. *Tatham, W. P. Franklin I. J.* 120 (1885) 449-; 122 (1886) 377-.
- transmission. *Ayrton, W. E., & Perry, J. Lum. Élect.* 3 (*1881) 405-.
- , —. *Thomson, E. Franklin I. J.* 81 (1881) 117-.
- , —. *Curie, P. C. R.* 103 (1886) 45-.
- , —. *Guigon, E.* [1888] I. Égypt. Bll. 9 (1889) 174-.
- , — (Guigon). *Ventre*, —. [1888] I. Egypt. Bll. 9 (1889) 185-.
- , —. *Robinson, S. W. Elect. Rv.* 38 (1896) 625-, 656-.
- , —, autographic. *Kent, W.* [1879] Am. I. Mn. E. T. 8 (*1880) 177-.
- , —, with direct reading and photographic record. *Mascart*, —. C. R. 110 (1890) 605-.
- , —, electric. *Kuztminskij, P. D. Rs. Ps.-C. S. J.* 28 (Ps.) (1896) 226-.
- , —, new. *Deprez, M. Lum. Élect.* 13 (1884) 481-.
- , —. *Meylan, E. Lum. Élect.* 27 (1888) 424-.
- , —. *Dalby, W. E. I. CE. P.* 132 (1898) 47-.
- , —, permanent. *Smith, C. A.* [1884] Am. S. CE. T. 15 (1886) 357-.
- for use with driving-bands. *Hefner-Alteneck, F. von.* (xii) Elekttech. Z. 2 (1881) 229-.
- with vernier. *Kleritj, L. Berg-Hm. Ztg.* 29 (1870) 3-, 16-.

- Dynamometric experiments (Ransonnet's). *Keraudren*, —. J. Méd. Chir. Phm. 24 (1812) 41-.
- , —. *Dollfus, G.* (vii) Mon. Sc. 3 (1861) 29-.
- , —, methods on railways. *Desdouts*, —. A. Mines 8 (1885) 481-.
- , —, testing of agricultural implements. *Grandvoininnet, J. A.* (xii) A. Agn. 2 (1876) 446-.
- Ergograph, new. *Binet, A., & Vaschide, N. C. R.* 125 (1897) 1161-.
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—, continuous registering. *Cancani, A. Rm. R. Ac. Linc. Rd.* 8 (1899) (*Sem.* 1) 46-, 447-.

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 —. *Johnston-Lavis, H. J.* Nt. 30 (1884) 608-.
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 —. *Johnston-Lavis, H. J.* [1884] Nt. 31 (1885) 53-.
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- — — — — velocity of air in flues and chimneys. *Fletcher, A. E.* B. A. Rp. 37 (1867) (Sect.) 33-; 39 (1869) (Sect.) 48-; *Lpool. Lt. Ph. S. P.* 24 (1870) 31-.
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- , for guns. *Vieille, P.* C. R. 112 (1891) 1052-.
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— — —. *Guglielmo, G.* *Rm. R. Ac. Linc. Rd.* 2 (1893) (*Sem. 2*) 8-.

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— plate and wedge by Kirchoff's method. *Réthy, M.* (*xii*) *Orv.-Term. Éts.* 4 (1879) (*Term. Szak*) 105-.

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— — explosive gaseous mixtures. *Petavel, J. E.* *B. A. Rp.* (1900) 655-.

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- , plane or curved. *Martynowski, A.* *Par. T. Nauk Śc. Pam.* 3 (*1873) 215-; 4 (*1874) *Art.* 1, 78 pp.
- , —, theory. *Steen, A.* [1872] *Kjöv. Skr.* 9 (1873) 539- (*Rés.* 558-).
- and temperature measurements, capillary corrections. *Pernet, J. Z.* *Instk.* 6 (1886) 377-.
- theory. *Cournot, A. A.* (vi *Adds.*) *Férussac Bll. Sc. Mth.* 9 (1828) 10-.
- *Moon, R.* *Ph. Mg.* 36 (1868) 27-, 116-.
- true theory as applied to elastic fluids. *Moon, R.* (viii) *Ph. Mg.* 26 (1863) 70-.
- variation in fluid in motion. *Lagerhjelm, P.* *Sk. Nf. F.* 3 (1842) 319-.
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- Resistance to air currents in mines. *Elwen, T. L.* [1889] *N. Eng. I. Mn. E. T.* 38 (1891) 205-.
- — — — —. *Murgue, D.* [1893-94] *Fed. I. Mn. E. T.* 6 (1894) 135-, 418-; 7 (1894) 211-.
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- Vacuum produced by air current. *Girouard, (Dr.)* —. *Les Mondes* 6 (1864) 513-.

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- , Amsler's hydrometric apparatus. *Zdzarski, A.* *Am. Eng. & Railroad J.* 67 (1893) 239-.
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- , —, instruments for recording. *Jones, J. R.* *R. S. P.* 24 (1876) 321-.
- , —, observations at single point. *Estignard, X.* *Rv. Mar.* 38 (1873) 224-.
- , —, registering apparatus for. *Weber, L.* [1896] *Schl.-Holst. Nt. Vr. Schr.* 11 (1898) 61.
- , experiments. *Fossombroni, V.* *Siena At. Ac.* 9 (1808) 261-.
- , hydrometric pendulum for measuring. *Bonati, T.* *Mod. Mm. S. It.* 8 (1799) 435-.
- , —, —. *Venturoli, G.* [1809-14] *Mod. S. It. Mm.* 14 (1809) 158-; *Bologna Opusc. Sc. I.* 1 (1817) 81-.
- , —, —. *Gerstner, F. J. von.* [1819] *Böhm. Gs. Ab.* 6 (1820) 92 pp.
- , instrument for measuring. *Regnier, E.* *Nicholson J.* 29 (1811) 68-.
- , —, —. [*Barilli, G.*] *Filopanti, Q. B.* *N. A. Sc. Nt.* 5 (1841) 165-.
- , —, —. *Stearns, F. P.* *Am. S. CE.* T. 12 (1883) 301-.
- , —, —, *asta ritrometrica.* *Bonati, T.* *Verona Mm. S. It.* 2 (1784) 676-; *Mod. Mm. S. It.* 8 (1799) 435-; *Mil. Mm. I. Lomb. Ven.* 3 (1816-17) 85-.
- , —, —, —. *Venturoli, G.* *Bologna Opusc. Sc. I.* (1817) 141-.
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- , —, —, electric. *Fuchs, K.* *Elekttech. Z.* 8 (1887) 74-, 150.
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- , —, —, recording. *Razzaboni, C.* Rm. At. R. Ac. 26 (1873) 512-.
- , —, —, testing. *Gordon, R.* I. ME. P. (1884) 190-.
- , —, —, Woltmann's. *Eytelwein, J. A.* Berl. Ab. (1816-17) 23-.
- , —, —, *Baumgarten, —.* Par. A. Pon. Chauss. 14 (1847) 326-.
- , —, —, *L'Éveillé, —.* Par. A. Pon. Chauss. 19 (1860) 215-.
- , —, —, *Treviranus, L. G.* Förster Al. Bauztg. 26 (1861) 125-.
- , —, —, *Culmann, K.* Zür. Vjschr. 13 (1868) 392-.
- , —, —, *Kvassay, E. von.* [1876] A. Pon. Chauss. 13 (1877) 236-.
- , —, —, *Rateau, —.* A. Mines 13 (1898) 331-.
- , —, —, formula of velocity. *Sasse, —.* Z. Bauw. 24 (1874) 77-; 26 (1876) 433-.
- , —, vertical parabola in measurements. *Sasse, —.* (xi) Hann. Archt.-Vr. Z. 19 (1873) 191-.
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- , —, at great depths. *Suchier, E.* Hann. Archt.-Vr. Z. 31 (1885) 373-.
- and pressure in current. *Michelotti, I.* [1805] Turin Mm. Ac. (1805-08) 181-.
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- , —, instrument for measuring, electric. *Harlacher, A. R.* [1883] Tel. E. J. 13 (*1884) 148-.
- , —, new method of measuring. *Poletti, G.* Mod. Mm. S. It. 19 (1821) (Mt.) 330-.
- , —, streams. *Focacci, F.* Mod. S. It. Mm. 13 (1807) 390-.
- , —, *Delprat, J. P.* Amst. N. Vh. 10 (1844) 157-; Amst. Vh. 3 (1850) 55-.
- , —, at various depths, apparatus for measuring. *Ritter, C.* As. Fr. C. R. (1889) (Pt. 2) 379-.
- , —, —, investigated by Brünings' measurements. *Hagen, G. H. L.* Berl. Ak. Ab. (1883) (Mth., Ab. 1) 79 pp.
- , —, instrument for measuring. *Müller, W.* Dingler 304 (1897) 8-.
- subaqueous, graphic representation (*Humphreys* and *Abbot*). *Fambri, P., & Revy, J. J.* Rm. R. Ac. Linc. T. 2 (1878) 149-.
- of water in torrents and under glaciers, experiments. *Vallot, (Mme.) G., & Vallot, J.* Mt. Blanc Obs. A. 4 (1900) 19-.

Water measurer, theory. *Savinère, É.* Gén. Civ. 9 (1886) 214-.

0840 Elastic Deformation of Solids. Compressibility and Rigidity. Elongation, Torsion, Flexure, Young's Modulus.

(See Mechanics :

- 3200 Elasticity, general.
- 3210 Strain and stress. Stress-strain relations. Strain-energy. Anisotropy. Crystals.
- 3220 Equations of elastic deformation and motion. General solutions. Special solutions. Vibrations.
- 3230 Torsion and flexure of prisms.
- 3240 Elastic rods and wires; springs.
- 3245 Elastic frameworks.
- 3250 Elastic plates and shells.
- 3260 Impact and rebound. Travelling loads.
- 3270 Stability of elastic systems.
- 3280 Principles of construction, including approximate formulæ for resistance of materials.)

Experimental determination of elastic constants.

(See also Mechanics 3600, 3630, 3650.)

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- Gough, J.* [1803] Manch. Ph. S. Mm. 1 (1805) 288-.
- contraction by heat. *Gezekhus [Heschus], N. A.* (xii) Rs. Ps.-C. S. J. 15 (Ps., Pt. 1) (1883) 103-; J. de Ps. 3 (1884) 459-.
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- and thermal expansion. *Graetz, L.* A. Ps. C. 28 (1886) 354-.
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- , —, and after-effect. *Pulfrich, C.* A. Ps. C. 28 (1886) 87-.
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- , —, *Broomall, C. M.* Science 8 (1898) 673-.
- temperature, effect on elasticity. *Schmulewitsch, J.* [1869] St. Pét. Ac. Sc. Bll. 14 (1870) 517-.

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- and loading, effects. *Schmulewitsch, J.* Zür. Vjschr. 11 (1866) 201-.
- — tension, effects. *Thomas, P.* Les Mondes 19 (1869) 575-.
- — —, — (Thomas). *Govi, G.* Les Mondes 19 (1869) 640-.
- — —, — (Govi). *Thomas, P.* Les Mondes 20 (1869) 8-.
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- , —. *Cantone, M.* Mil. I. Lomb. Rd. 31 (1898) 1521-.
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- vulcanised india-rubber. *Mallock, A. R. S.* P. 46 (1890) 233-.
- — —, variation with tension. *MacGregor, J. G.* [1899] N. Scotia I. Sc. P. & T. 10 (1903) xxviii-.
- — —, —, —. *Hebb, T. G.* [1900] N. Scotia I. Sc. P. & T. 10 (1903) 273-.

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- and elasticity of water. *Araldi, M.* Bologna Mm. I. It. 2 (1808) 327-.
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- — —, measurement, eliminating volume-change of containing vessel. *Boguski, J. J.* Kosmos (Lw.) 13 (1888) 243-; Z. Ps. C. 2 (1888) 120-.
- mercury, and elasticity of solids. *Amagat, E. H.* J. de Ps. 8 (1889) 197-, 359-; A. C. 22 (1891) 95-; Par. S. Ps. Sé. (1891) 102-.
- mud, amount of water removable by compression. *Douclot, J.* Arg. S. Ci. A. 37 (1894) 30-.
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- , — — vessels under internal pressure. *Agamennone, G., & Bonetti, F.* Rm. R. Ac. Linc. Rd. 1 (1885) 665-, 699-.
- and tensile strength. *Fairbairn, W., & Tate, T.* Phil. Trans. (1859) 213-.
- — Young's modulus. *Amagat, E. H.* C. R. 108 (1889) 228-.
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- — strength at high temperatures. *Kowalski, J. von.* A. Ps. C. 39 (1890) 155-.
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- , experiments. *Everett, J. D.* Phil. Trans. 156 (1866) 185-.
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- , measurement, taseometer for. *Steiner, F.* Dingler 226 (1877) 283-.
- , small, measurement. *Ewing, J. A.* R. S. P. 58 (1895) 123-.
- , —, apparatus. *Ewing, J. A.* Nt. 50 (1894) 408-.
- , —, —. *Warren, W. H.* N. S. W. R. S. J. 31 (1897) 89-.
- , —, — for bars subjected to twist. *Coker, E. G.* Ph. Mg. 46 (1898) 520-.
- Tensile tests, apparatus. *O'Neill, C.* [1863] Manch. Ph. S. Mm. 2 (1865) 389-.
- , —, self-recording. *Leuner, O.* Dingler 270 (1888) 165-.
- , —, —. *Tetzner, H.* Civing. 37 (1891) 503-.
- , —, —. *Guidi, C.* Tor. Ac. Sc. At. 34 (1898) 39-.
- , factors influencing results. *Goedicke, E.* Oestr. Z. Brgw. 31 (1883) 557-, 575-.
- of metals and fibres, smierologometer for. *Lydiatt, E.* Nicholson J. 32 (1812) 81-.
- — — silks, instrument for. *Bolle, G.* Trieste Bll. 7 (1882) 248-.
- — — wool, instrument for. *Karmarsch, K.* Wien Jb. Pol. I. 4 (1823) 347-.
- improvements. *Abbott, A. V.* Science 3 (1884) 812-, 814.
- for metals. *Thareau, G.* [1887] Gén. Civ. 12 (1887-88) 5-, 21-.
- , hydraulic system for tensile and other tests. *Foris, —.* Gén. Civ. 19 (1891) 25-.
- , Kennedy's. *Combe, J.* [1890] Gén. Civ. 18 (1890-91) 81-.
- six hundred ton machine at Athens, Pa. *Macdonald, C.* Am. S. CE. T. 16 (1887) 1-.
- springs, standardising of loading. *Pfuhl, E.* Civing. 35 (1889) 371-.
- , use in rigidity experiments. *Strack, —.* [1886] Karlsruhe Nt. Vr. Vh. 10 (1888) (Sb.) 104-.
- Taylor's, for vegetable fibres, threads and twine. *Taylor, T.* U. S. Sec. Ag. Rp. (1891) 414-.
- Thomasset's. *Gautier, F. I. & S. I. J.* (1889) (No. 1) 184-.
- U. S. A. machine at Watertown arsenal. *Holley, A. L.* Am. I. Mn. E. T. 7 (*1879) 256-.
- Timber, strength, microscopic investigation. *Day, F. M.* Am. Ph. S. P. 21 (1884) 333-.
- , uniform system of testing, need. *Campbell, F. A.* [1886] Vict. R. S. T. 23 (1887) 244-.
- Wires, apparatus for measurement and demonstration of deformation. *Oberbeck, A.* N. Vorp. Mt. 19 (1888) 86-.
- , extension, apparatus for measurement. *Searle, G. F. C.* Camb. Ph. S. P. 10 (1900) 318-.
- under stress, temperature changes in, testing apparatus. *Wassmuth, A.* Wien Ak. Sb. 97 (1889) (Ab. 2a) 52-.
- , telegraph-, mechanical testing. *Culley, R. S.* (ix) Tel. E. J. 2 (1873) 211-.
- , —, apparatus for. *Rothén, T.* J. Tél. 4 (1878-80) 697-.
- Minerals, dense, constants of some. *Voigt, W., & Drude, P.* Gött. Nr. (1889) 519-; (1890) 542-.
- , —, —. *Drude, P., & Voigt, W.* A. Ps. C. 42 (1891) 537-.

Testing Machines.

- Conti, P.* Bologna Ac. Sc. Mm. 7 (1876) 223-.
- for chain cables and timber. *Dunn, T.* (vi *Adds.*) CE. I. P. 16 (1856-57) 301-.
- Emery's. *Towne, H. R.* I. ME. P. (1888) 206-.
- for equal alternate stresses. *Warren, W. H.* N. S. W. R. S. J. 32 (1898) cxxix-.
- history, construction and use. *Abbott, A. V.* V. Nost. Eng. Mg. 30 (1884) 204-, 325-, 382-, 477-.
- horizontal lever. *Adamson, D. I. & S. I. J.* (1888) (No. 2) 12-.
- hydraulic. *Tuit, J. E.* Br. Archt. J. 3 (1896) 352-.
- for impact tests. *Russell, S. B.* Am. S. CE. T. 39 (1898) 237-.
- MODULI OF ELASTICITY.*
- adiabatic elastic constants. *Voigt, W.* Gött. Nr. (1888) 359-.
- determination by flexure of bars. *Koch, K. R.* A. Ps. C. 5 (1878) 251-.
- — — — — *Pscheidl, W.* Wien Ak. Sb. 79 (1879) (Ab. 2) 114-; 86 (1883) (Ab. 2) 115-.
- , new method. *König, A.* Berl. Ps. Gs. Vh. (1885) 59-.
- , 's Gravesande's method. *Oberbeck, A. A.* Ps. C. 37 (1889) 526.
- , —. *Stradling, G. A.* Ps. C. 41 (1890) 330-.
- for small loads. *Weston, C. P.* Ps. Rv. 8 (1899) 297-.

determination for small quantities of material, and some high moduli. *Auerbach, F.* A. Ps. C. 58 (1896) 381-.

— by tension experiments. *Brix, A. F. W.* Grunert Arch. 4 (1844) 239-.

— theory of balance spring. *Phillips, É.* C. R. 56 (1863) 296-; 58 (1864) 449-; A. Mines 15 (1869) 65-.

— vibrations. *Kurz, A.* Exner Rpm. 19 (1883) 246-.

and elastic limit, determination. *Phillips, É.* C. R. 88 (1879) 315-.

Hooke's law, apparent exceptions to. *Brillouin, M. A. C.* 13 (1898) 231-.

and moduli of resistance. *Winkler, E.* Civing. 9 (1863) 405-.

new constant, definition and determination, and correction of modulus. *Tammen, H. G.* (xii) *Zwick. Vr. Nt. Jbr.* (1880) 21-.

primary and secondary longitudinal moduli and thermal constants of latter. *Miller, A.* Münch. Ak. Ab. 15 (1886) 705-.

of rod as function of strain. *Hartig, E.* Civing. 39 (1893) 113-.

temperature, effect on modulus. *Mayer, A. M.* [1894] *Am. J. Sc.* 1 (1896) 81-, 250.

—, —, —, particularly of metals. *Kupffer, A. T.* [1852-56] *St. Pét. Ac. Sc. Mm.* 8 (1857) 397-; *St. Pét. Ac. Sc. Bl.* 14 (1856) 273-, 289-.

and of thermal capacity, and other physical constants, relations. *Tomlinson, H. R. S.* P. 38 (1885) 488-.

thermal and elastic phenomena, relations. *Mai, E.* *Mil. I. Lomb. Rd.* 24 (1891) 1050-.

—, —, —, —. *Alibrandi, P.* G. Mt. 38 (1900) 77-.

— expansion and extensibility of wires and caoutchouc, relations. *Kurz, A.* Exner Rpm. 22 (1886) 547-; 27 (1891) 631-.

—, —, temperature and torsion modulus, relations. *Sayno, A.* *Mil. I. Lomb. Rd.* 24 (1891) 293-, 574-.

and vibrations as function of molecular weights and specific heat. *Foerster, O. Z.* *Mth. Ps.* 41 (1896) 258-.

Young's, determination, principles. *Miller, A.* Münch. Ak. Ab. 16 (1888) 569-.

—, influence of magnetisation. *Tangl, K.* [1900] *Mth. Term. Éts.* 18 (1900) 49-; *Mth. Nt. B. Ung.* 18 (1903) 7-.

—, —, —, heat and electric current. *Noyes, M. C.* *Ps. Rv.* 3 (1896) 432-.

Poisson's ratio. *Poisson, S. D.* A. C. 36 (1827) 384-.

—, —. *Schneebeli, H.* *Zür. Vjschr.* 14 (1869) 375-.

—, —. *Mallock, A.* R. S. P. 29 (1879) 157-.

—, —. *Kayser, E.* [1887] *Danzig Schr.* 7 (1883-91) (*Heft* 1) xiii-.

— and Lamé's formulæ, experimental verification. *Amagat, E. H.* C. R. 106 (1888) 479-.

— for prisms. *Bauschinger, J.* Civing. 25 (1879) 81-.

Poisson's ratio at various temperatures. *Dahlander, G. R.* *Stockh. Öfv.* (1886) 213-; *Fschr. Ps.* (1886) (*Ab.* 1) 470-.

Resilience. *Tredgold, T.* *Tilloch Ph. Mg.* 51 (1818) 276-.

Rigidity. *Gerstner, F. A. von.* *Pogg. A.* 26 (1832) 269-.

—, —. *Göllner, H.* *Dingler* 273 (1889) 205-.

—, torsion and flexure, experiments. *Everett, J. D.* *Phil. Trans.* 157 (*1867) 139-; 158 (1868) 363-; B. A. Rp. 38 (1868) (*Sec.*) 8.

Slates, flexural strength. *Hanisch, —.* *Brux. S. Blg. Gl. Bil.* (1897) (*PV.*) 48.

—, —, determination. *Gamba, P.* N. Cim. 10 (1899) 168-.

Solids, elastic constants. *Saint-Venant, A. J. C. Barré de.* C. R. 86 (1878) 781-.

—, —, —. *Amagat, E. H.* C. R. 108 (1889) 1199-.

—, elasticity and strength. *Weisbach, J.* Civing. 9 (1863) 283-.

—, isotropic, effect of heat on modulus. *Borchardt, C. W.* *Berl. Mb.* (1873) 9-.

—, —, relations between elastic constants. *Voigt, W.* A. Ps. C. 38 (1889) 573-.

Stress and strain, influence on properties of matter. *Tomlinson, H. R. S.* P. 38 (1885) 488-.

—, —, —, —, —, — (Tomlinson). *Miller, A.* A. Ps. C. 25 (1885) 450-.

—, —, —, —, —, —. *Tomlinson, H.* [1886] *Phil. Trans.* 177 (1887) 801-.

THREADS AND FIBRES.

Glass, spun, tenacity. *Gibson, E. & Gregory, R. A. L.* *Ps. S. P.* 8 (1887) 191-; *Ph. Mg.* 23 (1887) 351-.

— threads, elasticity, and torsion-balances. *Ritchie, W.* *Phil. Trans.* (1830) 215-.

—, —, flexural rigidity. *Hartig, —.* Civing. 38 (1892) 265-.

Quartz threads, absolute rigidity coefficient. *Barnett, S. J.* *Ps. Rv.* 6 (1898) 114-.

—, —, elastic constants. *Threlfall, R.* *As. Rp.* (1890) 363-; *Ph. Mg.* 30 (1890) 99-.

—, —, — (Threlfall). *Boys, C. V.* *Ph. Mg.* 30 (1890) 116-.

Silk fibres, elasticity. *Quajat, E.* *St. Sp. Ag. It.* 15 (1888) 739-.

—, —, —. *Kurz, A.* Exner Rpm. 27 (1891) 409-.

— and threads, properties, relation. *Quajat, E.* *St. Sp. Ag. It.* 15 (1888) 738-.

— threads, elasticity. *Weber, W. E.* [1835] *Gött. Cm.* 8 (1832-37) (*Ps.*) 45-; *Pogg. A.* 34 (1835) 247-.

Spider lines, elasticity. *Gray, J. H.* *Ph. Mg.* 37 (1894) 491-.

Very fine threads, properties and uses. *Boys, C. V.* *L. Ps. S. P.* 9 (1888) 8-; *Ph. Mg.* 23 (1887) 489-.

Wool, physical properties. *Chludzinsky, W.* *Lndw. V.-St.* 33 (1887) 11-.

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- Colladon, D., & Sturm, C.* [1827] Par. Mm. Sav. Étr. 5 (1838) 267-.
- (Colladon & Sturm.) *Barlocci, S.* G. Arcad. 36 (1827) 308-.
- Ørsted, H. C.* Kiøb. Ov. (1827-28) 14-; Pogg. A. 12 (1828) 158-.
- Aimé, G. C. R.* 16 (1843) 1165-; A. C. 8 (1843) 257-.
- Despretz, C. C. R.* 21 (1845) 216-.
- Grassi, C. C. R.* 27 (1848) 153-.
- Soret, J. L.* Bb. Un. Arch. 16 (1851) 290-.
- Chase, P. E.* Camb. (U.S.) Mth. M. 2 (1860) 25-.
- Jamin, —, Amaury, —, & Descamps, C. C. R.* 66 (1868) 1104-.
- (Method of Jamin, Amaury and Descamps.)
- Dupré, A. C. R.* 67 (1868) 392-.
- Amaury, —, & Descamps, —.* C. R. 68 (1869) 1564-.
- Descamps, C.* Rv. Cours Sc. 3 (1872) 21-.
- Anagat, E. H. C. R.* 85 (1877) 27-, 139-; A. C. 11 (1877) 520-.
- Avenarius, M.* St. Pét. Ac. Sc. Bil. 24 (1878) 525-.
- Quincke, G. H. A. Ps. C.* 19 (1883) 401-.
- Pagliani, S., & Palazzo, L.* Rm. R. Ac. Linc. Mm. 19 (1884) 273-.
- Pagliani, S., & Vicentini, G. N. Cim.* 16 (1884) 27-, 161-.
- Guillaume, C. É. C. R.* 103 (1886) 1183-.
- Langlois, M. As. Fr. C. R.* (Pt. 2) 334-.
- Puschl, C.* Wien Ak. Sb. 96 (1888) (Ab. 2) 1028-.
- Barus, C. U. S. Gl. Sv. Bil. No. 92* (1892) 96 pp.
- Tait, —.* Edinb. R. S. P. 20 (1895) 245-.
- Compressibility at high pressures. *Cailletet, L. C. R.* 75 (1872) 77-.
- — — *Tait, P. G.* [1883] Edinb. R. S. P. 12 (1884) 223-.
- — — temperatures. *Ørsted, H. C.* [1826] Edinb. J. Sc. 6 (1827) 201-.
- and molecular pressure of liquids. *Tait, P. G.* Edinb. R. S. P. 20 (1895) 63-, 141-.
- — surface tension of liquids. *Devaux, —.* [1892] Bordeaux S. Sc. Mm. 4 (1894) ii-.
- Compression, thermal effects (water). *Ørsted, H. C.* Kiøb. Dn. Vd. Selsk. Afh. 12 (1846) exiv-.
- — — *Joule, J. P.* [1858] Phil. Trans. (1859) 133-.
- — — *Puschl, P. C.* Wien Az. 25 (1889) 123-.
- — — (water). *Galopin, P. C. R.* 114 (1892) 1525-.
- — — (—). *Tait, —.* Edinb. R. S. P. 19 (1893) 133-.
- — — (solutions). *Tammann, G.* Z. Ps. C. 13 (1894) 174-.
- Equation of van der Waals, application. *Tait, —.* Edinb. R. S. P. 20 (1895) 285-.
- Influence of temperature. *Heen, P. de.* Brux. Ac. Bil. 9 (1885) 550-.
- Laws. *Anagat, E. H. C. R.* 115 (1892) 638-.
- *Tumlirz, O.* Wien Ak. Sb. 109 (1900) (Ab. 2a) 837-.

MEASUREMENT OF COMPRESSIBILITY.

- Anagat, E. H.* Arch. Sc. Ps. Nt. 16 (1886) 181-.
- Tait, —.* Edinb. R. S. P. 13 (1886) 2-.
- apparatus (for water, piezometer). *Perkins, J.* Phil. Trans. (1820) 324-.
- (—). *Ørsted, H. C.* Kiøb. Ov. (1821-22) 6-; Schweigger J. 36 (=Jb. 6) (1822) 332-.
- *Pfaff, C. H.* Gilbert A. 72 (1822) 161-.
- (for water, Ørsted). *Hachette, J. N. P.* Par. S. Phlm. Bil. (1823) 46-.
- (—). *Ørsted, H. C.* (vi Adda.) Mg. Phm. 2 (1823) 139-.
- (—, Ørsted). *Magrini, L.* Mil. At. Aten. 2 (16) (1860-61) 58-.
- (piezometer). *Mees, R. A.* Amst. Ak. Vs. M. 19 (1884) 137-.
- *Skinner, S.* [1891] L. Ps. S. P. 11 (1892) 147-; Ph Mg. 32 (1891) 79-.
- (isentropic and isothermal compressibility of liquids and solids). *Guglielmo, G.* Rm. R. Ac. Linc. Rd. 1 (1892) (Sem. 1) 149-.
- (piezometer to compress and extend liquids). *Pizzarello, A.* N. Cim. 8 (1898) 266-.
- and dilatation. *Anagat, E. H. C. R.* 111 (1890) 871-.
- eliminating volume-change of containing vessel. *Guillaume, C. É.* Arch. Sc. Ps. Nt. 17 (1887) 177-.
- — — — *Boguski, J. J.* Kosmos (Lw.) 13 (1888) 243-; Z. Ps. C. 2 (1888) 120-.
- influence of heat of compression. *Röntgen, W. C. A. Ps. C.* 45 (1892) 560-.
- Jamin's method, using Regnault's manometer. *Mees, R. A.* Amst. Ak. Vs. M. 14 (1879) 108-; 15 (1880) 218-.

VARIOUS LIQUIDS.

- Ammonium chloride solutions. *Braun, F.* A. Ps. C. 31 (1887) 331-.
- Aqueous chloride solutions. *Schumann, M.* A. Ps. C. 31 (1887) 14-.
- Ethyl alcohol, volume-extensibility. *Worthington, A. M.* [1892] Phil. Trans. (A) 183 (1893) 355-.
- Hydrocarbons. *Elenev, A. S.* (xii) Rs. C. Ps. S. J. 5 (Pt. 1) (1873) 109-.
- *Bartoli, A.* Mil. I. Lomb. Rd. 28 (1895) 1141-.
- and alcohols, compressibility, tension coefficients and specific heats. *Pagliani, S.* Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 1) 885-.
- Mercury. *Langlois, M.* C. R. 103 (1886) 1009-.
- , compressibility, and elasticity of glass. *Anagat, E. H. C. R.* 108 (1889) 228-.
- , —, — — — solids. *Anagat, E. H. J. de* Ps. 8 (1889) 197-, 359-; A. C. 22 (1891) 95-; Par. S. Ps. Sé. (1891) 102-.

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- Mercury, and glass. *Metz, G. de.* [1890] N. Rs. S. Nt. Mm. (*Mth.*) 13 (1891) 109-; A. Ps. C. 47 (1892) 706-.
- Oils and colloids. *Metz, G. G. de.* Rs. Ps.-C. S. J. 22 (*Ps.*) (1890) 126-; A. Ps. C. 41 (1890) 663-.
- Organic liquids. *Röntgen, W. C.* A. Ps. C. 44 (1891) 1-.
- Potassium and calcium chlorides, solutions. *Drecker, J.* A. Ps. C. 34 (1888) 952-.
- Saline solutions. *Schneider, J.* Giessen Oberh. Gs. B. 25 (1887) 1-.
- , dilute, and solid sodium chloride. *Röntgen, W. C., & Schneider, J.* A. Ps. C. 31 (1887) 1000-.
- Solutions. *Gilbault, H.* Toul. Fac. Sc. A. 11 (1897) B, 63 pp.
- , compressibility, relation to that of constituents. *Braun, F.* A. Ps. C. 32 (1887) 504-.
- Sugar solutions. *Tait, —.* Edinb. R. S. P. 22 (1900) 359-.
- Sylvin, rock salt, and potassium chloride solutions. *Röntgen, W. C., & Schneider, J.* A. Ps. C. 34 (1888) 531-.

Water.

- Örsted, H. C.* Kiøb. Ov. (1817-18) 11-; Schweigger J. 21 (1817) 348-.
- Perkins, J.* Phil. Trans. (1820) 324-.
- (*Perkins.*) *Deuchar, J.* Tilloch Ph. Mg. 58 (1821) 201-.
- (—) *Roget, P. M.* Thomson A. Ph. 1 (1821) 135.
- (— and *Örsted.*) *Barlocci, S.* G. Arcad. 20 (1823) 338-.
- Clement, —.* Par. S. Phlm. Bil. (1823) 28-.
- Örsted, H. C.* A. C. 38 (1828) 326-; Kiøb. Ov. (1832-33) 16-; Pogg. A. 31 (1834) 361-; B. A. Rp. (1833) 353-.
- Rankine, W. J. M.* Edinb. R. S. P. 3 (1857) 58-.
- Anderssohn, A.* D. Nf. Tbl. (*1868) 95-.
- Tait, P. G.* [1882] Edinb. R. S. P. 12 (1884) 45-.
- Pagliani, S., & Vicentini, G.* (xii) Rv. Sc.-Ind. 15 (1883) 282; N. Cim. 16 (1884) 27-, 161-.
- Tait, P. G.* Edinb. R. S. P. 12 (1884) 757-.
- Langlois, M.* C. R. 102 (1886) 1451-.
- Amagat, E. H.* C. R. 104 (1887) 1159-.
- Röntgen, W. C., & Schneider, J.* A. Ps. C. 33 (1888) 644-.
- Amagat, E. H.* C. R. 116 (1893) 41-; Par. S. Ps. Sé. (1893) 145-.
- and alcoholic mixtures. *Pagliani, S.* Rm. R. Ac. Linc. Rd. 5 (1889) (*Sem.* 1) 777-, 937.
- compressibility and elasticity. *Araldi, M.* Bologna Mm. I. It. 2 (1808) 327-.
- , practical applications. *Forbes, J. D.* Edinb. N. Ph. J. 19 (1835) 36-.
- ; and thermoelectricity. *Örsted, H. C.* Par. S. Phlm. Bil. (1823) 45-.
- compression bathometer. *Regnard, P.* Par. S. Bl. Mm. 45 (1893) (*C. R.*) 6-.

Values of Densities 0845

- compression, progressive. *Perkins, J.* Phil. Trans. (1826) 541-.
- , theoretical rule. *Mac Kain, D.* Glasg. P. Ph. S. 1 (1841-44) 249-.
- elasticity. *Busse, F. G. von.* Gilbert A. 20 (1805) 504-.
- , mechanical effects. *Mensbrugge, G. van der.* Rv. Quest. Sc. 45 (1899) 580-.
- and ether. *Amagat, E. H.* C. R. 103 (1886) 429-.
- ethyl alcohol mixtures. *Pagliani, S., & Palazzo, L.* Tor. Ac. Sc. At. 19 (*1883) 1017-.
- at high temperature. *Barus, C.* Am. J. Sc. 41 (1891) 110-.
- incompressibility. *Anderssohn, A.* D. Nf. Tbl. (*1868) 95-.
- and paratoluidine. *Hulett, G. A.* Z. Ps. C. 33 (1900) 237-.
- salt solutions. *Tait, —.* Edinb. R. S. P. 15 (1889) 84.
- at different temperatures. *Rankine, W. J. M.* Ph. Mg. 1 (1851) 548-.

0845 Numerical Values of Mechanical Quantities (Density, Gravitation, etc.).

DENSITY.

(See also Chemistry 7115.)

- Air. *Agamennone, G.* Rm. R. Ac. Linc. Rd. 1 (1885) 111-.
- , liquid, and its components. *Wroblewski, S.* C. R. 102 (1886) 1010-.
- , —, — other liquefied gases. *Ladenburg, A., & Krügel, C.* Berl. B. 32 (1899) 46-, 1415-.
- Alcohol, pure. *Pierre, J. I.* C. R. 76 (1873) 336-.
- , table for dilution. *Anon.* Manch. Mer. S. T. (1891) 74.
- Alloys, change in volume density. *Kosmann, B.* Berg.-Hm. Ztg. 54 (1895) 51-.
- Animal substances. *Kapff, —, & Schübler, —.* Erdm. J. Tech. C. 14 (1832) 89-.
- Argon and helium, density, refractivity and viscosity. *Rayleigh, (Lord).* R. S. P. 59 (1896) 198-.
- Bismuth, fused. *Roberts-Austen, W. C., & Wrightson, T. L.* Ps. S. P. 4 (1881) 195-; Ph. Mg. 11 (1881) 295-.
- , —, anomalous densities. *Luedeking, C.* St. Louis Ac. T. 5 (1892) 292-.
- Brass, zinc, copper and iron, homogeneity. *Hennig, R.* A. Ps. C. 27 (1886) 321-; 28 (1886) 696-.
- Cæsium. *Menke, A. E.* Am. C. S. J. 21 (1899) 420-.
- Calcium sulphate. *McCaleb, J. F.* Am. C. J. 11 (1889) 35-.
- Carbon dioxide, solid and liquid. *Behn, U.* A. Ps. 3 (1900) 733-.
- Carbonic oxide, carbonic anhydride and nitrous oxide. *Rayleigh, (Lord).* R. S. P. 62 (1898) 204-.

- Chlorine and hydrochloric acid, density and molecular volume. *Leduc, A. C. R.* 116 (1893) 968-.
- Coke. *Tilden, W. A. S. C. In. J.* 3 (1884) 610-.
- Dilute aqueous solutions. *Kohlrausch, F., & Hallwachs, W. Gött. Nr.* (1893) 350-; *A. Ps. C.* 53 (1894) 14-, 1092.
- Earth and body consisting of all known elements, comparison of densities. *Bartoli, A. Rm. R. Ac. Linc. Rd.* 1 (1885) 596-.
- *Tolomei, G.*
[1897] *Ven. I. At.* (1897-98) 214-.
- Ebonite. *Campanile, F. Nap. Rd.* 33 (1894) 63-.
- Ether, aqueous solutions, temperature of maximum density. *Nort, H. Mbl. Nt.* (1895-96) 79-; *Fschr. Ps.* (1896) (*Ab.* 2) 250.
- , carbon disulphide and alcohol, liquid. *Battelli, A.* [1895] *Tor. Ac. Sc. Mm.* 45 (1896) 235-.
- , —, —, — (Battelli). *Mathias, —.*
As. Fr. C. R. (1898) (*Pt.* 2) 172-; *N. Cim.* 9 (1899) 327-.
- Ethyl alcohol, aqueous solutions. *Mendeléeff, D. C. S. J.* 51 (1887) 778-.
- Ferroaluminium. *Hogg, T. W. S. C. In. J.* 12 (1893) 239-.
- Gases at atmospheric pressure, density and molecular volume. *Leduc, A. C. R.* 125 (1897) 703-.
- ; and composition of air. *Leduc, A. C. R.* 126 (1898) 413-.
- ; — — — water. *Leduc, A. C. R.* 116 (1893) 1248-.
- , influence of moisture. *Thomson, T. Thomson A. Ph.* 3 (1822) 302-.
- , — — —, *Apjohn, Jas. Thomson A. Ph.* 3 (1822) 385-; 4 (1822) 195-.
- , — — —, *Herapath, J. Thomson A. Ph.* 3 (1822) 419-.
- , — — —, *Sylvester, C. Thomson A. Ph.* 4 (1822) 29-, 360.
- mixed with vapour. *Herapath, J. Thomson A. Ph.* 12 (1826) 97-.
- , principal. *Rayleigh, (Lord).* *R. S. P.* 53 (1893) 134-.
- Gems. *Liversidge, A. Am. C. S. J.* 16 (1894) 205-.
- Germanium and titanium, vapour density. *Nilson, L. F., & Pettersson, O. Z. Ps. C.* 1 (1887) 27-.
- Gold. *Hatchett, C. Phil. Trans.* (1803) 43-.
- and silver coinage. *Broch, O. J. As. Fr. C. R.* 9 (1880) 358-.
- Human body and sea-water, comparative gravity. *Spencer, K. Tilloch Ph. Mg.* 46 (1815) 248-.
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- (Rainy). *Thomson, T. Thomson A. Ph.* 10 (1825) 352-.
- , *Rainy, H. Thomson A. Ph.* 11 (1826) 187-.
- , *Stacewicz, T. Phm. Z. Russl.* 23 (1884) 65-, 95.
- desiccated by liquid air. *Rayleigh, (Lord).* *R. S. P.* 66 (1900) 334-.
- Hydrogen and oxygen. *Morley, E. W.* [1895] *Smiths. Ct.* 29 (1903) *Art. II.*, 117 pp.
- — —, *Thomsen, J. Z. Anorg. C.* 12 (1896) 1-.
- — —, relative densities. *Rayleigh, (Lord).* *R. S. P.* 43 (1888) 356-; 50 (1892) 448-.
- Iron and antimony alloys, density and specific heat. *Laborde, J. C. R.* 123 (1896) 227-.
- nickel alloys. *Hopkinson, J. R. S. P.* 50 (1892) 121-.
- Isomorphous mixtures. *Retgers, J. W. Z. Ps. C.* 3 (1889) 497-.
- Lead. *Reich, F. Pogg.* A. 109 (1860) 541-.
- , *Streng, A. Berg-Hm. Ztg.* 20 (1861) 225-.
- Leads. *Williams, C. P. Am. I. Mn. E. T.* 5 (*1876-77) 615-.
- Liquids. *Nobile, A.* [1829] *Nap. At. I. Inc.* 5 (1834) 79-.
- of very high density. *Platz, —.* [1884] *Karlsruhe Nt. Vr. Vh.* 10 (1888) (*Sb.*) 42.
- Mean density. *Ure, Andr. QJ. Sc.* 4 (1818) 151-.
- Mercury. *Stewart, B.* [1866] *R. S. P.* 15 (1867) 10-.
- , solid. *Tardy de la Brossey, —.* *Bb. Brit.* 30 (1805) 275-.
- , —, *Biddle, J. Gilbert A.* 24 (1806) 385-.
- , —, *Mallet, J. W.* [1877] *R. S. P.* 26 (1878) 71-.
- and water. *Guillaume, C. É.* [1900] *Sc. Abs.* 4 (1901) 475-.
- Muddy liquids and nebulous gases. *Garcia de la Cruz, D. V. Rv. Sc.* 3 (1895) 272-.
- Nitrogen. *Rayleigh, (Lord).* *Nt.* 46 (1892) 512-.
- , anomaly in density. *Rayleigh, (Lord).* *R. S. P.* 55 (1894) 340-.
- , atmospheric, and pure nitrogen and argon. *Ramsay, W. R. S. P.* 64 (1899) 181-.
- dioxide. *Leduc, A. C. R.* 116 (1893) 322-.
- Nitrous oxide, ethylene and carbonic anhydride, liquefied, and their saturated vapours. *Cailletet, L., & Mathias, —.* *C. R.* 102 (1886) 1202-.
- Oxygen, liquid. *Offret, J. A. C.* 19 (1880) 271-.
- , —, *Wroblewski, S. von. A. Ps. C.* 20 (1883) 860-.
- , —, density and coefficient of expansion. *Olszewski, K.* [1883] (*xn*) *Krk. Ak. (Mt.-Prz.) Rz. & Sp.* 11 (1884) 11-.
- and nitrogen and argon; and composition of air. *Leduc, A. C. R.* 123 (1896) 805-.
- — —; — composition of air. *Leduc, A. J. de Ps.* 10 (1891) 37-.
- — — — hydrogen. *Leduc, A. C. R.* 113 (1891) 186-.
- — — —; and composition of air. *Leduc, A. J. de Ps.* 1 (1892) 231-.
- — — —, liquefied. *Cailletet, L., & Hautefeuille, P.* *C. R.* 92 (1881) 1086-.
- — — — methane, liquefied. *Olszewski, K. Krk. Ak. (Mt.-Prz.) Rz.* 14 (1886) 181-, 197-; *A. Ps. C.* 31 (1887) 58-.
- Phosphorus vapour. *Dumas, J. B. A. C.* 49 (1832) 210-.
- Platinum. *Hess, H. St. Pét. Ac. Sc. Mm.* 1 (1831) 587-.

Platinum, iridium, and platinum-iridium, physical properties. *Stas*, —. Par. Poids et Mes. PV. (*1877) 6-.

— metals and alloys, densities and expansions. *Broch*, O. J. Par. Poids et Mes. PV. (*1877) 209-.

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— and liquids. *Clarke*, F. W. [1873] (ix) Smiths. Misc. Col. 12 (1874) Art. 2, 272 pp.; 32 (1888) Art. 1, xi+409 pp.

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— *Schmedding*, G. J. Pogg. A. 27 (1833) 40-.

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—, and progressive dissociation. *Riecke*, E. Z. Ps. C. 6 (1890) 430-.

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— — — *Bott*, W. B. A. Rp. (1888) 632-.

— — — *Scott*, A. Edinb. R. S. P. 14 (1888) 410-.

—, saturated, and liquefied gases. *Cailletet*, L., & *Mathias*, E. J. de Ps. 5 (1886) 549-.

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— hypothesis. *Girard de Caudenberg*, —. Bordeaux Ac. Sc. Sé. Pbl. (1831) 36.

—, leading doctrines. *Ure*, *Andr.* Phil. Trans. (1818) 338-.

—, mode of action. *Prevost*, P. Bb. Brit. 26 (1804) 205-, 309-.

— and molecular mechanics. *Girard de Caudenberg*, —. Dijon Ac. Mm. (1830) 5-, (livr. 2) 3-.

—, received doctrines. *Tilloch*, A. [1799] Tilloch Ph. Mg. 8 (1800) 70-, 119-, 211-.

— of vacuum. *Gay-Lussac*, L. J. A. C. 13 (1820) 304-.

Heat, action on bodies, importance of study. *Cantoni*, G. Rm. R. Ac. Linc. Rd. 7 (1891) (Sem. 2) 438-.

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—, experiments, reflexions derived from. *Wünsch*, (Prof.) —. Gilbert A. 26 (1807) 289-.

—, nature. P., —. Tilloch Ph. Mg. 12 (1802) 317-.

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—, —. *Hombres-Firmas*, L. A. d'. Gard Not. Tr. Ac. (1811) 138-.

—, —. *Moscatti*, P. Bb. Brit. 46 (1811) 405-.

—, —. *Tarbé de St. Hardouin*, —. Reims A. Ac. 1 (1843) 257-.

—, synthesis. *Pictet*, R. Arch. Sc. Ps. Nt. 2 (1879) 460-.

—, theory. *Ostrogradsky*, M. A. [1829] St. Pét. Ac. Sc. Mm. 1 (1831) 123-, 129-.

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—, —, and applications to arts and manufactures. *MacDonnell*, A. [1873] Dubl. S. J. 6 (1875) 494-.

—, —, Regnault's experiments. *Bosscha*, J. Amst. Ak. Vs. [1] (1893) 180-.

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Physical and chemical phenomena at low temperatures. *Pictet*, R. C. R. 114 (1892) 1245-.

Temperature of lava erupted by Etna. *Bartoli*, A. Catania Ac. Gioen. Bil. 29 (1892) 2-; Mil. I. Lomb. Rd. 29 (1896) 363-.

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- Calorific power of some solid combustibles, determined by calorimeters of Mahler and Thompson. *Cavazzi, A., & Baroni, G.* [1895] Bologna Ac. Sc. Mm. 6 (1896-97) 217- or 137-.
- value of fuels, steam boiler tests as means of determining. *Robb, D. W.* [1890] N. Scotia I. Sc. P. & T. 8 (1895) 9-.
- Cold. *Payer, J.* [1875] Wien Vr. Nw. Kennt. Schr. 16 (1876) 131-.
- Combustion, experiments and views. *Grotthus, T. von. Schweigger J. 9* (1813) 327-.
- Fire by compression of air. *Accum, F. Tilloch Ph. Mg. 31* (1808) 130-.
- making, methods. *Hough, W. Smiths. Rp.* (1890) (*U. S. Nat. Ms. Rp.*) 395-.
- Flame contact and heating of water. *Fletcher, T. Nt. 34* (1886) 230-.
- Fuel, economic use on scientific principles. *Precht, J. J. Haarl. Ntk. Vh. Mtsch. 3* (1806) 1-.
- Heat developed by friction. *Becquerel, A. C. C. R. 7* (1838) 363-; *Par. Mm. de l'I. 17* (1840) 181-.
- — — *Hirn, G. A., & Séguin, —. Moigno Cosmos 6* (1855) 679-.
- — — between liquids and solids. *Maschke, O. A. Ps. C. 146* (1872) 431-.

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- *Martini, T. Ven. I. At.* (1896-97) 502-.
- *Lagergren, S.* [1898] Stockh. Ak. Hndl. Bh. 24 (*Afd. 2*) (1899) No. 5, 14 pp.
- *Martini, T. Ven. I. At.* (1897-98) 927-.
- *Ercolini, G. N. Cim. 9* (1899) 110-.
- (Ercolini). *Martini, T. N. Cim. 9* (1899) 334-.
- (Martini). *Ercolini, G. N. Cim. 9* (1899) 446-.
- (Ercolini). *Martini, T. N. Cim. 10* (1899) 42.
- *Martini, T. Ven. I. At.* (1899-1900) (*Pt. 2*) 615-.
- *Bellati, M. Ven. I. At.* (1899-1900) (*Pt. 2*) 931-.

- Heat equivalent of fossil combustibles, industrial apparatus for. *Magnanini, G., & Zunino, V. Mod. Ac. Sc. Mm. 2* (1900) 117-.
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- Heat as introduction to study of temperature. *Hauvel, —. Fr. S. Mét. An. 44* (1896) 139-.
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- — —, production by compression. *Hombres-Firmas, L. A. d'. Gard Not. Tr. Ac.* (1811) 175-.
- produced by blast of air from bellows. *Winter, R. Nicholson J. 13* (1806) 72-.
- — — — — *D., K. H. (vi Add.) Nicholson J. 13* (1806) 170-.
- — — compression of air. *Bellani, A. Poligrafo 10* (1832) 321-.
- — with platinum black. *Bellani, A. Poligrafo 10* (1832) 321-.
- , sources. *Knoblauch, H. Pogg. A. 71* (1847) 58-.
- , —, natural and artificial. *Daubrée, A. Par. S. Gl. Bl. 4* (1846-47) 1056-.
- Ice caverns of Naye, Switzerland, origin of ice. *Dutoit, —, & Blanc, V. L. Laus. S. Vd. Bl. 32* (1896) xxx-.
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- Petroleum as source of power. *Clark, N. B. Franklin I. J. 117* (1884) 341-.
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- — —, mechanical effect on confined air. *Mouchot, —. C. R. 59* (1864) 527.
- — —, use as motive force. *Haro, A. Nancy S. Sc. Bl. 3* (10^e Ann.) (1877) 91-.
- — —, with plane reflector. *Güntner, C. [1875] Wien Ak. Sb. 72* (1876) (*Ab. 2*) 713-.
- — —, — to replace fuel in certain countries. *Mouchot, —. C. R. 67* (1868) 1182-.
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- Terrestrial heat, cause determining reproduction. *Ponte, S. C. [1880] Catania Ac. Gioen. At. 15* (1881) 27-.
- Trials by fire, etc., apparatus for. *Rochas d'Aigun, É. A. A. de. Rv. Sc. 4* (1882) 344-.
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- Calorimeter, Ougrimoff electric. *Montpellier, J. A.* [1900] *Sc. Abs.* 4 (1901) 92-.
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- , domestic, perfecting. *Forestier, C. Toul. Ac. Sc. Mm.* 7 (1875) 233-.
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- , —, regenerative, use of peat in. *Mac Donnell, A.* [1874] *Dubl. S. J.* 6 (1875) 503-.
- , —, temperature. *Périsse, J. S. Cuyper Rv. Un.* 38 (1875) 269-.
- , —, use of peat in, Motala, Sweden. *Sebenius, J. L. Jern-Kont. A.* 31 (1876) 227-.
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- , —, —, —. *Damour, E. Gén. Civ.* 31 (1897) 324-, 405-, 417-; 32 (1897-98) 4-, 22-, 46-; 33 (1898) 108-.
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- Lenses and mirrors for burning instruments and lighthouses. *Brewster, (Sir) D.* [1823-27] *Edinb. Ph. J.* 8 (1823) 160-; *Edinb. R. S. T.* 11 (1831) 33-.
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- and their first inventor. *Gilbert, L. W. Gilbert A.* 22 (1806) 51-.
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- , —, comparison of different systems. *Bacon, A. J. Br. Archt. T.* (1880-81) 105-.

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—, mechanical, bibliography. *Bourne, J. I. CE. P.* 37 (1874) 271-.

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— for brewers' wort. *Davison, R. (vi Add.) CE. I. P.* 1 (1841) 57-.

— with volatile liquids not miscible at low temperatures. *Pictet, R. C. R.* 100 (1885) 329-.

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Water, artificial freezing. *Decourdemanche, —. J. Phm.* 11 (1825) 584-.

—, freezing by ether. *Hare, R. Sturgeon A. Electr.* 5 (1840) 151-.

—, —, new method. *Leslie, J. Thomson A. Ph.* 9 (1817) 412-; *Tilloch Ph. Mg.* 51 (1818) 411-.

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 Apparatus. *Merryweather, G.* Edinb. N. Ph. J. 14 (1833) 360-.
 —. *Kohlrausch, F. A.* Ps. C. 125 (1865) 626-.
 —. *Cady, H. P.* J. Ps. C. 2 (1898) 242-.
 — (calorifères à feu continu). *Pelet, L.* Laus. S. Vd. Bll. 34 (1898) 243-.
 — for maintaining constant temperature above 100°. *Ulsch, K.* Z. Vr. Rübenzuckin. 40 (1890) 1039-.
 — — obtaining constant temperature water current. *Pulfrich, C.* Z. Instk. 18 (1898) 49-.

Automatic maintenance of constant temperature in chamber. *Arsonval, A. d'.* C. R. 107 (1888) 194-; Par. S. Bl. Mm. 40 (1888) (C. R.) 530-.

— regulation. *Čebyšev, (Lt.-Gen.) V. L.* Rs. Ps.-C. S. J. 28 (Ps.) (1896) 56-.
 — and registration. *Parenty, H., & Bricard, R.* C. R. 122 (1896) 919-.

Constant high temperatures in metallic vapour baths. *Barus, C., & Hallock, W.* U. S. G. Sv. Bll. No. 54 (1889) 56-.
 — temperature from 100° to 700°. *Bodenstein, M.* Z. Ps. C. 30 (1899) 113-.
 —, d'Arsonval's method of maintaining. *Neesen, F.* [1882-83] (XII) Berl. Ps. Gs. Vh. 1 (1882) 39-; 2 (1884) 29.
 — in buildings. *Wild, H.* [1885] St. Pét. Ac. Sc. Bll. 30 (1886) 363-.

— and pressure, maintenance. *Brown, F. D.* [1879] L. Ps. S. P. 3 (1880) 68-; Ph. Mg. 7 (1879) 411-.

Heat regulation, thermoelectric. *Regaud, C., & Fouilliand, R.* J. Pl. Pth. Gén. 2 (1900) 457-.

Hot blast, equalisation of varying temperatures. *Gjers, L. F., & Harrison, J. H.* I. & S. I. J. (1900) (No. 1) 154-.

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Regulation of temperature. *Prytz, K.* Kjøb. Ov. (1892) 142-; Fsch. Ps. (1892) (Ab. 2) 249.

Regulator (Sir J. Hall's). *Hall, B.* [1833] Gl. S. P. 1 (1834) 478-.
 —. *Benoit, R.* Par. S. Ps. Sé. (1879) 6-.
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—. *Darwin, H.* Nt. 33 (1886) 596-.

—, electrical. *Grassini, R.* Rv. Sc.-Ind. 32 (1900) 27-.

—, gas. *Schroewald, E.* Z. Ws. Mkr. 5 (1888) 331-.

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— and thermograph. *Baumhauer, E. H. von.* Arch. Néerl. 19 (1884) 297-.

— for warming by steam. *Fischer, Herm.* Dingler 234 (1879) 161-.

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Laspeyres, E. A. H. A. Ps. C. 152 (1874) 132-.

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Arsonval, A. d'. C. R. 107 (1888) 194-; Par. S. Bl. Mm. 40 (1888) (C. R.) 530-.

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Michel, A. Par. S. Bl. Mm. 44 (1892) (C. R.) 932-.

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—, for bacteriological incubator. *Hanfland, F.* Z. Ws. Mkr. 17 (1900) 440-.

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—, modification. *Karawaiew, W.* Z. Ws. Mkr. 13 (1896) 289-.

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- gas pressure regulator for. *Murrill, R. M.* S. J. (1898) 480-.
- improvement. *Blimcke, A. A.* Ps. C. 25 (1885) 419-.
- *Golicyn, (Prince) B. B.* St. Pét. Ac. Sc. Bll. 7 (1897) xv-.
- for incubation and artificial digestion experiments. *Randolph, N. A.* Franklin I. J. 86 (1883) 465-.
- — microscope work. *Koch, A.* Z. Ws. Mkr. 10 (1893) 161-.
- self-regulating (without gas or electricity). *Landois, L.* N.-Vorp. Mt. 24 (1892) 30-.
- simple. *Reichert, E. A.* Ps. C. 144 (1872) 467-.
- and sensitive. *Andrae, G.* [J.] L. (xii) Mbl. Nt. 8 (1878) 98-; (ix) A. Ps. C. 4 (1878) 614-.
- , working by gas pressure. *Baumhauer, E. H. von.* C. R. 99 (1884) 370-.
- for temperatures between 50° and 300°. *Mahlke, A.* Z. Instk. 13 (1893) 197-.

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- Cotte, L.* J. de Ps. 68 (1809) 132-, 222-.
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- Pernet, J.* Carl Rpm. 11 (1875) 257-.
- Mills, E. J.* Ph. Mg. 6 (1878) 62-.
- Crafts, J. M. C.* R. 91 (1880) 574-.
- Mills, E. J.* Edinb. R. S. T. 29 (1880) 567-; Ph. Mg. 12 (1881) 142-.
- Brown, F. D. L.* Ps. S. P. 5 (1884) 116-; Ph. Mg. 14 (1882) 57-.
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- Cole, A. S., & Durgan, E. L.* Ps. Rv. 4 (1897) 217-.
- Chree, C.* Nt. 58 (1898) 304-; Ph. Mg. 45 (1898) 205-, 299-.
- Aneroid-thermoscope, lecture demonstration apparatus. *Karsten, G.* [1889] Schl.-Holst. Nt. Vr. Schr. 8 (1891) 17-.
- Barometer, formula for use as thermometer. *Villeneuve, — (comte) de.* Fr. Cg. Sc. 33 (1866) 339-.
- Capillary corrections to pressure and temperature measurements. *Pernet, J.* Z. Instk. 6 (1886) 377-.
- Glass, change in properties. *Weber, R.* Par. Bll. S. C. 1 (1864) 305-.
- , "Jena normal." *Wiebe, H. F.* Z. Instk. 6 (1886) 167-.
- , permeability by gases. *Bartoli, A.* Rm. R. Ac. Linc. T. 8 (1884) 337-.
- , physical properties. *Schott, O.* Z. Instk. 11 (1891) 330-.
- Heat, fundamental laws, and true measure of temperature. *Schitko, J.* Baumgartner Z. 4 (1828) 436-; 6 (1829) 138-.

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- Heat, measurement, new method. *Müller-Erzbach, —.* Cztg. Opt. 10 (1889) 14-.
- High temperatures. *Saint-Edme, E.* Cosmos 22 (1863) 754-.
- , experiments. *Pouillet, C. S. M.* C. R. 3 (1836) 782-; Pogg. A. 39 (1836) 544-, 567-.
- and vaporisation of carbon. *Berthelot, —.* C. R. 115 (1892) 1275-.

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- Pollet, —.* Amiens Mm. Ac. (1843) 39-.
- Fiévet, E.* Cuyper Rv. Un. 19 (1866) 308-.
- Bosscha, J.* Les Mondes 21 (1869) 720-, 761-.
- Recknagel, G. A.* Ps. C. Ergänz. 6 (1874) 275-.
- Dragoumis, E. J.* Berl. B. 10 (1877) 1648-.
- Callendar, H. L.* [1886] Phil. Trans. (A) 178 (1888) 161-.
- Weber, C. L.* Cztg. Opt. 11 (1890) 88-, 111-.
- Accuracy. *Renou, E.* C. R. 109 (1889) 895-.
- *Guillaume, C. É.* C. R. 109 (1889) 963-.
- Air temperature. *Dufour, C.* Arch. Sc. Ps. Nt. 4 (1897) 344-.
- Atmosphere in sunshine. *Aymonnet, —.* C. R. 87 (1878) 23-.
- Cyclically varying temperature. *Burstall, H. F. W. L.* Ps. S. P. 13 (1895) 579-; Ph. Mg. 40 (1895) 282-.
- Flame of water-gas. *Blass, E.* [1892] Nt. 47 (1892-93) 113.
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- temperatures. *Biot, J. B.* J. Mines 17 (1804) 203-.
- *Prinsep, J.* [1827] Phil. Trans. (1828) 79-.
- *Pouillet, C. S. M.* Froriep Not. 24 (1829) 39-.
- *Erman, A., & Herter, P.* Pogg. A. 97 (1856) 489-.
- *Sainte-Claire Deville, H., & Troost, L.* C. R. 56 (1863) 977-.
- *Becquerel, E.* C. R. 57 (1863) 855-.
- (Becquerel). *Sainte-Claire Deville, H.* C. R. 57 (1863) 894-.
- *Becquerel, E.* C. R. 57 (1863) 925-.
- *Berthelot, M.* Par. Bll. S. C. 8 (1867) 387-; A. C. 13 (1868) 144-.
- *Fischer, F.* Dingler 230 (1878) 319-.
- *Sainte-Claire Deville, E. H., & Troost, L.* C. R. 90 (1880) 727-, 773-.
- *Selivanov, T.* Rs. Ps.-C. S. J. 23 (Ps.) (1891) 152-; J. de Ps. 1 (1892) 134-.
- *Barus, C.* Ph. Mg. 34 (1892) 1-.
- *Le Chatelier, H.* Rv. Sc. 49 (1892) 162-.
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- —. *Béguin, L.* Gén. Civ. 28 (1895-96) 388-.
- —. *Boudouard, —.* Z. Angew. C. (1900) 794.
- —. *Grünhut, —.* [1900] Nass. Vr. Jb. 54 (1901) XL-.
- Liquids, correction for, in case of insufficient immersion. *Ferrini, R.* Mil. I. Lomb. Rd. 8 (1875) 141-.
- and solids. *Botelho de Lacerda, C.* Lisb. Mm. Ac. Sc. 5 (1818) (pte. 2) 28-.
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- —. *Cailletet, L., & Colardeau, E.* C. R. 106 (1888) 1489-; Par. S. Ps. Sé. (1888) 295-.
- —. *Guillaume, C. É.* Arch. Sc. Ps. Nt. 20 (1888) 396-.
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- —. *Kamerlingh Onnes, H.* Amst. Ak. Vs. 5 (1897) 37-, 79-; J. de Ps. 9 (1900) 128.
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- Solid homogeneous body. *Betti, E.* Mod. Mm. S. It. 1 (pte. 2) (1868) 165-.
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- Temperature determination in a given time, of variable source of heat. *Indra, A.* Wien Ak. Sb. 105 (1896) (Ab. 2a) 823-.
- and time, measurement, analogy between. *Macgregor, J. G.* [1887] N. Scotia I. Sc. P. & T. 7 (1890) 20-.

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- Schultes, J. A.* Gehlen J. 5 (1808) 729-.
- Bellani, A.* Poligrato 9 (1832) 169-.
- Dobrzyński, F.* Kosmos (Lw.) 9 (1884) 712.
- Müller-Uri, R.* Braunsch. Vr. Nt. Jbr. (10) (1897) 35-.
- behaviour in vacuum. *Loewy, B.* R. S. P. 17 (1869) 319-.
- centigrade, fixing boiling point. *Abbadie, A.* T. d'. C. R. 40 (1855) 847-.
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- , —, effect of composition of glass. *Weber, R.* Berl. Ak. Sb. (1883) 1233-.
- , —, freedom from. *Weber, R.* D. Nf. Tbl. (1889) 249-.
- , —, rise. *Flaugergues, H.* Bb. Un. 20 (1822) 117-.
- , —. *Crafts, J. M.* C. R. 91 (1880) 291-.
- , —. *Young, S.* Nt. 41 (1890) 152.
- , —. *Tomlinson, H.* Nt. 41 (1890) 198.
- , —. *Mills, E. J.* Nt. 41 (1890) 227.
- , —. *Young, S.* Nt. 41 (1890) 271-, 488-.
- , —. *Mills, E. J.* Nt. 41 (1890) 537-.

1230 Electrical Thermometry.

- Bolometer. *Langley, S. P.* Am. Ac. P. 16 (1881) 342-.
- , —. *Crova, A.* A. C. 29 (1893) 137-.
- , —, measurements with by zero method. *Crova, A.* As. Fr. C. R. (1892) (Pt. 1) 178-.
- , —, —, —. *Wadsworth, F. L. O.* Asps. J. 5 (1897) 268-.
- , —, sensitiveness. *Guye, C. E.* Arch. Sc. Ps. Nt. 24 (1890) 669-.
- , —, surface-construction. *Lunmer, O., & Kurlbaum, F.* Z. Instk. 12 (1892) 81-.
- , —, theory. *Reid, H. F.* Am. J. Sc. 35 (1888) 160-.
- , —. *Guye, C. E.* Arch. Sc. Ps. Nt. 27 (1892) 26-.

MEASUREMENT OF TEMPERATURE.

- by aid of telephone. *Lenz, R.* St. Pét. Ac. Se. Bll. 29 (1884) 291-.
- resistance method. *Siemens, C. W.* R. I. P. 6 (1872) 438-.
- , —. *Bartoli, A., & Somigliana, C.* Mil. I. Lomb. Rd. 29 (1896) 275-.
- , — (high temperatures). *Griffiths, E. H.* Nt. 53 (1895-96) 389-.
- , —. *Clark, G. M.* Elect. 38 (1897) 175-, 241-, 273-, 371-, 747-.
- , —. *Chrusterschow, P., & Sitnikow, A.* Fsch. Ps. (1898) (Ab. 2) 257.
- , — and thermoelectric method. *Guillaume, C. É.* Lum. Elect. 28 (1888) 201-, 312-, 409-, 454-, 566-, 601-.
- , — (high temperatures). *Holborn, L., & Wien, W.* Z. Instk. 12 (1892) 257-, 296-.
- , —. *Blondin, J.* Lum. Elect. 47 (1893) 21-, 75-, 125-.

Thermoelectric Measurement.

- Regnault, V.* Bb. Un. Arch. 10 (1849) 265-; 11 (1849) 5-, 265-.
- Boutan, A.* C. R. 47 (1858) 74-.
- (Boutan). *Bequerel, A. C.* C. R. 47 (1858) 173-, 717-.
- Rossetti, F.* N. Cim. 26 (*1867) 404-.
- Arsonval, A. d'.* Lum. Elect. 5 (*1881) 40-.
- Rosenthal, J.* [1894] Erlang. Ps. Md. S. Sb. 26 (1895) 40-.
- Aubel, E. van, & Paillot, R.* Arch. Sc. Ps. Nt. 33 (1895) 148-.
- Fessenden, R. A.* Nt. 53 (1895-96) 244-.
- Jacobus, D. S.* Am. As. P. (1900) 151.
- of flames. *Waggener, W. J.* Berl. Ps. Gs. Vh. (1895) 78-; A. Ps. C. 58 (1896) 579-.
- , —. *Berkenbusch, F. A.* Ps. C. 67 (1899) 649-.
- , — high temperatures. *Bequerel, A. C.* A. C. 31 (1826) 371-.
- , —. *Siemens, E. W. von, & Halske, J. G.* (xii) Elekttech. Z. 2 (1881) 246-.
- , —. *Le Chatelier, H.* Par. S. Ps. Sé. (1886) 100-; Gén. Civ. 10 (1886-87) 291-.
- , —. *Barus, C.* U. S. Gl. Sv. Bll. No. 54 (1889) 313 pp.
- , —. *McCrae, J.* A. Ps. C. 55 (1895) 95-.
- , —, calibration. *Lindeck, S., & Rothe, R.* Z. Instk. 20 (1900) 285-.
- , —. *Nichols, E. L.* Arch. Néerl. 5 (1900) 339-.
- , —, present status of research. *Barus, C.* Am. J. Sc. 48 (1894) 332-.
- interpolation formulæ. *Holman, S. W.* Am. Ac. P. 31 (1896) 193-.
- by iron-constantan couple. *Aubel, E. van.* Arch. Sc. Ps. Nt. 6 (1898) 169-.
- of underground and atmospheric temperature. *Bequerel, A. C.* C. R. 46 (1858) 1183-.
- , — temperature. *Bequerel, A. C., & Breschet, —.* Bb. Un. 7 (1837) 173-.
- , —. *Bequerel, E.* C. R. 56 (1863) 1057-.
- , —. *Pernet, J.* (x) Wild Rpm. Met. 2 (1872) 85-.

- Platinum temperatures. *Dickson, J. D. H.* Ph. Mg. 44 (1897) 445-.
- thermometry. *Callendar, H. L.* Ph. Mg. 47 (1899) 191-.
- *Chree, C.* [1899] R. S. P. 67 (1901) 3-.

PYROMETERS.

- Heräus, W. C.* Z. Angew. C. (1895) 431-.
- electric. *Siemens, C. W. I.* and S. I. J. 1 (1871) 50-.
- *Abney, (Lt.)* —. Ph. Mg. 44 (1872) 80.
- (Siemens's). *Brit. Ass. Comm. (Foster, G. C.)* B. A. Rp. (1874) 242-.
- *Braun, F.* Elekttech. Z. 9 (1888) 421-.
- (Braun's). *Palaz, A.* Lum. Élect. 30 (1888) 65-.
- *Roberts-Austen, W. C.* [1893] Elect. 32 (1894) 41-.
- *Montpellier, J. A.* Sc. Abs. 3 (1900) 859.
- modification of Siemens's. *Spohr, J.* Dingler 257 (1885) 315-.
- platinum. *Callendar, H. L. I. & S. I. J.* (1892) (No. 1) 164-.
- technical. *Heräus, W. C., Keiser, —, & Schmidt, —.* Z. Instk. 15 (1895) 373-.
- thermoelectric. *Le Chatelier, H.* Par. S. C. Bl. 47 (1887) 2.
- *Schoentjes, H.* Arch. Sc. Ps. Nt. 5 (1898) 136-.
- *Le Chatelier's. Rigaut, A.* Lum. Élect. 36 (1890) 308-.
- *Struthers, J.* Sch. Mines Q. N. Y. 12 (1891) 143-; 13 (1892) 221-.
- *Damour, E.* Berg-Hm. Ztg. 51 (1892) 277-, 301-, 310-.
- *Heräus, W. C.* [1895] Z. Elektch. (1895-96) 276-.
- *Ernst, C. von.* Oestr. Z. Brgw. 45 (1897) 300-.
- , automatic methods of observation. *Roberts-Austen, W. C. I. & S. I. J.* (1891) (No. 1) 90-.
- , calibration. *Holman, S. W.* Am. Ac. P. 31 (1896) 234-.
- , for melting-point of cast iron. *Moldenke, R.* Sc. Abs. 2 (1899) 282.
- , new form. *Jacobus, D. S.* Am. As. P. (1900) 151.
- , recording. *Roberts-Austen, W. C. I. & S. I. J.* (1893) (No. 1) 112-.
- *Stansfield, A.* L. Ps. S. P. 16 (1899) 103-; Ph. Mg. 46 (1898) 59-.

Thermograph, thermoelectric, and lunar radiation. *Hutchins, C. C., & Owen, D. E.* Am. Ac. P. 24 (1889) 125-.

THERMOMETERS.

- Guillaume, C. É.* Par. Poids et Mes. PV. (1891) 53-.
- differential resistance. *Mendenhall, T. C.* Am. J. Sc. 30 (1885) 114-.
- electric. *Solly, E.* Ph. Mg. 19 (1841) 391-.
- contact. *Grunmach, L.* Z. Instk. 9 (1889) 296-.

- electric, for low temperatures. *Witkowski, A.* Krk. Ak. (Mt.-Prz.) Rz. 3 (1891) 380-; Cro. Ac. Sc. Bl. (1891) 188-.
- , —, —. *Rr. Dingler* 304 (1897) 57-.
- , in medicine. *Guéroul, A.* Lum. Élect. 4 (*1881) 153-.
- , modification. *Mascart, É. J. de Ps. 2* (1873) 313-.
- , registering. *Morin, A. J.* C. R. 64 (1867) 327-.
- resistance-. *Siemens, C. W.* (vi Adds.) Ph. Mg. 21 (1861) 73-.
- *Shaw, W. N.* B. A. Rp. (1888) 590-.
- platinum. *Griffiths, E. H.* [1890] Phil. Trans. (A) 182 (1892) 43-.
- *Wade, E. B. H.* Camb. Ph. S. P. 9 (1898) 526-.
- *Chappuis, —.* Par. Poids et Mes. PV. (1899) 157-.
- , construction. *Callendar, H. L.* Ph. Mg. 32 (1891) 104-.
- , direct reading. *Clark, G. M.* B. A. Rp. (1894) 758.
- , —, —. *Appleyard, R.* [1895] L. Ps. S. P. 14 (1896) 74-; Ph. Mg. 41 (1896) 62-.
- , for low temperatures. *Griffiths, E. H., & Clark, G. M.* [1892] Camb. Ph. S. P. 8 (1895) 2-.
- , standardising. *Callendar, H. L., & Griffiths, E. H.* [1890] Phil. Trans. (A) 182 (1892) 119-.
- quick-indicating. *Genglaire, E.* Lum. Élect. 46 (1892) 372-.

- Thermomultiplier. *Nobili, L.* Bb. Un. 44 (1830) 225-.
- Thermophone. *Whipple, G. C.* Science 2 (1895) 639-.
- *Whipple, G. C., & Warren, H. E.* [1899] Sc. Abs. 3 (1900) 69.
- Thermopile, differential. *Beaulieu-Marconnay, K. (Frhr.) von.* Humb. 5 (1886) 224-.
- , new. *Rubens, H.* Z. Instk. 18 (1898) 65-, 137.
- , — (Rubens). *Czermak, P.* Z. Instk. 18 (1898) 135-.
- Thermoscope, electric. *Ascoli, M.* Rm. R. Ac. Linc. Rd. 6 (1890) (Sem. 1) 449-.
- , —, differential. *Nosworthy, W. F.* Tel. J. 11 (1882) 167-.

1240 Temperature Measurement by Calorimeter, Vapour Density, Transpiration, Viscosity, etc.

- Air-calorimeter. *Gezekhus, N. A.* [1882] (xii) Rs. Ps.-C. S. J. 15 (Ps., Pt. 1) (1883) 10-.
- Calorimetric methods. *Arsonval, A. d'.* Lum. Élect. 13 (1884) 361-, 405-, 445-, 493-.
- Evaporation of carbon-tetrachloride. *Müller-Erzbach, W. D. Nf. Vh.* (1894) (Th. 2, Hälfte 1) 72-.

- Evaporation as means of measuring temperature. *Müller-Erbach, W.* Exner Rpm. 24 (1888) 575-; Met. Z. 5 (1888) 453-; Z. Instk. 10 (1890) 88-.
- Furnace temperature, determination. *Beau-nier, —, & Gallois, —.* J. Mines 12 (1801) 272-; 16 (1804) 37-, 81-, 193-.
- — — — — *Appolt, —.* Berg-Hm. Ztg. 15 (1856) 165-.
- Gases, temperature measurements by refractivity. *Berthelot, D.* Par. Ms. H. Nt. Bl. 4 (1898) 301-.
- High temperatures, measurement. *Wilson, John.* ME. I. P. (1852) 53-.
- — — — — (Wilson's method). *Kohlmann, —.* Halle Z. Nw. 2 (1853) 115-.
- — — — — *Beutel, E.* Wien Az. 36 (1899) 261.
- — — — — *Berthelot, D.* Par. S. C. Bl. 23 (1900) 322-.
- — — — — by meldometer. *Ramsay, W., & Eunorjopoulos, N. L.* Ps. S. P. 14 (1896) 105-; Ph. Mg. 41 (1896) 360-.
- — — — — Weinhold's calorimeter. *Schneider, C. H.* Carl Rpm. 11 (1875) 116-.
- Hydrometer for metallurgists' use. *Andrée, S. A.* Jern-Kont. A. 39 (1884) 173-; Berg-Hm. Ztg. 43 (1884) 506-.
- Lava from Etna, temperature. *Bartoli, A.* Catania Ac. Gioen. At. 3 (1891) 61-; Catania Ac. Gioen. Bl. 29 (1892) 2-; Mil. I. Lomb. Rd. 29 (1896) 363-.
- Modern calorimeters and their use. *Struthers, J.* Sch. Mines Q. N.Y. 16 (1895) 201-.
- Pyrometer. *Mensching, J., & Meyer, V.* Gött. Nr. (1887) 128-.
- , acoustic. *Cagniard-Latour, C., & Demon-ferrand, F.* C. R. 4 (1837) 28-.
- , —. *Mayer, A. M.* Am. J. Sc. 4 (1872) 427-.
- , —. *Chautard, J.* J. de Ps. 3 (1874) 78-; C. R. 78 (1874) 128-.
- , —. *Sanford, F.* Ps. Rv. 1 (1894) 140-.
- , calorimetric. *Byström, O.* Stockh. Öfv. 19 (1862) 159-.
- , —. *Salleron, J.* Les Mondes 37 (1875) 500-.
- , micrometric. *C., H. T.* QJ. Sc. 6 (1819) 230-.
- , platinum. *Hoadley, J. C.* Franklin I. J. 84 (1882) 91-.
- , —-water. *Hoadley, J. C.* Franklin I. J. 84 (1882) 169-, 252-.
- , steam. *Johnson, W. R.* Silliman J. 22 (1832) 96-.
- , water-circulation. *Amagat, E. H.* C. R. 97 (1883) 1053-.
- Pyrometric bricks of clay, effect of prolonged exposure to heat. *Guyton de Morveau, L. B.* A. C. 78 (1811) 73-.
- cylinders, Wedgwood's, manufacture. *Ga-zeran, —.* A. C. 36 (1800) 100-.
- Thermometer, acoustic. *Preston, S. T.* Ph. Mg. 32 (1891) 58-.
- , —. *Quincke, G.* A. Ps. C. 63 (1897) 66-.
- , —. *Anon.* Rv. Sc.-Ind. 31 (1899) 30-.
- , —. *Anon.* Rv. Sc.-Ind. 31 (1899) 68-.
- , aspiration. *Fuchs, P.* Z. Instk. 18 (1898) 337-.

- Thermometer, electro-capillary. *Debrun, E.* C. R. 89 (1879) 755.
- , float-. *Fuchs, K.* Exner Rpm. 27 (1891) 118-.
- Thermophone, for measurement of high temperatures. *Wiborgh, J.* [1896] Jern-Kont. A. 51 (1897) 102-; Berg-Hm. Ztg. 55 (1896) 247-.
- , Wiborgh's. *Jüptner, H. (Frhr.) von.* Oestr. Z. Brgw. 45 (1897) 99-.
- Thermoscope, differential viscosity. *Thomson, (Sir) W.* Edinb. R. S. P. 10 (1880) 537.
- , new. *Baur, C.* (xii) Berl. Ps. Gs. Vh. 1 (1882) 47-.
- , —. *Coleman, J. J.* Glasg. Ph. S. P. 15 (1884) 94-.
- , — principle. *Leroux, F. P.* L'I. 29 (1861) 6-.
- , thermomagnetic. *Thomson, (Sir) W.* Edinb. R. S. P. 10 (1880) 538-.
- Transition temperatures as fixed points in thermometry. *Meyerhoffer, W., & Saunders, A. P.* Z. Ps. C. 27 (1898) 367-.
- — — — — *Richards, T. W., & Churchill, J. B.* Z. Ps. C. 28 (1899) 313-.
- Viscosity of gases at high temperatures. *Barus, C. Am. J. Sc.* 35 (1888) 407-.
- Water vapour pressure, measurement by. *Shaw, W. N.* [1883] Camb. Ph. S. T. 14 (*1889) 30-.

1250 Special Thermometers (Maximum, Minimum, Self-recording, etc.).

(See also *Meteorology 0250*.)

- Furnace temperature, autographic record. *Roberts-Austen, —.* I. & S. I. J. (1892) (No. 2) 33-.
- Microthermometer. *Laroque, F.* C. R. 97 (1883) 1207-.
- Pyrometers. *Fourmy, —.* J. Mines 14 (1803) 423-; 28 (1810) 427-.
- , —. *Miller, A.* Edinb. N. Ph. J. 44 (1848) 126-.
- , —. *Decharme, C. J.* [1877] (xii) M.-et-L. S. Ac. Mm. 34 (1878) 112-.
- , differential, water circulation. *Knab, L.* Gén. Civ. 16 (1889-90) 327-.
- , hot blast, Krupp's. *Bergens, A. von.* I. & S. I. J. (1886) 207-.
- , registering. *Daniell, J. F.* Phil. Trans. (1830) 257-; (1831) 443-.
- , —. *Bristol, W. H.* [1900] Sc. Abs. 4 (1901) 294.
- , — heat developed in lightning discharge. *Raasche, G.* Riga Cor.-Bl. 38 (1895) 91.
- Pyrometry at high temperatures by water circulation. *Lauth, C., & Vogt, G.* [1886] Gén. Civ. 10 (1886-87) 78-.
- Pyroscopie of fire-station on St. Peter's tower in Munich. *Steinheil, C. [A.] von.* Münch. Ab. 3 (1837-43) 561-.
- Pyroscopes. *Ledieu, A. C. H.* C. R. 94 (1882) 1274-.

Thermograph, Hough's. *Grugan, F. C.* [U.S.]
Chief Sig. Off. A. Rp. (*1877) 510-.

THERMOMETERS.

alarm or signalling. *Morin, J.* C. R. 59 (1864) 1082.
— — —. *Palmieri, L.* (x) Nap. Rd. 12 (1873) 59-.
— — —. *Barillé, —.* C. R. 118 (1894) 246-.
— — —. *Cochius, F.* C. Ztg. 19 (1895) 1733.
— — —, to indicate presence of icebergs.
Michel, R. F. C. R. 78 (1874) 1066-.
baroscopic. *F.* Gén. Civ. 18 (1890-91) 308-.
black-bulb in vacuo. *Busoni, D.* (rx) Ven. Aten. At. 3 (1866) 529-.
— — —. *Wilson, J. M.* Ph. Mg. 31 (1866) 104-, 261-.
— — — (Wilson). *Tyndall, J.* Ph. Mg. 31 (1866) 191-.
— — —. *Vernon, G. V.* Manch. Lt. Ph. S. P. 11 (1872) 129-.
— — —. *Hicks, J. J.* [1874] Met. S. QJ. 2 (1875) 99-.
— — —. *McLeod, H.* B. A. Rp. (1889) 505-.
calorimetric, delicate. *Pickering, S. U.* L. Ps. S. P. 8 (1887) 8-; Ph. Mg. 21 (1886) 330-; L. Ps. S. P. 8 (1887) 229-; Ph. Mg. 23 (1887) 401-.
—, *Pickering's.* *Wegscheider, R.* Z. Instk. 6 (1886) 266-.
contact. *Fourier, J. B. J.* A. C. 37 (1828) 291-.
deep sea (Six's). *Aboville, —.* J. Mines 9 (1798-99) 75-.
— — —. *Dietrichson, J. L. W.* A. Ps. C. 148 (1873) 298-.
— — —. *Jones, J. R.* R. S. P. 24 (1876) 321-.
— — —. *Chabaud, V.* C. R. 114 (1892) 65-.
— — —. *Biéatrix, E.* Par. S. Phlm. Bll. 6 (1894) 59-.
— — —, tests. *Thoulet, J.* Rv. Mar. et Col. 122 (1894) 204-.
— — —, electrical. *Siemens, (Sir) C. W.* [1882] R. S. P. 34 (1883) 89-.
— — —, —, *Siemens's.* *Bartlett, J. R.* [1882] Am. As. P. 31 (1883) 221-.
differential (Leslie's). *De Butts, E.* [1814] Am. Ph. S. T. 1 (1818) 301-.
— — —. *Howard, W.* QJ. Sc. 8 (1820) 219-.
— — —. *Ritchie, W.* [1826] Phil. Trans. (1827) 129-.
— (Leslie's). *B., D.* Gleanings Sc. 2 (1830) 23-.
— — —. *Kemp, K. T.* Edinb. J. Nt. Gg. Sc. 1 (1830) 262-.
— — —. *Hall, M.* Ph. Mg. 8 (1836) 56-.
— — —. *Walferdin, H.* C. R. 14 (1842) 63-.
— — —. *Dupré, Anat.* As. Fr. C. R. 4 (1875) 420-.
— — —. *Dufour, H.* [1879-83] Laus. S. Vd. Bll. 16 (1880) 655-; J. de Ps. 2 (1883) 321-.
— air. *Brough, J. C.* Phm. J. 10 (1869) 214-.
— — —. *Pfaundler, L.* [1875] Wien Ak. Sb. 72 (1876) (Ab. 2) 729-.
— mercury. *Mendelejeff, D. I.* Berl. B. 8 (1875) 539-.
distance-. *Wheatstone, (Sir) C. B. A.* Rp. 37 (1867) (Sect.) 11-.

distance-. *Ferrini, R.* Mil. I. Lomb. Rd. 15 (1882) 44-.
— — —. *Luvini, G.* (xii) Rv. Sc.-Ind. 14 (1882) 177-.
— — —. *Becker, A.* Magdeb. Nt. Vr. Jbr. u. Ab. (1889) 32-.
— — —. *Moennich, P.* Z. Instk. 9 (1889) 122-.
— — —. *Puluj, J.* Wien Ak. Sb. 98 (1890) (Ab. 2a) 1502-.
—, for hot chamber. *Grosheintz, H.* [1886] Mulhouse S. In. Bll. 57 (1887) 97-.
—, of Morin and Barthélemy. *Meylan, E.* Lum. Élect. 32 (1889) 511-.
house-, in form of watch. *Steinhauser, A.* Carl Rpm. 12 (1876) 388-.
hypsometric. *Walferdin, H.* C. R. 17 (1843) 904-.
to indicate mean temperatures. *Jürgensen, J.* C. R. 3 (1836) 143-.
for lecture purposes. *Bickerton, A. W.* N. Z. I. T. 7 (1874) 152-.
marine. *Jamieson, R.* Tilloch Ph. Mg. 57 (1821) 294-.
maximum. *Magnus, G.* Pogg. A. 22 (1831) 136-.
— — —. *Walferdin, H.* Par. S. Gl. Bll. 7 (1835-36) 193-; C. R. 40 (1855) 951-.
— — —. *Grüel, C. A.* Dingler 155 (1860) 192-.
— — —. *Geissler, H.* A. Ps. C. 123 (1864) 657-.
— and minimum. *Keith, A.* [1795] Edinb. R. S. T. 4 (1798) 203-.
— — —. *Lemaistre, L. F.* J. Mines 7 (1798) 473-.
— — —. *Gay-Lussac, L. J.* A. C. 3 (1816) 90-.
— — —. *Landriani, M.* Brugnattelli G. 1 (1818) 413-.
— — —. *MacVicar, J. G.* C. S. J. 10 (1858) 221-; 11 (1859) 106.
— — —. *Symons, W.* C. S. J. 15 (1862) 299-.
— — —. *Govi, G.* [1864] Tor. Lav. Sc. Fis. Mt. (1869) 5-.
— — —. *Codazza, G.* Tor. At. Ac. Sc. 5 (1869-70) 711-.
— — —. *Denton, S. G.* [1874] Met. S. QJ. 2 (1875) 193-.
— — —. *Duclaux, É.* J. de Ps. 5 (1876) 13-.
— — —. *Kappeller, H.* Wien Met. Z. 18 (1883) 225-; Moncalieri Oss. Bll. 3 (*1883) 87-.
— — —, coloured liquids for filling. *Lüdersdorff, F.* Dingler 118 (1850) 360-.
— — —, gas-. *Gar, A.* (vi Add.) N. Cim. 18 (1863) 238-.
— — —, Hicks's. *Stewart, B.* R. S. P. 10 (1859-60) 312-.
— — —, metallic (Hermann and Pfister's). *Hirsch, A.* [1868] Neuch. Bll. 8 (1870) 221-.
— — —, —, portable. *Jürgensen, L. U.* As. Nr. 14 (1837) 173-.
— — —, registering. *Hall, M.* QJ. Sc. 4 (1818) 43-.
— — —, —. *Delta (Δ).* Edinb. J. Sc. 10 (1829) 159-.

1250 Thermometers Radiation Thermometry, Optical Pyrometry 1255

maximum and minimum, registering. *Lallemand, A.* C. R. 66 (1868) 812-.

— — —, *Macdougall, W.* Sc. Met. S. J. 3 (1873) 78-.

— — —, *Trouillet, (le capit.)* —. [1885] Doubs S. Mm. 10 (1886) 54-.

— — —, application of capillary phenomena. *Barbier, É.* (VI *Adds.*) Par. A. Obs. 7 (1863) 368-.

— — —, *Bertoni's. Serpieri, A.* Rm. Cor. Sc. 3 (1855) 14-.

— — —, *Marchi's. Marangoni, C.* N. Cim. 27 (*1868) 318-.

— — —, relative merits of types. *Draper, D.* U. S. Weath. Bur. Bil 11 (1894) 710-.

—, new. *Monaco, E.* Moncalieri Oss. Bil. 13 (1893) 12.

—, registering. *King, J.* Edinb. J. Sc. 9 (1828) 113-.

—, — (King's). *Delta (Δ).* Edinb. J. Sc. 9 (1828) 300-.

—, —. *Phillips, J.* B. A. Rp. (1832) 574-; (1856) (pt. 2) 41.

—, —, compensation. *Scott, W. L.* C. N. 1 (1860) 98-.

mercurial, electrically read at a distance. *Brown, H. T.* Nt. 23 (1881) 464-.

metastatic maximum, new. *Walferdin, H.* C. R. 46 (1858) 737-.

— mercurial, as maximum thermometer. *Walferdin, H.* C. R. 38 (1854) 770-.

minimum. *Walferdin, H.* Par. S. Gl. Bil. 7 (1835-36) 354-.

—, alcohol. *Pastorelli, F.* Br. Met. S. P. 4 (1869) 264-.

—, Rutherford's, modifications. *Walferdin, H.* C. R. 40 (1855) 899-.

—, —, new form. *Whipple, G. M.* B. A. Rp. 43 (1873) (Sect.) 50.

mining. *Birkner, —.* Jb. Berg.-Hw. (1898) 108-.

for physiological purposes. *Marey, É. J.* C. R. 92 (1881) 1441-.

platinum, for freezing points of dilute solutions. *Griffiths, E. H.* Nt. 62 (1900) 563.

recording. *Harrison, M.* B. A. Rp. (1848) (pt. 2) 14-.

—, *Moberg, A.* [1859] (VIII) Helsingf. Öfv. 5 (1863) 58-.

—, *Lewis, J.* Am. As. P. (1860) 21-.

—, *Hamilton, G.* As. S. M. Not. 25 (1865) 29-.

—, *Zech, P.* Würtb. Jh. 25 (1869) 101-.

—, *Bouziat, —.* (XII) Fr. S. Ag. Mm. (1876) (2) 455-.

—, *Mallock, A.* B. A. Rp. (1882) 477-.

—, *Artimini, F.* Rv. Sc.-Ind. 18 (1886) 201-.

—, *Russell, H. C.* N. S. W. R. S. J. 22 (1889) 335-.

—, horary. *Veladini, G.* Mil. G. I. Lomb. 3 (1842) 19-; 2 (1850) 55-.

—, metallic. *Maurer, J.* (XII) Z. Instk. 3 (1883) 308-.

—, —, maximum and minimum. *Burg, V.* [1883] Par. S. Bl. Mm. 35 (*1884) (C.R.) 446-.

registering air- construction. *Sprung, A.* U. S. Weath. Bur. Bil. 11 (1894) 718-.

—, for hot springs. *Guzzanti, C.* Rass. Sc. Gl. It. 2 (1892) 308-.

Sikes', improvement. Adie, Rich. Edinb. N. Ph. J. 54 (1853) 84-.

unaffected by radiation. *Joule, J. P.* [1867] Manch. Lt. Ph. S. P. 7 (1868) 35-.

with variable mercury filling. *Grützmacher, F.* Z. Instk. 16 (1896) 171-, 200-.

Thermometric instrument. *Bellani, A.* (VI *Adds.*) Majocchi A. Fis. C. 14 (1844) 62-.

— sunshine recorder, U. S. Weather Bureau. *Marvin, C. F.* U. S. Weath. Bur. Rp. (1893) 17-.

Thermoscope. *Rumford, B.* (Count) Par. Mm. de l'I. 6 (1806) 71-.

1255 Radiation Thermometry, Optical Pyrometry, etc.

"Absolute black" bodies, electrically heated. *Lummer, O., & Kuribaum, F.* Berl. Ps. Gs. Vh. (1898) 106-.

Colour, relation to temperature. *Decharme, C.* (XII) M.-et-L. S. Ac. Mm. 32 (1875) 102-.

—, — —. *Howe, H. M.* Rv. Un. Mines 49 (1900) 200-.

—, — — (heated steel). *White, M., & Taylor, F. W.* [1899] Sc. Abs. 3 (1900) 243.

— thermometer. *Rebenstorff, H. A.* Dresden Isis Sb. (1896) 31-.

Compensation pyrheliometer, radiation measurement by. *Ångström, K.* A. Ps. C. 67 (1899) 633-.

OPTICAL PYROMETRY.

Crova, A. [1880] Mntp. Ac. Mm. 10 (1884) 157-.

Nichols, E. L. Am. J. Sc. 19 (1880) 42-.

Crova, A. C. R. 92 (1881) 707-.

Le Chatelier, H. C. R. 114 (1892) 214-; Par. S. Ps. Sé. (1892) 132-.

(Le Chatelier.) *Becquerel, H.* C. R. 114 (1892) 255-.

(Becquerel.) *Le Chatelier, H.* C. R. 114 (1892) 340-.

(Le Chatelier.) *Becquerel, H.* C. R. 114 (1892) 390-.

Violle, J. C. R. 114 (1892) 734-.

Crova, A. C. R. 114 (1892) 941-.

Berthelot, D. Par. S. Ps. Sé. (1895) 135-; C. R. 120 (1895) 831-; 126 (1898) 410-.

Pyrometer. *St., H.* Oestr. Z. Brgw. 37 (1889) 326.

— (Mesuré and Nouel's). *Ernst, C.* Oestr. Z. Brgw. 38 (1890) 533-.

— (— — —). *Struthers, J.* Sch. Mines Q. N. Y. 12 (1891) 292-.

—, *Thwaitte, B. H.* I. & S. I. J. (1892) (No. 1) 183-.

Pyrometers. *Salomon, —.* Z. Angew. C. (1891) 440.

Red heat and "grey" heat. *Lummer, O.* Berl. Ps. Gs. Vh. (1897) 121-.

Refrangibility of emitted light, measurement by. *Dewar, J.* B. A. Rp. 43 (1873) 461-.

Refrangibility of emitted light, measurement by. *Crova, A.* C. R. 87 (1878) 979-; *J. de Ps.* 8 (1879) 196-; C. R. 90 (1880) 252-.

Rotatory polarisation, measurement by (Mesuré and Nouel's method). *Evrard, A. Gén. Civ.* 13 (1888) 43-.

1260 Comparison of Thermometers. Thermometric Scales. Reduction to Thermodynamic Scale. (See also Thermodynamics, 2400, etc.)

Absolute temperature. *Schreber, K. N.-Vorp.* Mt. 29 (1898) 45-.

—, dimensions. *Burton, C. V.* Ph. Mg. 24 (1887) 96-.

—, —. *Abraham, H.* Lum. Elect. 51 (1894) 66-.

— and low temperature. *Gleue, —.* [1899] Lüneb. Nt. Vr. Jh. 15 (1901) xvii-.

— zero of heat. *Dalton, J.* Nicholson J. 5 (1803) 34-.

— — —. *Benzenberg, J. F.* Gilbert A. 61 (1819) 363-.

— — —. *Clément, —, & Désormes, —.* J. de Ps. 89 (1819) 428-.

— — —. *Veinberg [Weinberg], Y. I.* [1868] (xii) Mosc. S. Sc. Bll. 8 (No. 3) (1870) 7-.

— — —. *Koppe, C. A.* Ps. C. 151 (1874) 642-.

— — —. *Klein, J. F.* V. Nost. Eng. Mg. 22 (1880) 279-.

— — — perfect gas-thermometer. *Rankine, W. J. M.* Edinb. R. S. T. 20 (1853) 561-.

Calibration. *Walferdin, H. C. R.* 17 (1843) 1195.

— *Krüger, A.* [1872] Helsingf. Öfv. 15 (1873) 52-.

— (Krüger). *Argelander, F. W. A.* [1873] Helsingf. Öfv. 16 (1874) 43-.

— *Lermantov, V. V.* (xii) Rs. C. Ps. S. J. 10 (Ps.) (1878) [Pt. 1] 244-.

— *Thiesen, M.* Carl Rpm. 15 (1879) 285- 677-.

— *Broch, O. J.* Par. Poids et Mes. Tr. Mm. 5 (1886) 82 pp.

— *Offret, A.* Fr. S. Mn. Bll. 13 (1890) 405-.

— *Pernet, J., Jaeger, W., & Gumlich, E.* Berl. Ps. Reichsanst. Ab. 1 (1894) 39-.

— *Hulett, G. A.* Z. Ps. C. 33 (1900) 237-.

— and its errors. *Pernet, J., Jaeger, W., & Gumlich, E.* Berl. Ps. Reichsanst. Ab. 1 (1894) 17-.

—, method, Bessel's. *Rücker, A. W., & Thorpe, T. E.* B. A. Rp. (1881) 540-.

—, —, Hansen's. *Brown, C. G.* V. Nost. Eng. Mg. 29 (1883) 1-.

—, —, Kew. *Griffiths, E. H.* Nt. 52 (1895) 536.

—, —, of least squares applied to. *Marek, W. J.* Carl Rpm. 15 (1879) 300-.

Calibration, method of least squares applied to. *Wright, T. W.* Des Moines Anal. 10 (1883) 33-.

—, —, Neumann's. *Russell, T.* Am. J. Sc. 21 (1881) 373-.

—, —, simple. *Holman, S. W.* Am. Ac. P. 17 (1882) 157-.

—, methods, report. *Rücker, A. W.* B. A. Rp. (1882) 145-.

— and standardising. *Pickering, S. U.* Ph. Mg. 21 (1886) 180-.

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Watson, W. L. Ps. S. P. 15 (1897) 122-; Ph. Mg. 44 (1897) 116-.

air, and liquid. *Pierre, J. I.* C. R. 27 (1848) 213-; Caen Ac. Mm. (1852) 1-.

alcohol and air. *White, A. C.* Am. Ac. P. 21 (1886) 45-.

— — mercury. *Flaugergues, H.* Zach Cor. 9 (1823) 435-.

Joule's and French standards. *Schuster, A.* Manch. Lt. Ph. S. Mm. & P. 9 (1895) 87-.

mercury. *Dorn, —.* D. Nf. Tbl. (*1874) 174.

— *Thiesen, M., Scheel, K., & Sell, L.* Berl. Ps. Reichsanst. Ab. 2 (1895) 1-.

— and air. *Regnault, V. A. C.* 5 (1842) 83-; 6 (1842) 370-.

— — — (from 0° to 100° C.). *Waterston, J. J.* [1852] R. S. P. 6 (1850-54) 225-.

— — — (below 100° C.). *Waterston, J. J.* Ph. Mg. 15 (1858) 212-.

— — —. *Bosscha, J.* C. R. 69 (1869) 875-; Arch. Néerl. 4 (1869) 197-; Amst. Vs. Ak. 4 (1870) (Ntk.) 69-; Arch. Néerl. 4 (1869) 461-.

— — —. *Rowland, H. A.* [1879] Am. Ac. P. 15 (1880) 75-.

— — —. *Grunmach, L.* D. Nf. Tbl. (*1881) [45]-.

— — — (greatest differences). *Russell, T.* Smiths. Misc. Col. 33 (1888) Art. 4, 25- (Wash. Ph. S. Bll. 9 (1887).)

— — — (between 100° and 300°). *Wiebe, H. F., & Bütcher, A.* Z. Instk. 10 (1890) 16-, 233-.

— (glass 59^{III}) — —. *Mahlke, A.* A. Ps. C. 53 (1894) 965-.

— (—, 122^{III} and resistance) — —. *Grützmacher, F.* Z. Instk. 15 (1895) 250-.

— (—) — —. *Lemke, H.* Z. Instk. 19 (1899) 33-.

—, of different glass. *Pierre, J. I.* A. C. 5 (1842) 427-.

— — — (between 0° and 100°). *Wiebe, H. F.* Z. Instk. 10 (1890) 435-.

—, enclosed scale and divided stem. *Gumlich, E., & Scheel, K.* Z. Instk. 17 (1897) 353-.

— and gas. *Chappuis, P.* Par. Poids et Mes. Tr. Mm. 6 (1888) 125 + clxxxvii pp.; Par. Poids et Mes. Pv. (1888) 26-.

—, high range (glass 59^{III}). *Mahlke, A.* Z. Instk. 15 (1895) 171-.

— and hydrogen. *Crafts, J. M.* C. R. 95 (1882) 836-.

— — —. *Scheel, K. A.* Ps. C. 58 (1896) 168-.

- mercury and platinum (at low temperatures).
Griffiths, E. H. B. A. Rp. (1890) 130-.
- — — *Ewan, T., & Gee, W. W. H.* Manch. Lt. Ph. S. Mm. & P. 4 (1891) 357-.
- — — *Waidner, C. W., & Mallory, F. J.* H. Un. Cir. [16 (1898-97)] 42-; Ph. Mg. 48 (1899) 1-.
- platinum and air (at low temperatures).
Dickson, J. D. H. Ph. Mg. 45 (1898) 525-.
- — gas. *Harker, J. A., & Chappuis, P.* [1899] Phil. Trans. (A) 194 (1900) 37-.
- of different purity. *Tory, H. M.* L. Ps. S. P. 17 (1901) 341-; Ph. Mg. 50 (1900) 421-.
- Rossetti's and mercury. *Rossetti, F.* As. Fr. C. R. (1879) 404-.
- Rowland's and Paris standard. *Day, W. S.* Ph. Mg. 46 (1898) 1-.
- below common temperature and for cold stations. *Marvin, C. F.* [U. S.] Chief Sig. Off. A. Rp. (1890) 650-.
- temperatures above 50°. *Pomplun, W. Z.* Instk. 11 (1891) 1-.
- between 250° and 600°. *Mahlke, A. Z.* Instk. 14 (1894) 73-.
-
- Dynamical equivalent of temperature in water.
Rankine, W. J. M. [1850-57] Edinb. R. S. T. 20 (1853) 191-; Edinb. R. S. P. 3 (1857) 5-, 287-.
- Errors of thermometers. *Campbell, W. D. C.* Cn. J. 1 (1856) 138-.
- — — *Russell, H. C.* [1876] N. S. W. R. S. J. 10 (1877) 35-.
- — — *Waldo, F.* Science 21 (1893) 99-.
- — — cause. *Provenzani, F. S.* Rm. At. N. Linc. 26 (1873) 26-.
- — — of low range. *Pastorelli, F.* Met. S. QJ. 2 (1875) 407-.
- Graduation. *Dalton, J.* Nicholson J. 5 (1803) 34-.
- [Shortrede non] *Shortreed, R.* Gleanings Sc. 1 (1831) 87-.
- *Person, C. C.* C. R. 17 (1843) 657-.
- *Ackland, W.* [1867] Br. Met. S. P. 4 (1869) 23-.
- *Osborne, J. W.* Am. As. P. (1876) 75-.
- for Arctic expedition. *Welsh, J.* [1852] R. S. P. 6 (1850-54) 183-.
- of clinical thermometer. *Henry, C.* As. Fr. C. R. (1889) (Pt. 1) 254-.
- Kelvin's absolute method. *Rose-Innes, J.* [1897] L. Ps. S. P. 16 (1899) 26-; Ph. Mg. 45 (1898) 227-.
- Kew corrections, charts. *Shaw, W. N. B. A.* Rp. (1888) 590.
- Scale of temperature. *Walker, Rich.* Tilloch Ph. Mg. 33 (1809) 166-; 35 (1810) 416-.
- — — *Dulong, P. L., & Petit, A. T.* A. C. 7 (1817) 113-, 225-, 337-.
- — — *H., —.* Gleanings Sc. 1 (1829) 271-.
- — — *B., D.* Gleanings Sc. 2 (1830) 23-.
- — — *Volpicelli, P.* Rm. At. I (1847-48) 91-.
- — — *Walferdin, H.* C. R. 41 (1855) 122-.
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- — —, absolute and gas. *Houllievig, L.* J. de Ps. 4 (1895) 110-.
- — —, arguments against new. *Anon. C.* Ztg. 15 (1891) 1157-.
- — —, centigrade. *Mendelejeff, D. I.* Berl. B. 7 (1874) 126-.
- — —, thermometric (Accademia del Cimento). *Libri, G.* A. C. 45 (1830) 354-.
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- — —, in Denmark and Norway. *Ørsted, H. C.* Sk. Nf. F. 2 (1840) 65-.
- — —, and Fahrenheit. *Abbadie, A. T. d'.* C. R. 30 (1850) 570-.
- — —, — — —, reduction. *Tiberi, E.* Rv. Sc.-Ind. 30 (1898) 216-.
- — —, Central Physical Observatory. *Glasek, S.* [1892] St. Pet. Ac. Sc. Mm. (Rs.) 71 (1893) (App. No. 7) 32 pp.
- — —, Fahrenheit. *Gamgee, A.* Camb. Ph. S. P. 7 (1892) 95-.
- — —, divisions. *S. (vi Add.) Thomson* A. Ph. 8 (1816) 26-.
- — —, zero. *Cayley, G.* Ph. Mg. 5 (1829) 88-.
- — —, new. *Forbes, G., & Preece, W. H.* B. A. Rp. (1889) 514-.
- — —, reduction to scale of heat. *Flaugergues, H. J.* de Ps. 82 (1816) 386-; 83 (1816) 209-.
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- — —, unification. *Guillaume, C. É.* Arch. Sc. Ps. Nt. 18 (1887) 341-.
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- Standard thermometers, comparison. *Benoit, J. R.* [1889] Par. Poids et Mes. Tr. Mm. 7 (1890) 132 pp.
- — —, *Marek, W.* Z. Instk. 10 (1890) 283-.
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- — —, construction. *Sheepshanks, R.* As. S. M. Not. 11 (1850-51) 233-.
- — —, at Kew. *Griffiths, E. H.* [1895] Nt. 53 (1895-96) 39-.
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- — — (clinical). *Schuster, A.* Manch. Lt. Ph. S. Mm. & P. 8 (1894) 100-.
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- Thermodynamic correction for air thermometer. *Rose-Innes, J.* Nt. 58 (1898) 77-.
- — — — —. *Orr, W. McF.* [1898] Nt. 59 (1898-99) 126.
- Thermometers used in determination of standard kilogram. *Marek, W. J.* Par. Poids et Mes. Tr. Mm. 1 (*1881) D. 4-; 2 (*1883) D. 5-; 3 (1884) D. 5-.
- , verification. *Péteaux, J.* [1896] Lyon S. Ag. A. 4 (1897) lx-.
- , — at freezing point of mercury. *Whipple, G. W.* L. Ps. S. P. 7 (1886) 283-; Ph. Mg. 21 (1886) 27-.
- Thermometric corrections. *Grützmacher, F.* A. Ps. C. 68 (1899) 769-.
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- — — — —. *Holman, S. W., Lawrence, R. R., & Barr, L.* Am. Ac. P. 31 (1896) 218-.
- — — — —. *Griffiths, E. H.* Camb. Ph. S. P. 9 (1898) 224-.
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- Thermometry, boiling points for. *Holman, S. W., & Gleason, W. H.* Am. Ac. P. 23 (1888) 237-.
- , Mills's researches. *Rücker, A. W., & Thorpe, T. E.* Ph. Mg. 12 (1881) 1-, 184-.
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- — — — —. *Volpicelli, P.* Rm. At. 4 (1850-51) 216-; 12 (1858-59) 349-; 13 (1860) 187-, 204-, 357-.
- — — — —. *Barré de Saint-Venant,* —. L'I. 23 (1855) 440-.
- — — — —. *Laurent, J. A.* Gén. Civ. 4 (1875) 150-.
- — — — —. *Cassani, P.* Ven. I. At. (1892-93) 1655-.
- — — — —, dynamical study. *Schwartz, T.* (xii) Ausl. 54 (1881) 1021-.
- — — — —, law. *Tessan, — de.* C. R. 50 (1860) 20-.
- — — — —, universal, relating to. *Lévy, M.* C. R. 87 (1878) 449-, 676-.
- — — — —, — — — — — (Lévy). *Boltzmann, L.* C.R. 87 (1878) 593.
- — — — —, — — — — — (Boltzmann). *Lévy, M.* C. R. 87 (1878) 649.
- — — — —, — — — — — (Lévy). *Massieu, F.* C. R. 87 (1878) 731-.
- — — — —, — — — — — (—). *Boltzmann, L.* C. R. 87 (1878) 773.
- — — — —, especially liquids. *Weilenmann, A.* Zür. Vjschr. 33 (1888) 37-.
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- — — — —. *Thiesen, M., Scheel, K., & Sell, L.* Berl. Ps. Reichsanst. Ab. 2 (1895) 73-.
- — — — —. *Thiesen, M., Scheel, K., & Diesselhorst, H.* Berl. Ps. Reichsanst. Ab. 3 (1900) 1-.
- — — — — and gases, law at high temperatures. *Dulong, P. L., & Petit, A. T.* [1815] A. C. 2 (1816) 240-.
- — — — —, — — — — — (Dulong and Petit). *Biot, J. B.* Par. S. Phlm. Bl. (1815) 107-.
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- Heat of compression of solids. *Spring, W.* Par. S. C. Bil. 41 (1884) 488-.
- — — and liquids. *Burton, C. I., & Marshall, W.* R. S. P. 50 (1892) 130-.
- , doctrine, particularly states of dense and elastic fluidity in bodies. *Astley, J.* Nicholson J. 5 (1802) 23-.
- and force, action on matter. *Dyer, J. C.* Manch. Ph. S. P. 3 (1862-63) 77-.
- Liquid and gaseous states. *Andrews, T.* [1886] Phil. Trans. (A) 178 (1888) 45-.
- Liquids and gases, theory. *Bakker, G.* Z. Ps. C. 12 (1893) 670-; 14 (1894) 446-; 17 (1895) 678-.
- solids at high temperatures. *Aitken, J.* (of Darroch). [1880] Nt. 23 (1881) 34-.
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- , — mechanical properties of metals. *Le Chatelier, A.* Gén. Civ. 19 (1891) 59-, 73-, 107-.
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- Fizeau, H. L.* C. R. 66 (1868) 1005-, 1072-.
- Hirsch, A.* Neuch. Bil. 8 (1870) 456-.
- Buff, H.* A. Ps. C. 145 (1872) 626-.
- Handl, A.* Wien Ak. Sb. 70 (1874) (Ab. 2) 505-.
- Kurz, A.* A. Ps. C. Ergänz. 6 (1874) 314-.
- Glatzel, P.* A. Ps. C. 160 (1877) 497-.
- Russner, J.* Carl Rpm. 18 (1882) 655-.
- Pionchon, —.* [1889] C. R. 108 (1889) 992-; Bordeaux S. Sc. Mm. 5 (1890) xxii-.
- Coefficient of dilatation, theory. *Sayno, A.* Mil. I. Lomb. Rd. 23 (1890) 787-, 851-.
- Compensation of chronometers. *Cellerier, G.* Gen. S. Ps. Mm. 29 (1884-87) No. 6, 45 pp.
- pendulum. *Weber, R.* Neuch. S. Sc. Bil. 15 (1886) 169-.
- in signalling apparatus. *Hermand, —.* [1883] Gén. Civ. 4 (*1883-84) 124-.
- Deformation, elastic, of sphere, due to heat. *Almanst, E.* Tor. Ac. Sc. At. 32 (1896) 701- or 963-.
- of thin circular disc for temperature as continuous function of distance from centre. *Niemöller, F.* Z. Mth. Ps. 24 (1879) 270-.
- Elastic solid, stresses due to unequal temperature. *Hopkinson, J. B.* A. Rp. 42 (1872) (Sect.) 51-.
- Expansion by cold. *Rankine, W. J. M.* Ph. Mg. 8 (1854) 357-.
- at high temperatures. *Le Chatelier, H. C.* R. 107 (1888) 862-.
- low temperatures. *Mayer, A. M.* [1886] Am. J. Sc. 40 (1890) 323-.
- — — *Zakrzewski, J.* Krk. Ak. (Mt.-Prz.) Rz. 20 (1890) 227-; Crc. Ac. Sc. Bil. (1889) No. 10, xix-.
- surface of separation of 2 solids. *Heen, P. de.* Liège S. Sc. Mm. 18 (1895) No. 2, 6 pp.
- Expansive force of substances. *Lagerhjelm, P.* Stockh. Ak. Hndl. 48 (1827) 164-.
- Glass for apparatus, to stand heating. *Winkelmann, A., & Schott, O.* Z. Instk. 14 (1894) 6-.
- Heat resulting from sudden cooling of solid body. *Mousson, A.* Bb. Un. 12 (1837) 418-.
- Influence of pressure. *Puschl, K.* [1875] Wien Ak. Sb. 72 (1876) (Ab. 2) 245-.
- residual viscosity. *Day, H. D.* Am. J. Sc. 2 (1896) 342-.
- Interference dilatometer, compensated. *Tutton, A. E.* Phil. Trans. (A) 191 (1898) 313-.
- Invariable pendulum, construction. *Koch, K. R.* D. Nf. Vh. (1899) (Th. 2, Hälfte 1) 39-.
- Isotropic body, free expansion. *Zehfuss, G.* Schölmilch Z. 8 (1863) 127-.
- Lengths of bars at temperature of melting ice. *Flint, A. R., Voigt, W., Wheeler, E. S., & Woodward, R. S.* Am. J. Sc. 25 (1883) 448-.
- Marine chronometers and watches, influence of temperature. *Birkenmajer, L.* Krk. Ak. (Mt.-Prz.) Rz. 10 (1896) 357-; Crc. Ac. Sc. Bil. (1896) 78-.

1410 Expansion of Solids by Heat.

(For Compressibility of Solids, see Mechanics, Elasticity 3200, etc.)

- Gilbert, L. W.* Gilbert A. 58 (1818) 281-.
- Galen, P. van.* Utr. A. Ac. (1826-27) 78 pp.
- Lechevalier, V.* Metz Mm. Ac. 10 (1828-29) 166-.
- Roberts, R. B.* A. Rp. (1850) (pt. 2) 16-.
- Pierre, J. I.* A. C. 33 (1851) 199-.
- Kopp, H.* Lieb. A. 81 (1852) 1-.
- Fick, A.* Pogg. A. 91 (1854) 287-.
- Kopp, H.* Lieb. A. 93 (1855) 129-; A. C. 47 (1856) 291-.
- Cuénoud, S.* [1860] Laus. Bil. S. Vd. 7 (1864) 160-.
- Dupré, A.* C. R. 59 (1864) 490-, 768-.
- Fizeau, H. L.* C. R. 62 (1866) 1101-, 1133-.
- Mousson, A.* Zür. Vjschr. 11 (1866) 175-.

MEASUREMENT.

- Tralles, J. G.* Berl. Mm. Ac. (1804) 12-.
- Mather, W. W.* Silliman J. 30 (1836) 324-.
- Steinheil, C. A. von.* Münch. Bil. Ak. (1843) 225-.
- Grunert, J. A.* Grunert Arch. 6 (1845) 443-.
- Krist, J.* Carl Rpm. 2 (1867) 65-.
- Müller, Joh.* A. Ps. C. 135 (1868) 672-.
- Schellen, H.* Carl Rpm. 5 (1869) 326-.
- Müller, Joh.* Freiburg B. 5 (1870) (Heft 1) 81-.
- Wild, H.* Arch. Sc. Ps. Nt. 41 (1871) 373-.
- Reusch, F. E. von.* Carl Rpm. 13 (1877) 1-.
- Thoulet, J.* C. R. 98 (1884) 620-.
- Artimini, F.* Rv. Sc.-Ind. 18 (1886) 113-.
- Benoit, R. J. de Ps.* 8 (1889) 253-, 451-.
- Morley, F. W.* Am. As. P. (1891) 137-.
- Le Chatelier, —, & Coupeau, —.* Par. S. Ps. Sé. (1898) 3*.
- Vandevyver, L. N.* Brux. Ac. Bil. 35 (1898) 551-.
- Darwin, H.* Nt. 60 (1899) 149.
- by comparator. *Steinheil, C. A. von.* Münch. Sb. (1870) (I) 1-.
- , *Lenoir's.* *Prony, R. de.* Bb. Brit. 19 (1802) 301-.
- , screw. *Pernet, J.* Arch. Néerl. 5 (1900) 395-.
- dilatometer. *Abbe-Fizeau.* *Pulfrich, C. Z.* Instk. 13 (1893) 865-, 401-, 437-.
- influence of change of temperature due to the expansion. *Miller, A.* [1883] Münch. Ak. Sb. 13 (1884) 17-; A. Ps. C. 20 (1883) 94-.
- by interference. *Bierliet, A. van.* Brux. S. Sc. A. 12 (1888) (Pt. 2) 215-.
- Newton's rings (thermomicrometer). *Jerichau, E. B.* Sk. Nf. F. 2 (1840) 234-; A. C. 4 (1842) 363-.
- pendulum. *Weber, R. C. R.* 103 (1886) 553-; *Neuch. S. Sc. Bil.* 15 (1886) 177-.
- , *Guillaume, C. É.* C. R. 103 (1886) 689-; Arch. Sc. Ps. Nt. 16 (1886) 393-.
- , *Sečnikov, P. I.* Kazan S. Nt. (Ps.-Mth.) P. 7 (1889) 3.
- , horizontal, to observe minute changes in dimensions. *Rood, O. N.* Am. J. Sc. 9 (1875) 444-.
- photography. *Le Chatelier, —.* [1888] S. C. In. J. 8 (1889) 638.
- in relation to standards. *Bosscha, —.* A. Cons. Arts et Mét. 10 (*1873) 76-.
- , —, *Benoit, J. R.* Par. Poids et Mes. Tr. Mm. 2 (*1883) C. 1-, C. 1-; 3 (1884) C. 1-, C. 1-.
- , —, *Sadebeck, M.* Lpldina. 19 (1883) 141-.
- , —, *Rogers, W. A.* Am. S. Mer. P. (1887) 5-.
- terms of wave lengths. *Rogers, W. A.* Am. Mer. S. T. 17 (1895) 305-.

Molecular changes produced by changes of temperature in solids. *Duhamel, J. M. C.* Par. Mm. Sav. Étr. 5 (1838) 440-.

- Monument (Bunker Hill), effect of heat on perpendicularity. *Horsford, E. N.* Am. As. P. (1851) 81-.
- Phenomena accompanying change of volume in solids. *Edlund, E.* Stockh. Öfv. 18 (1861) 119-; *Pogg. A.* 114 (1861) 1-.
- Relation between thermal and elastic phenomena. *Kupffer, A. T.* St. Pé. Ac. Sc. Bil. 14 (1856) 273-, 289-.
- — — —, *Mai, E.* Mil. I. Lomb. Rd. 24 (1891) 1050-.
- — — expansion and melting point. *Freuchen, P., & Poulsen, V.* N. Ts. Fs. K. 1 (1896) 45-; *C. Ztg.* 20 (1896) (Rpm.) 125-.
- — —, melting point and elasticity. *Sayno, A.* Mil. I. Lomb. Rd. 24 (1891) 574-.
- — —, temperature, and torsion modulus. *Sayno, A.* Mil. I. Lomb. Rd. 24 (1891) 293-.
- Rocker, Trevelyan,* mechanical analysis. *Frisbee, S. H.* Nt. 17 (1878) 242-.

SPECIFIED SOLIDS.

- Alloys. *Wiedemann, E. E. G.* [1877] A. Ps. C. 3 (1878) 237-.
- , *Le Chatelier, H. C. R.* 128 (1899) 1444-.
- , measurement of expansion. *Hockin, C., & Matthiessen, A.* Lb. 1 (1867) 89-, 149-.
- Aluminium bronze. *Fontana, A.* Rm. R. Ac. Linc. Rd. 3 (1894) (Sem. 2) 129-.
- Alums, measurement of expansion by dilatometer. *Spring, W.* Brux. Ac. Bil. 6 (1883) 685-; Berl. B. 17 (1884) 408-.
- Baily's metal, Jessup's steel and Chance's glass. *Rogers, W. A.* Am. As. P. (1887) 80-.
- Bismuth amalgams, contraction. *Vicentini, G., & Cattaneo, C.* Rm. R. Ac. Linc. Rd. 7 (1891) (Sem. 2) 95-.
- Brick-tower, daily motion caused by solar heat. *Rockwood, C. G.* Am. As. P. 20 (1871) 171-.
- Brickwork. *Hawkes, W.* Br. Archt. I. Pp. (1861) 121-.
- Building materials. *Lang, C.* [1873] (x) Carl Rpm. 10 (1874) 63-.
- Ceramic pastes and glazes. *Le Chatelier, H. S. C. In. J.* 14 (1895) 751.
- Cobalt at high temperatures. *Quadrio-Curzio, A.* Catania Ac. Gioen. Bil. 49 (1897) 16-.
- Crystalline alkali sulphates. *Tutton, A. E.* Phil. Trans. (A) 192 (1899) 455-.
- Crystals. *Mitscherlich, E.* Berl. Ab. (1825) 201-; Berl. B. (1837) 69-.
- , *Hahn, H. C.* (xii) Arch. Phm. 148 (1859) 19-.
- , *Moutier, J.* Par. S. Phlm. Bil. 2 (1878) 78-.
- , *Blasius, E.* A. Ps. C. 22 (1884) 523-.
- , form in relation to expansion. *Mitscherlich, E.* *Pogg. A.* 1 (1824) 125-.
- , glauconite. *Brewster, (Sir) D.* Ph. Mg. 1 (1832) 417-.
- and other solids, measurement of expansion. *Voigt, W.* A. Ps. C. 43 (1891) 831-.

- Crystals, trimetric, coefficients, axial density and crystalline parameters. *Schrauf, A.* A. Ps. C. 28 (1886) 438-.
- Diabase, contraction. *Barus, C.* Am. J. Sc. 42 (1891) 498-.
- Diamond. *Joly, J.* Nt. 49 (1893-94) 480-, 530-.
- and cuprous oxide. *Fizeau, H. L. C. R.* 60 (1865) 1161-.
- Ebonite. *Kohlrausch, F.* A. Ps. C. 149 (1873) 577-.
- Glass. *Bellani, A.* Brescia Cm. (1823) 57-; *Brugnatelli G. 6* (1823) 20-, 217-, 274-.
- *Crichton, J.* Thomson A. Ph. 7 (1824) 241-.
- *Regnault, V.* A. C. 4 (1842) 64-.
- *Crafts, J. M. C. R.* 91 (1880) 413-.
- *Thiesen, M., & Scheel, K.* Z. Instk. 12 (1892) 293-; 13 (1893) 76.
- *Baudin, L. C. C. R.* 116 (1893) 971-.
- *Winkelmann, A., & Schott, O.* [1893] A. Ps. C. 51 (1894) 730-.
- *Granger, A.* Mon. Sc. 12 (1898) 681-.
- , expansion in relation to chemical composition. *Grenet, L. C. N.* 76 (1897) 101-.
- Gypsum. *Beckenkamp, J.* A. Ps. C. Beibl. (1882) 650-.
- Ice. *Struve, F. G. W. von.* St. Pét. Ac. Sc. Mm. 6 (1850) (pte. 1) 297-.
- *Larsson, H., & Pettersson, O.* Stockh. Öfv. 36 (1880) No. 3, 65-.
- *Andrews, T. R. S. P.* 40 (1886) 544-.
- *Nichols, E. L. Ps. Rv.* 8 (1899) 184-.
- , action on pile bridge, Rice Lake (Canada). *Clarke, T. C. Cn. J.* 3 (1854-55) 249-.
- , expansion and contraction. *Dumble, J. H. Cn. J.* 3 (1858) 414-; 5 (1860) 418-.
- India-rubber. *Goulier, C. M.* Les Mondes 20 (1869) 11-.
- *Puschl, K.* Wien Ak. Sb. 71 (1875) (Ab. 2) 95-.
- *Lebedev, I.* (xn) Rs. Ps.-C. S. J. 13 (Ps.) (1881) [(Pt. 1)] 246-.
- *Lundal, A. E.* A. Ps. C. 66 (1898) 741-.
- *Cantone, M., & Contino, G.* Mil. I. Lomb. Rd. 33 (1900) 215-.
- , analogy with gelatin. *Ejerkén, P. von.* A. Ps. C. 43 (1891) 817-.
- , contraction. *Gezekhus [Hesehus], N. A.* (xn) Rs. Ps.-C. S. J. 15 (Ps., Pt. 1) (1883) 103-; J. de Ps. 3 (*1884) 459-.
- , elasticity and expansion. *Graetz, L. A. Ps. C.* 28 (1886) 354-.
- , paraffins, etc. *Russner, J.* Carl Rpm. 18 (1882) 152-.
- , stretched, behaviour when heated. *Schmulewitsch, J.* Zür. Vjschr. 11 (1866) 201-.
- , —, —, *Govi, G.* Tor. At. Ac. Sc. 2 (1866-67) 225-, 455-; 4 (1868-69) 571-.
- , —, —, *Schmulewitsch, J.* [1869] St. Pét. Ac. Sc. Bll. 14 (1870) 517-.
- , —, —, *Thomas, P.* Les Mondes 19 (1869) 575-.
- , —, —, (Thomas). *Govi, G.* Les Mondes 19 (1869) 640-.
- , —, —, (Govi). *Thomas, P.* Les Mondes 20 (1869) 8-.
- India-rubber, stretched, behaviour when heated. *Madan, H. G.* Nt. 32 (1885) 625.
- and wires, expansion and extensibility, relations. *Kurz, A.* Exner Rpm. 22 (1896) 547-; 27 (1891) 631-.
- Invar. *Hirsch, A.* Neuch. S. Sc. Bll. 25 (1897) 217-.
- Iron. *Hällström, G. G.* Stockh. Ak. Hndl. 26 (1805) 253-; Gilbert A. 36 (1810) 52-.
- *Zschau, E. F.* Dresden Sb. Isis (1865) 89-.
- , cast. *Mushet, D.* Tilloch Ph. Mg. 18 (1804) 1-.
- , —, *Mallet, R.* Franklin I. J. 69 (1875) 156-.
- and steel. *Abt, A.* (xn) Orv.-Term. Éts. 5 (1880) (Term. Szak) 105-.
- — — at high temperatures. *Le Chatelier, H. C. R.* 129 (1899) 331-.
- — — — welding temperatures. *Wrightson, T.* [1895] Phil. Trans. (A) 186 (1896) 593-.
- — — — zine, determination of expansion. *Börsch, A.* As. Nr. 99 (1881) 177-.
- Marble. *Dunn, J., & Sang, E.* Edinb. N. Ph. J. 11 (1831) 66-.
- *Fröhlich, I.* A. Ps. C. 61 (1897) 206-.
- Masonry. *Bouncey, —.* Medley I. Eng. 2 (1865) 198-.
- Metal spiral. *Jaquez, E.* A. Tél. 7 (1880) 320-.
- Metallic arches. *Bresse, J. A. C.* L'I. 23 (1855) 257-.
- wires. *Dahlander, G. R.* Stockh. Öfv. 28 (1871) 703-; A. Ps. C. 145 (1872) 147-.
- Metals. *Prinsep, J.* Gleanings Sc. 1 (1831) 379-; (vi Adds.) Bb. Un. 58 (1835) 160-.
- and alloys. *Matthiessen, A.* Phil. Trans. 156 (1866) 861-.
- — — *Hirsch, A.* Neuch. S. Sc. Bll. 16 (1888) 298-.
- — — and salts. *Crace-Calvert, F. B. A.* Rp. (1858) (pt. 2) 46-.
- , expansion by obscure heat. *Rogers, W. A.* Am. As. P. (1894) 65-.
- at high temperatures. *Le Chatelier, H. C. R.* 108 (1889) 1096-.
- — low temperatures. *Andrews, T. R. S. P.* 43 (1888) 299-.
- , measurement of expansion. *Nouel, A.* Gén. Civ. 10 (1886-87) 405-.
- , — — — by interference. *Morley, E. W., & Rogers, W. A.* Ps. Rv. 4 (1897) 1-, 106-.
- , quasi-isotropic, expansion and pressure. *Voigt, W.* Gött. Nr. (1893) 177-.
- , in relation to temperature of fusion. *Lémeray, —.* C. R. 131 (1900) 1291-.
- and other solids, measurement of expansion. *Nasmyth, J.* Edinb. J. Sc. 6 (1827) 225-; Pogg. A. 9 (1827) 608-.
- Minerals, unequal expansion in different directions. *Miller, W. H.* B. A. Rp. (1837) (pt. 2) 43-.
- Nickel and cobalt. *Tutton, A. E.* R. S. P. 65 (1900) 306-.
- steels. *Guillaume, C. É.* C. R. 124 (1897) 176-; 125 (1897) 235-, 342; Par. S. Ps. Sé. (1897) 120-.

- Phosphorus. *De Franchis, G., & Pisati, G.* *Gz. C. It.* 4 (1874) 497-.
- , *Leduc, A.* *C. R.* 113 (1891) 259-.
- Platinum and brass. *Tissot, A.* *Les Mondes* 6 (1864) 317.
- , incandescent. *Nichols, E. L.* *Am. As. P.* (1881) 24-.
- , platinumiridium, palladium, silver, nickel, iron, steel and constantan at high temperatures. *Holborn, L., & Day, A.* *Berl. Ak. Sb.* (1900) 1009-.
- Porcelain. *Bedford, T. G.* *B. A. Rp.* (1899) 245; *L. Ps. S. P.* 17 (1901) 143-; *Ph. Mg.* 49 (1900) 90-.
- , Bayeux (between 1000° and 1500°). *Sainte Claire-Deville, H., & Troost, L.* *C. R.* 59 (1864) 162-.
- Pottery clay mass. *Granger, A.* *Mon. Sc.* 13 (1899) 5-.
- Quartz. *Le Chatelier, H.* *C. R.* 108 (1889) 1046-.
- Rock crystal. *Fizeau, H. L.* *C. R.* 58 (1864) 923-; *A. C.* 2 (1864) 143-.
- Rocks. *Halloek, W.* *U. S. G. Sv. Bil. No.* 78 (1891) 109-.
- Salts. *Joule, J. P., & Playfair, L.* [1848] *C. S. J.* 1 (1849) 121-.
- containing water of crystallisation. *Wiedemann, E. E. G.* *A. Ps. C.* 17 (1882) 561-.
- Silica, fused. *Le Chatelier, H.* *C. R.* 130 (1900) 1703-.
- Silver chloro-brom-iodides. *Rodwell, G. F.* [1876] *R. S. P.* 25 (1877) 292-.
- iodide. *Rodwell, G. F.* [1874] *R. S. P.* 23 (1875) 97-.
- , bromide, and chloride. *Rodwell, G. F.* [1876] *R. S. P.* 25 (1877) 280-.
- , —, —, and some chloro-brom-iodides of silver. *Rodwell, G. F.* *R. S. P.* 31 (1881) 291-.
- iodides and double iodides of silver with copper and lead. *Bellati, M., & Romanese, R.* *Ven. I. At.* 1 (1883) 1043-.
- , measurement of expansion. *Hirsch, A., & Plantamour, E.* *Arch. Sc. Ps. Nt.* 38 (1870) 37-; 40 (1871) 9-.
- , —, — (Hirsch and Plantamour). *Wild, H.* *Arch. Sc. Ps. Nt.* 40 (1871) 5-.
- Sodium. *Lucchi, G. de.* *Ven. I. At.* 6 (1879-80) 445-.
- and potassium and their alloy. *Hagen, E. B.* [1882] *A. Ps. C.* 19 (1883) 436-.
- Speculum metal for gratings, measurement of expansion. *Rogers, W. A.* *Am. As. P.* (1884) 116-.
- Standard 10 ft. iron bar of Indian survey and gold, silver and copper. *Prinsep, J.* *Beng. J. As. S.* 2 (1833) 130-.
- Steel and argentan, measurement of expansion by Fizeau's apparatus. *Ascoli, M.* *Rm. R. Ac. Linc. Mm.* 1 (1894) 150-.
- , Jessup's, measurement of expansion. *Morley, E. W., & Rogers, W. A.* *Am. As. P.* (1891) 138-; *Science* 2 (1895) 351.
- Stone. *Destigny, —.* *J. Gén. Civ.* 2 (1829) 227-.
- Stone. *Adie, A. J. B. A. Rp.* (1834) 569-; *Edinb. R. S. T.* 13 (1836) 354-.
- , expansion and contraction. *Bartlett, W. H. C.* *Silliman J.* 22 (1832) 136-.
- Sulphur. *Schrauf, A.* *A. Ps. C.* 27 (1886) 315-.
- , selenium and tellurium. *Spring, W.* *Brux. Ac. Bil.* 2 (1881) 88-.
- Thallium. *Steele, W. H.* *Vict. R. S. P.* 5 (1893) 193-.
- and alloys. *Omodei, D.* *Rv. Sc.-Ind.* 23 (1891) 25-.
- Vulcanite. *Mayer, A. M.* *Am. J. Sc.* 41 (1891) 54-.
- Walls of houses, action of solar heat. *Vogt, A. Z. Bl.* 15 (1879) 605-.
- Wires, telegraph, tension at different temperatures. *Barbarat, A.* *A. Tél.* 14 (1887) 229-.
- , —, — and "sag" at different temperatures. *Schenkel, H.* *Elektech. Z.* 17 (1896) 721-.
- under tension. *Wehage, H.* *Civing.* 25 (1879) 619-.
- — —. *Bottomley, J. T.* *Ph. Mg.* 24 (1887) 314-; *L. Ps. S. P.* 10 (1890) 184-; *Ph. Mg.* 28 (1889) 94-.
- Wood. *Rittenhouse, D.* [1796] *Am. Ph. S. T.* 4 (1799) 29-.
- , *Joule, J. P.* [1857] *R. S. P.* 9 (1857-59) 3.
- , *Villari, E. N.* *Cim.* 25 (*1867) 399-.
- , expansion and contraction. *Braddock, J.* *Madras J.* 7 (1838) 108-.
- Wooden rods. *Stadthagen, H.* *A. Ps. C.* 61 (1897) 208-.
- (Stadthagen). *Hildebrand, R.* *A. Ps. C.* 61 (1897) 808.
- Zinc bar, variation in length at same temperature. *Comstock, (Gen.) C. B.* *Am. J. Sc.* 22 (1881) 26-.
- Table of expansions of elements and some hydrocarbons. *Fizeau, H. L.* *C. R.* 68 (1869) 1125-.
- — — solids. *Fizeau, H. L.* *Les Mondes* 20 (1869) 137-.
- — — —. *MacGregor, J. G.* [1888] *Cn. R. S. P. & T.* 6 (1889) (Sect. 3) 3-.
- Temperatures of maximum density. *MacGregor, J. G.* [1885] *N. Scotia I. Sc. P. & T.* 6 (1886) 226-.

1420 Permanent Deformation and Thermal Hysteresis. Annealing.

- Annealing, effect on crystalline structure. *Brooke, C. B. A. Rp.* 39 (1869) (Sect.) 21-.
- , — — patience of copper and silver. *Howe, H. M.* *Am. I. Mn. E. T.* 13 (1885) 646-.
- , — — physical properties of metals. *Le Chatelier, A.* *C. R.* 110 (1890) 705-.
- Caoutchouc and gutta-percha, stretched, abnormalities. *Russner, J.* *Carl Rpm.* 18 (1882) 206-, 251-.
- Dimensions of heated solid when cooled to original temperature. *Zantedeschi, F.* *Zantedeschi A. Fis.* (1849-50) 29-, 223-.
- Glass, after-effects. *Wiebe, H. F.* *Berl. Ak. Sb.* (1884) 843-; (1885) 1021-.

- Glass, after-effects. *Weidmann, G. A. Ps. C. 29* (1886) 214-.
- , gradual alteration. *Pickering, S. U. Ph. Mg. 29* (1890) 289-.
- , permanent deformation. *Marchis, L. Bordeaux S. Sc. PV.* (1896-97) 50-, 137-; *Bordeaux S. Sc. Mm. 4* (1898) 1-; *J. de Ps. 7* (1898) 573-; 8 (1899) 193-.
- , —, theory. *Duhem, P. Bordeaux S. Sc. PV.* (1896-97) 45-.
- , secular expansion. *Volkman, P. A. Ps. C. 13* (1881) 209-.
- and steel, strain due to sudden cooling. *Barus, C., & Strouhal, V.* [1886] *U. S. Gl. Sv. Ill. No. 42* (1887) 98-.
- , toughened. *Curioni, G. Tor. Ac. Sc. At. 10* (1875) 365-.
- , —, *Feil, C., & Luynes, V. de. C. R. 81* (1875) 341-.
- , —, *Pocklington, H.* [1875] *Phm. J. 6* (1876) 251-.
- , —, *Schott, O. Dingler 216* (1875) 75-.
- , —, *Thuron, C. Gén. Civ. 5* (1884) 24-.
- , —, *Siemens, F. V. Nost. Eng. Mg. 33* (1885) 105-.
- , —, resistance to bending. *Bastie, A. de la. C. R. 92* (1881) 194-.
- , —, — shock and heat. *Bastie, A. de la. Brux. Ill. Pht. 14* (1875) 118-, 139-.
- , —, strains in. *Hoff, J. H. van't. (xii) Mbl. Nt. 6* (1876) 145-.
- Iron, cast, cooling curves. *Keep, W. J. I. & S. I. J. (1895) (No. 2) 227-*.
- , —, permanent expansion by heat. *Erman, A., & Herter, P. Pogg. A. 97* (1856) 489-.
- , changes produced by thermal treatment. *Morin, A. J. C. R. 59* (1864) 585-.
- , —, —, —, *Ball, E. J. I. & S. I. J. (1890) (No. 1) 85-*; (1891) (No. 1) 103-.
- and steel at a bright red heat, peculiarities in. *Newall, H. F. Ph. Mg. 24* (1887) 435-.
- —, molecular changes produced by heating and cooling. *Norris, R.* [1877] *R. S. P. 26* (1878) 127-.
- —, —, physical condition. *Hughes, D. E. I. ME. F.* (1884) 36-.
- —, —, yield point, effects of straining and annealing. *Unwin, W. C. R. S. P. 57* (1895) 178-.
- wire, molecular changes at low red heat. *Barrett, W. F. Ph. Mg. 46* (1873) 472-.
- Metals, change of form due to heating and partial cooling. *Clerk, H. R. S. P. 12* (1863) 453-.
- , —, —, —, —, — (note to Clerk's paper). *Stokes, G. G. (viii) R. S. P. 12* (1863) 471-.
- Nickel steels, annealing and permanent set. *Guillaume, C. É. C. R. 124* (1897) 1515-.
- , —, irreversible expansion. *Guillaume, C. É. C. R. 126* (1898) 738-.
- , —, properties. *Guillaume, C. É. Par. S. Ps. Sé. (1897) 120-*.
- Permanent deformations and hysteresis. *Duhem, P. Brux. Mm. Cour. 4^o, 54* (1896) No. 4, 61 pp.
- modifications, general theory. *Duhem, P. Brux. Mm. Cour. 4^o, 54* (1896) No. 6, 55 pp.
- Permanent modifications of sulphur. *Duhem, P. Brux. Mm. Cour. 4^o, 54* (1896) No. 5, 86 pp.
- Railway axles, effect of temperature on strength. *Andrews, T. I. CE. P. 87* (1886) 340-; 94 (1888) 180-; 105 (1891) 161-.

RECALESCENCE.

- Shand, R. Tel. J. 26* (1890) 247.
- investigation method. *Smith, F. J. Ph. Mg. 31* (1891) 433-.
- iron. *Forbes, G.* [1874] *Edinb. R. S. P. 8* (1875) 363-.
- , *Tomlinson, H. L. Ps. S. P. 9* (1888) 107-; *Ph. Mg. 25* (1888) 103-.
- , *Hopkinson, J. R. S. P. 45* (1889) 455-.
- , *Thomson, E. Tel. J. 24* (1889) 471.
- , *Terešin, S. J., & Rozing, B. L. Rs. Ps.-C. S. J. 26 (Ps.)* (1894) 200-.
- and steel, anomalous changes during recalcence. *Svedelius, G. E. Jern-Kont. A. 51* (1897) 202-; *Ph. Mg. 46* (1898) 173-.
- and magnetism. *Hopkinson, J. R. S. P. 48* (1891) 442-.
- steel. *Newall, H. F. Ph. Mg. 25* (1888) 510-.
- , *Thomson, E. Tel. J. 24* (1889) 616-.

RUPERT'S DROPS.

- ("Bologna phial.") *Morozzo, C. L. (conte) de. [1786] Turin Mm. Ac. 3* (1786-87) 449-.
- Snart, J. Tilloch Ph. Mg. 22* (1805) 334-.
- Biot, J. B. Par. S. Phlm. Ill. (1815) 122-*.
- Helwig, C. G. von. Gilbert A. 51* (1815) 112-.
- Merian, P. Meisner A. 1* (1824) 133-.
- (Breaking of vessel filled with water, by explosion.) *Bellani, A. A. Sc. Lomb. Ven. 5* (1835) 298-.
- Cagniard-Latour, C. Par. S. Phlm. PV. (1837) 118-*.
- (Breaking of glass vessels by explosion.) *Mazzoli, A. A. Sc. Lomb. Ven. 7* (1837) 153-.
- Vogel, A. Erdm. J. Pr. C. 77* (1859) 480-.
- Reusch, E. A. Ps. C. 130* (1867) 494-.
- Dufour, L. Arch. Sc. Fs. Nt. 34* (1869) 125-; *C. R. 68* (1869) 398-.
- Luynes, V. de. (x) Par. S. Phlm. Ill. 8* (1872) 95-; (viii) *C. R. 76* (1873) 346-.
- Thomson, W. Manch. Lt. Ph. S. Mm. & P. 2* (1889) 42-.
- Steel, effect of heat on molecular structure. *Barrett, W. F. B. A. Rp. (1875) (Sect.) 259-*.
- , —, — thermal and mechanical treatment on structure. *Sauveur, A. I. & S. I. J. (1899) (No. 2) 195-*.
- , hardening. *Howe, H. M. I. & S. I. J. (1895) (No. 2) 258-*.
- , —, *Howe, H. M., & Sauveur, A. I. & S. I. J. (1896) (No. 1) 170-, 188-*.
- , — (Howe). *Osmond, F. I. & S. I. J. (1896) (No. 1) 180-*.
- , —, *Howe, H. M. I. & S. I. J. (1897) (No. 1) 193-*.
- , — and tempering. *Roberts-Austen, W. C. [1889] Nt. 41* (1890) 11-, 32-.

- Steel, soft, brittleness produced by annealing. *Stead, J. E. I. & S. I. J.* (1898) (No. 2) 137-.
- , tempering, change in physical properties. *Kimball, A. S. Am. J. Sc.* 12 (1876) 110-.
- , —, —, —, —, —. *Rydberg, C. F.* [1887] *Stockh. Ak. Hndl. Bh.* 13 (*Afd.* 1) (1888) No. 6, 25 pp.; *Fschr. Ps.* (1887) (*Ab.* 1) 465-.
- Strain of elastic bodies, and heat. *Wittwer, W. C. Z. Mth. Ps.* 14 (1869) 478-.
- metal wires, and heat. *Haga, H.* [1881] *Amst. Ak. Vs. M.* 17 (1882) 211-; *Arch. Néerl.* 17 (1882) 261-.
- Stresses due to unequal heating. *Hopkinson, J. B. A. Rp.* 42 (1872) (*Sept.*) 51; *Mess. Mth.* 8 (1879) 168-.
- — —, and resulting double refraction. *Rayleigh, (Lord).* *Arch. Néerl.* 5 (1900) 32-.
- Systems affected by hysteresis, theorem relating to. *Duhem, P. Bordeaux S. Sc. PV.* (1898-99) 68-.
- depending on one or two variables. *Duhem, P. Brux. Mm. Cour.* 4^o, 56 (1897-98) No. 6, 198 pp.
- Wax, flexure by irregular cooling. *B., R.* (*vt Add.*) *Nicholson J.* 4 (1803) 176-.
- Zero changes in thermometers, causes. *Crafts, J. M. C. R.* 94 (1882) 1298-; *Nass. Vr. Jb.* 38 (1885) 159.
- Zinc, sounds obtained by change of temperature. *Strehlike, F. Pogg. A.* 43 (1838) 405-.

1430 Expansion of Liquids: Pressure-Volume-Temperature Relations.

- Adiabatic volume change in solutions. *Rogóyski, K., & Tammann, G. Z. Ps. C.* 20 (1896) 1-.
- Aerometer and thermometer, comparative march in same water. *Embry, —. Bb. Brit.* 33 (1806) 17-.
- Barometric readings, reduction to zero. *Viard, —. Mntp. Mm. Ac.* 3 (1855-57) 441-.
- Density, boiling point, and coefficient of expansion, relation between. *Longinescu, G. G.* [*Bucarest S. Sc. Bl.* 5 (1896)] 56-.
- , coefficient of expansion and refractive index of ethyl ether. *Oudemans, A. C. (jun.) Amst. Ak. Vs. M.* 1 (1885) 426-; *Delft. Ec. Pol. A.* 3 (1887) 1-.
- and expansion of liquefied gases. *Andréeff, E. d'. A. C.* 56 (1859) 317-; *Lieb. A.* 110 (1859) 1-.
- of liquids existing only under high pressures. *Blümcke, A. A. Ps. C.* 23 (1884) 404-.
- Elasticity and dilatibility at high pressures. *Amagat, E. H. A. C.* 29 (1893) 505-.
- , effects. *Mensbrugge, G. van der. Brux. Ac. Bl.* 32 (1896) 270-, 418-; 36 (1898) 281-; (1899) 497-.
- Expansion coefficients, corrections. *Sainte-Claire Deville, H. C. R.* 69 (1869) 1007.
- and contraction, force. *Beck, L. C. Silliman J.* 45 (1843) 49-.
- on cooling, theory. *Havrez, P. Cuyper Rv. Un.* 10 (1861) 358-.

EXPANSION OF LIQUIDS.

- Dalton, J. Nicholson J.* 5 (1803) 34-.
- Gay-Lussac, L. J. A. C.* 2 (1816) 130-.
- Emmett, J. B. Thomson A. Ph.* 8 (1824) 254-.
- Muncke, G. W.* [1828] *St. Pét. Mm. Sav. Étr.* 1 (1831) 249-.
- Zantedeschi, F. Majocchi A. Fis. C.* 4 (1841) 282-.
- Pierre, J. I. A. C.* 15 (1845) 325-; *C. R.* 23 (1846) 443-, 594-.
- Frankenheim, M. L. J. Pogg. A.* 72 (1847) 422-.
- Pierre, J. I. A. C.* 20 (1847) 5-; 31 (1851) 118-.
- Waterston, J. J. Ph. Mg.* 27 (1864) 348-.
- Avenarius, M. P.* [1876-77] (*xii*) *Kiev S. Nt. Mm.* 5 (1) (1878) 66-; (*ix*) *St. Pét. Ac. Sc. Bl.* 24 (1878) 525-; *Rs. Ps.-C. S. J.* 16 (*Ps.*) (1884) 242-; *J. de Ps.* 4 (1885) 587-.
- Mendeléev, D. I. Rs. Ps.-C. S. J.* 16 (*C.*) (1884) 1-; *C. S. J.* 45 (1884) 126-.
- (*Avenarius, Mendeléev, D. I. Rs. Ps.-C. S. J.* 16 (*Ps.*) (1884) 282-; *Nt.* 32 (1885) 87.
- (*Mendeléev, Avenarius, M. Rs. Ps.-C. S. J.* 16 (*Ps.*) (1884) 400-; *J. de Ps.* 4 (1885) 587-.
- (*Avenarius, Mendeléev, D. I. Rs. Ps.-C. S. J.* 16 (*Ps.*) (1884) 475-; *A. C.* 2 (1884) 271-.
- Pagliani, S. Tor. Ac. Sc. At.* 20 (1885) 54-.
- Žuk, K. Rs. Ps.-C. S. J.* 17 (*Ps.*) (1885) 13-; *J. de Ps.* 5 (1886) 89.
- Grimaldi, G. P. Gz. C. It.* 17 (1887) 566-.
- Puschl, C. Wien Ak. Sb.* 96 (1888) (*Ab.* 2) 1131-.
- Pickering, S. U. Ph. Mg.* 30 (1890) 400-.
- Heilborn, E. Z. Ps. C.* 7 (1891) 367-.
- Konovalov, D. P. Rs. Ps.-C. S. J.* 23 (*C.*) (1891) 599-; *C. Ztg.* 16 (1892) 80.
- application of work done by. *Petit, A. T. A. C.* 9 (1818) 196-.
- — —. *Sigma* [Σ]. *Edinb. J. Sc.* 3 (1825) 101-.
- — —. *Tommasi, F. Les Mondes* 26 (1871) 575-.
- above their boiling points. *Drion, C. C. R.* 46 (1858) 1235-.
- — —. *Mendelejeff, D. Lieb. A.* 119 (1861) 1-.
- formula for. *Rankine, W. J. M. Edinb. N. Ph. J.* 47 (1849) 235-.
- mixed liquids. *Bartoli, A., & Stracciati, E. N. Cim.* 18 (1885) 111-.
- law. *Biot, J. B. Arcueil Mm. Ps.* 3 (1817) 191-.
- , *Avogadro, A. Brugnatelli G.* 2 (1819) 416-.
- , *Waterston, J. J. Ph. Mg.* 21 (1861) 402-.
- , *Potter, R.* (*viii*) *Ph. Mg.* 26 (1863) 347-.
- , *Heen, P. de. Brux. Ac. Bl.* 4 (1882) 528-; 11 (1886) 545-.
- , *Amagat, E. H. C. R.* 115 (1892) 919-.
- , *Aubel, E. van. Arch. Sc. Ps. Nt.* 4 (1897) 201-.
- , *Mendelejeff's. Luther, R. Z. Ps. C.* 12 (1893) 524-.
- , on molecular theory. *Heen, P. de. Brux. Ac. Bl.* 18 (1889) 208-.

MEASUREMENT.

Hällström, G. G. Gilbert A. 14 (1803) 297-.
 Boguski, J. J. Prace Mt.-Fiz. 1 (1888) 52-.
 Barrett, W. F. [1889] *Dubl. S. Sc. P.* 6 (1888-90) 327-.
 Berget, A. [Bucarest S. Sc. Bl. 3 (1894)] 265-.
 Guglielmo, G. *Rm. R. Ac. Linc. Rd. 8* (1899) (Sem. 2) 271-, 310-.
 change of volume in vessels during. Boguski, J. J. *Z. Ps. C.* 2 (1888) 482-.
 by dilatometer. Knöfler, O. *A. Ps. C.* 38 (1889) 136-.
 — (Abbe's). Wiedemann, G. *A. Ps. C.* 38 (1889) 453-.
 Dulong and Petit's method, improvement. Govi, G. *Nap. Rd. 24* (1885) 89-.
 microscopic. Lehmann, O. *Z. Kr.* 12 (1887) 409.
 by Mohr's balance. Negreanu, D. *Bucarest Ac. Rom. A.* 21 (*Pt. admin.*) (1899) 78-; *Bucarest S. Sc. Bl.* 9 (1900) 217-.
 photographic register. Berget, A. *C. R.* 123 (1896) 745-.
 in sealed tubes. Golycin, B. B. *Mosc. S. Sc. Bl.* 73 (No. 2) (1891) 5; *A. Ps. C.* 47 (1892) 466-.

at different pressures. Grimaldi, G. P. *Catania Ac. Gioen. At.* 18 (1885) 273-; *J. de Ps.* 5 (1886) 29-; 7 (1888) 72-.
 — (Grimaldi). Heen, P. de. *J. de Ps.* 7 (1888) 155-.
 — great pressures. Amagat, E. H. *C. R.* 105 (1887) 1120-.
 relation to critical temperature. Mendelëev, D. I. *Rs. Ps.-C. S. J.* 16 (C.) (1884) 452-; *Par. S. C. Bull.* 43 (1885) 108-.
 — — — Bartoli, A., & Stracciati, E. *N. Cim.* 16 (1884) 91-.
 — — internal friction. Heen, P. de. *Brux. Ac. Bull.* 7 (1884) 248-.
 — — surface tension. Heen, P. de. *Brux. Ac. Bull.* 5 (1883) 505-.

SPECIFIED LIQUIDS.

alcohol and carbon disulphide. Muncke, G. W. [1834] *St. Pét. Mm. Sav. Étr.* 2 (1835) 483-.
 —, ether, benzene, etc., solutions. Tammann, G., & Hirschberg, W. *Z. Ps. C.* 13 (1894) 543-.
 — and water mixtures. Makins, G. H. *C. S. J.* 2 (1850) 224-.
 — — — Hoh, T. (xii) *Bamb. Nf. Gs. B.* 11 (1876) (*Pt. 1, No. 4*) 26 pp.; (x) *A. Ps. C.* 158 (1876) 334-.
 — — — before solidification. Recknagel, G. *Carl Rpm.* 4 (1868) 119-.
 alcoholic solutions of salicylic, anisic and gallic acids. Folgheraiter, G. *Ven. I. At.* 6 (1880) 1095-.
 alloys in liquid state (tin and lead). Vicentini, G., & Omodei, D. *Rm. R. Ac. Linc. Rd.* 3 (1887) (Sem. 2) 235-, 294-, 321-.

alloys in liquid state. Vicentini, G., & Omodei, D. *Rm. R. Ac. Linc. Rd.* 4 (1888) (Sem. 1) 718-, 805-, (Sem. 2) 19-, 39-, 75-.
 amalgams in liquid state. Cattaneo, C. *Tor. Ac. Sc. At.* 25 (1890) 492-; 26 (1891) 580-.
 aqueous solutions. Forch, C. *A. Ps. C.* 55 (1895) 100-.
 — — of glycerin. Emo, A. (xii) *Rv. Sc.-Ind.* 14 (1882) 357-.
 benzene and toluene. Muresianu, M. *Bucarest Ac. Rom. A.* 16 (*Pt. admin.*) (1894) 112-.
 bismuth, fused. Vicentini, G. *Rm. R. Ac. Linc. Rd.* 6 (1890) (Sem. 2) 147-.
 —, —, near melting point. Vicentini, G. *Rm. R. Ac. Linc. Rd.* 6 (1890) (Sem. 2) 121-.
 —, —, —. Cattaneo, C. *Rm. R. Ac. Linc. Rd.* 7 (1891) (Sem. 1) 88-.
 chloroform, ether, amyl hydride, at different pressures. Grimaldi, G. P. *Rm. R. Ac. Linc. Rd.* 2 (1886) (Sem. 1) 231-.
 diethylamine. Oudemans, A. C. (jun.) [1881] *Amst. Ak. Vs. M.* 17 (1882) 1-; *Arch. Néerl.* 16 (1881) 453-.
 ether. Oudemans, A. C. (jun.) *Amst. Ak. Vs. M.* 1 (1885) 426-; *Delft Éc. Pol. A.* 3 (1887) 1-.
 — at various pressures. Grimaldi, G. P. *Rm. R. Ac. Linc. T.* 8 (1884) 292-.
 ethyl sulphonate. Carius, L. *J. Pr. C.* 110 (1870) 279-.
 gas solutions. Nichols, E. L., & Wheeler, A. W. [1890] *Ph. Mg.* 11 (1881) 113-.
 homologous liquids. Mendelëeff, D. *Lieb. A.* 114 (1860) 165-.
 mercury. Hällström, G. G. Gilbert A. 17 (1804) 107-; 20 (1805) 397-.
 — Avogadro, A. *Brugnatelli G.* 3 (1820) 24-.
 — Crichton, J. *Thomson A. Ph.* 7 (1824) 241-.
 — Weeg, —. *Oken Isis* (1836) 721-.
 — Regnault, V. *C. R.* 15 (1842) 391-.
 — (Regnault's experiment). Holten, C. *Kiöb. Ov.* (1850) 37-.
 — Miltzer, H. *Pogg. A.* 80 (1850) 55-.
 — Bosscha, J. *C. R.* 69 (1869) 875-.
 — (Bosscha). *Regnault, V. C. R.* 69 (1869) 879-.
 — (Regnault). *Bosscha, J. Amst. Vs. Ak.* 4 (1870) (*Ntk.*) 38-; *Arch. Néerl.* 4 (1869) 167-; *C. R.* 69 (1869) 1185-.
 — (correction of Regnault's formula). Govi, G. *Tor. At. Ac. Sc.* 6 (1870-71) 122-.
 — (Regnault's experiments). Wüllner, F. H. *A. A. A. Ps. C.* 153 (1874) 440-.
 — (—). Mendelyeev, D. I. (xii) *Rs. C. Ps. S. J.* 7 (*Ps.*) (1875) [(*Pt. 1*)] 75-.
 — Broch, O. J. *Par. Poids et Mes. Tr. Mm.* 2 (*1883) 1-.
 — (-39° to 0°). Ayerton, W. E., & Perry, J. L. *Ps. S. P.* 8 (1887) 86-; *Ph. Mg.* 22 (1886) 325-.
 — Kurz, A. *Exner Rpm.* 22 (1886) 244-.
 —, Dulong and Petit's method. Lermantov, V. V. *Rs. Ps.-C. S. J.* 19 (*Ps.*) (1887) 142-.
 — — — —. Leduc, A. *J. de Ps.* 10 (1891) 561-.

- mercury in ebonite. *Lachinov, D. A.* (xii) Rs. Ps.-C. S. J. 14 (*Ps.*) (1882) [(*Pt.* 1)] 202-.
- , formula. *Heen, P. de.* Brux. Ac. Bil. 17 (1889) 168-.
- and glass. *Bellani, A.* Brescia Cm. (1823) 57-; *Brugnatelli, G.* 6 (1823) 20-, 217-, 274-.
- in Jena glass, between 0° and 100°. *Pernet, J., Jaeger, W., & Gümlich, E.* Berl. Ps. Reichsanst. Ab. 1 (1894) 102-.
- and water. *Rosenberg, B.* (xii) Rs. C. Ps. S. J. 9 (*Ps.*) (1877) [(*Pt.* 1)] 129-.
- metals, fused. *Vicentini, G.* [1886] Tor. Ac. Sc. At. 22 (1886-87) 28-.
- , —. *Vicentini, G., & Omodei, D.* [1887] Tor. Ac. Sc. At. 22 (1886-87) 712-; 23 (1887-88) 38-.
- methyl formate. *Kosonogov, I. I.* [1889-90] Kiev S. Nt. Mm. 11 (1) (1890) xlix-, lxxv-; Rs. Ps.-C. S. J. 22 (*Ps.*) (1890) 95; J. de Ps. 10 (1891) 432.
- milk. *Fleischmann, W.* Münch. Ak. Sb. 4 (1874) 97-.
- oils. *Preisser, F.* [1898] J. Phm. 25 (1899) 87-.
- , mineral. *Marek, W. J.* Carl Rpm. 16 (1880) 119-.
- organic compounds, solutions. *Turbaba, D.* Fschr. Ps. (1890) (*Ab.* 2) 274.
- phosphorus. *De Franchis, G., & Pisati, G.* Gz. C. It. 4 (1874) 497-.
- saline solutions. *Nicol, W. W. J.* Ph. Mg. 23 (1887) 385-.
- —. *Černaj, N.* Rs. Ps.-C. S. J. 20 (*C.*) (1888) 430-, 486-; 21 (*C.*) (1889) 73-, 176-; C. S. J. 56 (1889) (*Abs.*) 204-, 330-, 1101-; 58 (*Abs.*) (1890) 318-.
- — and liquid sulphur. *Despretz, C. C. R.* 7 (1898) 588-.
- — organic liquids. *Heen, P. de.* [1879] Brux. Mm. Cour. 8°, 31 (1881) (*No.* 4) 51 pp.
- sea water (+8° to -3° R.). *Erman, A.* Pogg. A. 12 (1828) 463-.
- —. *Lenz, R.* St. Pét. Ac. Sc. Mm. 29 (1881) *No.* 4, 24 pp.
- — near freezing point, and statics of Polar seas. *Zöppritz, K.* [1870] A. Ps. C. 5 (*Erg. Bd.*) (1871) 497-.
- sodium and potassium and their alloy in liquid state. *Hagen, E. B.* [1882] A. Ps. C. 19 (1883) 436-.
- sulphur, fused. *Moitessier, A.* [1864] Mntp. Mm. Ac. Sect. Sc. 6 (1864-66) 107-.
- —. *Pisati, G.* Gz. C. It. 4 (1874) 29-; Palermo G. Sc. Nt. 12 (1877) (*Pt.* 1) 33-.
- —. *Scichilone, S.* Gz. C. It. 7 (1877) 501-.
- thallium, liquid. *Pacher, G.* N. Cim. 2 (1895) 143-.
- volatile liquids. *Drion, C.* A. C. 56 (1859) 5-.
- water. *Haüy, R. J.* Par. S. Phlm. Bil. 1 (1791) 75-.
- (below 42°). *Dalton, J.* [1799] Manch. Ph. S. Mm. 5 (1802) 373-.
- —. *Hope, T. C.* [1804] Edinb. R. S. T. 5 (1805) 379-.
- (0° to 20° C.). *Hällström, G. G.* Gilbert A. 20 (1805) 384-.
- —. *Tardy de la Brossy, —.* Bb. Brit. 29 (1805) 22-; 31 (1806) 305-; 41 (1809) 296-.
- water. *Eytelwein, J. A.* Gilbert A. 39 (1811) 221-.
- (32° to 41° F.). *T.* (vi *Adds.*) Tilloch Ph. Mg. 46 (1815) 417-.
- —. *Avogadro, A.* Brugnatelli G. 1 (1818) 351-.
- —. *Stampfer, S.* Wien Jb. Pol. I. 16 (1830) 1-.
- —. *Tredgold, T.* CE. I. T. 1 (1836) 141-.
- —. *Ritter, E.* Gen. Mm. S. Ps. 11 (1846) 413-.
- —. *Frankenheim, M. L.* Pogg. A. 86 (1852) 451-.
- —. *Alexander, J. H.* Silliman J. 16 (1853) 170-.
- —. *Hagen, G. H. L.* Berl. Ab. (1855) (*Mth.*) 1-.
- —. *Pile, W. H.* Am. Phm. As. P. 8 (1859) 374-.
- (30° to 100°). *Jolly, P.* Münch. Sb. (1864) (1) 141-.
- (below +4° R.). *Weidner, (Dr.) —.* A. Ps. C. 129 (1866) 300-.
- —. *Gudberg, C. M.* Christiania F. 12 (1869) 1-.
- —. *Morton, A.* (x) Glasg. I. Eng. T. 15 (1872) 135-.
- (below 4° C.). *Hément, F.* C. R. 77 (1873) 1219-.
- —. *Veress, V.* (xii) Orv.-Term. Éts. 4 (1879) (*Term. Szak*) 85-.
- —. *Volkmann, P.* A. Ps. C. 14 (1881) 260-.
- (0° to 10°). *Bonetti, F.* Rm. R. Ac. Linc. T. 8 (1884) 323-.
- (4° to 0°). *Naccari, A.* Tor. Ac. Sc. At. 20 (1885) 969-.
- —. *Kurz, A.* Exner Rpm. 25 (1889) 192-.
- —. *Coppet, L. C. de.* [1891] Laus. S. Vd. Bll. 27 (1892) 276-.
- —. *Marek, W.* A. Ps. C. 44 (1891) 171-.
- —. *Mendelëev, D.* Rs. Ps.-C. S. J. 23 (*Ps.*) (1891) 183-; Ph. Mg. 33 (1892) 99-.
- —. *Chappuis, P.* Par. Poids et Mes. PV. (1892) 139-.
- —. *Puschl, C.* Wien Ak. Sb. 101 (1892) (*Ab.* 2a) 300-; Mh. C. (1892) 440-.
- —. *Scheel, K.* A. Ps. C. 47 (1892) 440-.
- —. *Amagat, E. H.* C. R. 116 (1893) 41-.
- —. *Stéphane de Lannoy, —.* C. R. 120 (1895) 866-.
- —. *Mendelëev, D.* Rs. Ps.-C. S. J. 29 (*Ps.*) (1897) (*App.*) 133-; J. de Ps. 6 (1897) 615-.
- —. *Thiesen, M., Scheel, K., & Diesselhorst, H.* A. Ps. C. 60 (1897) 340-.
- (0° to 40°). *Chappuis, P.* A. Ps. C. 63 (1897) 202-.
- —, formula. *Kurz, A.* Exner Rpm. 21 (1885) 515-; 22 (1886) 16-.
- —, —, 0° to 100° C. *Külz, L.* Carl Rpm. 18 (1882) 46-.
- —, at high temperatures. *Waterston, J. J.* (viii) Ph. Mg. 26 (1863) 116-.
- — and mercury. *Matthiessen, A.* [1865] Phil. Trans. 156 (1866) 231-.
- — saline solutions at high temperatures. *Sorby, H. C.* Ph. Mg. 18 (1859) 81-.
- —, tables. *Scheel, K.* Z. Instk. 17 (1897) 331-; 18 (1898) 32.

Expansive energy of heated water. *Rankine, W. J. M.* Ph. Mg. 26 (1863) 388-, 436-.

— liquids as introduction to terrestrial physics. *De Luc, J. A.* A. C. 48 (1803) 138-, 273-; 49 (1804) 84-, 118-, 225-; 54 (1805) 156-, 229-.

Glaciers, curious phenomenon. *Rumford, B. (Count).* [1803] Phil. Trans. (1804) 23-.

De Heen's equations, experimental verification. *Grimaldi, G. P.* Rm. R. Ac. Linc. Rd. 2 (1886) (Sem. 1) 244-; *J. de Ps.* 7 (1888) 72-.

— for members of homologous series. *Bartoli, A., & Stracciati, E.* N. Cim. 18 (1885) 107-.

Impelling power of moving water, effects of changes of temperature. *Wagner, S.* Silliman J. 8 (1824) 393-.

Laws of expansion and compressibility of water, and maximum density of water. *Amagat, E. H.* Par. S. Ps. Sé. (1893) 145-.

Liquid state, theory. *Heen, P. de.* A. C. 5 (1885) 83-.

Liquids, thermal behaviour. *Ramsay, W., & Young, S.* Ph. Mg. 37 (1894) 215-, 503-.

—, —. *Galitzine, B.* Ph. Mg. 37 (1894) 423.

—, —. *Heen, P. de.* Ph. Mg. 37 (1894) 424, 584.

—, —. *Battelli, —.* Ph. Mg. 38 (1894) 245-.

MAXIMUM DENSITY OF LIQUIDS,
TEMPERATURE.

alcohol and water. *Coppet, L. de.* C. R. 115 (1892) 652-, 1346.

alcoholic mixtures. *Rossetti, F.* Ven. At. 15 (1869-70) 1297-; C. R. 70 (1870) 1092-.

aqueous methyl alcohol. *Moretto, P.* N. Cim. 6 (1897) 198-.

— solutions. *Coppet, L. C. de.* C. R. 131 (1900) 178.

— of ether. *Nort, H.* Mbl. Nt. (1895-96) 79-; *Fschr. Ps.* (1896) (Ab. 2) 250.

barium chloride solutions. *Coppet, L. C. de.* C. R. 125 (1897) 533.

saline solutions (between 100° and 150°). *Zepernick, K., & Tammann, G.* Z. Ps. C. 16 (1895) 659-.

— *Coppet, L. C. de.* C. R. 128 (1899) 1559-.

— and their freezing point. *Lussana, S., & Bozzola, G.* Ven. I. At. (1892-93) 785-.

sea water. *Erman, A.* A. C. 38 (1828) 287-.

— *Hope, T. C.* [1838] Edinb. R. S. T. 14 (1840) 242-.

sugar solutions. *Coppet, L. C. de.* A. C. 3 (1894) 268-.

water. *Rumford, B. (Count).* Gilbert A. 1 (1799) 436-.

— *Hällström, G. G.* Gilbert A. 17 (1804) 107-.

— *Rumford, B. (Count).* [1805] Par. Mm. de l'I. (1806) (Sem. 1) 78-.

— *Tardy de la Brossy, —.* Bb. Brit. 32 (1806) 332-; 34 (1807) 193-.

— *Pictet, M. A.* Bb. Brit. 34 (1807) 113-.

water. *Sym, G. O. Thomson A. Ph.* 9 (1817) 387-.

— *Crichton, J.* Thomson A. Ph. 5 (1823) 401-.

— *Hällström, G. G.* Stockh. Ak. Hndl. (1823) 193-; A. C. 28 (1825) 56-; Stockh. Ak. Hndl. (1824) 1-.

— *Moll, G.* Amst. N. Vh. 1 (1827) 241-.

— *Stampfer, S.* Wien Jb. Pol. I. 16 (1830) 1-.

— *Hällström, G. G.* Stockh. Ak. Hndl. (1833) 166-; *Pogg. A.* 34 (1835) 220-.

— *Joule, J. P., & Playfair, L.* [1846] Ph. Mg. 30 (1847) 41-.

— *Erner, F.* Wien Sb. 68 (1873) (Ab. 2) 463-.

— *Tait, P. G.* [1883] Edinb. R. S. P. 12 (1884) 226-.

— *Vernon, H. M.* Ph. Mg. 31 (1891) 387-.

— *Coppet, L. C. de.* Laus. S. Vd. Bil. 29 (1893) 1-; A. C. 3 (1894) 246-.

—, distilled, and sea water. *Weber, L. D.* Meere Jbr. 4, 5 & 6 (1878) 1-.

—, influence of pressure. *Puschl, K.* [1875] Wien Ak. Sb. 72 (1876) (Ab. 2) 283-.

—, —, —. *Waals, J. D. van der.* Amst. Ak. Vs. M. 11 (1877) 119-; Arch. Néerl. 12 (1877) 457-.

—, —, —. *Marshall, D. H., Smith, C. M., & Omond, R. T.* Edinb. R. S. P. 11 (1882) 626-, 809-.

—, —, —. (Marshall, Smith and Omond).

— *Tait, P. G.* Edinb. R. S. P. 11 (1882) 813-.

—, —, —. *Grimaldi, G. P.* Gz. C. It. 15 (1885) 297-.

—, —, —. *Amagat, E. H.* C. R. 104 (1887) 1159-; 116 (1893) 946-.

—, mechanical explanation. *Piarron de Mondésir, —.* C. R. 77 (1873) 1154-.

— and saline solutions. *Rossetti, F.* Ven. At. 12 (1866-67) 73-; 13 (1867-68) 1047-, 1419-; 17 (1869) 370-.

—, —, —, influence of pressure. *Lussana, S.* N. Cim. 2 (1895) 233-.

— sulphuric acid mixtures. *Kohlrausch, F.* A. Ps. C. Ergänz. 8 (1878) 675-.

Molecular volumes and thermal expansion of liquids at corresponding temperatures. *Bartoli, A.* Rm. R. Ac. Linc. Mm. 19 (1884) 577-.

Pressure, volume and temperature relations. *Grimaldi, G. P.* Z. Ps. C. 1 (1887) 550-; 2 (1888) 374-.

—, —, —. *Barus, C.* Am. J. Sc. 38 (1899) 407-; 39 (1890) 478-.

—, —, —. *Amagat, E. H.* C. R. 118 (1894) 566-.

—, —, — during dissociation. *Waals, J. D. van der.* Amst. Ak. Vs. M. 15 (1880) 199-; A. Ps. C. Beibl. 4 (1880) 749-.

Volume of liquids as function of temperature at high pressures. *Zhuk [Žuk], K. N.* [1881-96] (xn) Rs. Ps.-C. S. J. 13 (Ps.) (1881) 239-, 411-; 16 (Ps.) (1884) 304-; (xi) A. Ps. C. Beibl. 6 (1882) 86-; (xn) Kiev S. Nt. Mm. 7 (1884) lxxxvi-; 16 (1) (1899) xii-.

- Volume and pressure relation of solutions. *Tammann, G.* Z. Ps. C. 17 (1895) 620-.
- , temperature of bodies, especially liquids. *Weitenmann, A.* Zür. Vjschr. 33 (1888) 37-.
- Water, adiabatics and isothermals. *Rücker, A. W.* R. S. P. 22 (1874) 451-.
- , — (near maximum density point). *Peddie, W.* Edinb. R. S. P. 12 (1884) 933-.
- , expansion and contraction. *Crane, W.* Tilloch Ph. Mg. 38 (1811) 54-.
- , — pressure coefficient. *Amagat, E. H.* C. R. 116 (1893) 779-.
- , phenomenon depending on different densities. *Surdi, D.* (xii) Rv. Sc.-Ind. 7 (1875) 145-.
- Weight thermometer, temperature compensation. *Wild, H.* St. Pét. Ac. Sc. Bil. 15 (1871) 139-; 16 (1871) 132-.
- Work of internal expansion in liquid mixtures. *Drecker, J.* A. Ps. C. 20 (1883) 870-.

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(See also Chemistry 7160.)

- Adiabatic relation. *Moutier, J.* A. C. 7 (1876) 318-.
- , —. *Antoine, C.* C. R. 105 (1887) 1242-.
- , ether. *Ramsay, W., & Perman, E. P.* R. S. P. 49 (1891) 447.
- , —. *Perman, E. P., Ramsay, W., & Rose-Innes, J.* [1896] Phil. Trans. (A) 189 (1897) 167-.
- , modification for gaseous jet. *Parenty, H.* C. R. 113 (1891) 791-.
- Aëriforms, law of volume extended to dense bodies. *Macvicar, J. G.* Edinb. R. S. T. 23 (1864) 581-.
- Air and coal gas, explosion constants of mixtures. *Witz, A.* C. R. 100 (1885) 1131-.
- , composition, conflicting results. *Leduc, A.* C. R. 111 (1890) 262-.
- , compressed, efflux. *Salcher, P., & Whitehead, J.* [1888] Wien Ak. Sb. 98 (1890) (Ab. 2a) 267-.
- , new phenomena. *Armellini, T.* Rm. At. N. Linc. 25 (1872) 94-.
- , compression in air-bubble under water. *Tait, P. G.* Edinb. R. S. P. 5 (1866) 563-.
- , condensation and refraction, applications. *Fränkel, W.* Dresden Sb. Isis (1868) 42-.
- , heated, slightly compressed, use. *Miller, J. A.* (vi Adds.) Am. I. T. (1863-64) 586-.
- , Pascal's experiments on weight. *Thurot, C. J.* de Ps. 1 (1872) 267-.
- , pressure variometer, Hefner-Alteneck. *Weber, L.* [1896] Schl.-Holst. Nt. Vr. Schr. 11 (1898) 9.
- , pump, limit of rarefaction. *Deventer, J. G. van.* Batav. Ntk. Ts. 56 (1897) 183-.
- , variable pressure under piston. *Golicyn, (Prince) B. B.* St. Pét. Ac. Sc. Bil. 5 (1896) xi-; 7 (1897) 409-.

- Atmosphere, density and pressure. *Speer, T. C.* Tilloch Ph. Mg. 33 (1809) 417-.
- , height. *Minary, E.* [1899] Doubs S. Mm. 4 (1890) 221-.
- , volume. *Hill, G. W.* Des Moines Anal. 4 (1877) 97-.
- Avogadro's law. *Blaserna, P.* Gz. C. It. 1 (1871) 64-.
- , —. *Leduc, A.* C. R. 124 (1897) 285-.
- , —, analogue. *Groshans, J. A.* Mon. Sc. 24 (1882) 1027-.
- Balloon problem: expanding gas. *Paradox (Pseud.)* Science 19 (1892) 136-.
- Barothermoscope and absolute millesimal scale. *Salomon, F.* Z. Angew. C. (1894) 687-.

BOYLE'S (OR MARIOTTE'S) LAW.

- Arnim, L. A. von.* Gilbert A. 2 (1799) 238-.
- Ampère, A. M.* [1814] A. C. 94 (1815) 145-.
- Örsted, H. C., & Suensson, (Capt.)* —. Kiöb. Ov. (1824-25) 13-.
- Örsted, H. C.* Schweigger J. 45 (=Jb. 15) (1825) 352-.
- Exley, T.* Thomson Rc. 4 (1836) 336-.
- Regnault, V.* Bb. Un. Arch. 2 (1846) 66-.
- Hunt, E. B.* Silliman J. 9 (1850) 412-.
- Wilbraham, H.* Camb. and Dubl. Mth. J. 6 (1851) 167-.
- (at pressure below an atmosphere.) *Siljeström, P. A.* [1873-74] (xi) Stockh. Ak. Hndl. Bh. 2 (1873-75) No. 1, 54 pp., No. 10, 21 pp. (Siljeström.) *Mendelejeff, D. I.* Berl. B. 7 (1874) 1339-.
- (Mendelejeff.) *Siljeström, P. A.* Berl. B. 8 (1875) 576-.
- (Siljeström.) *Mendelejeff, D. I.* Berl. B. 8 (1875) 744-.
- Gosiewski, W.* Par. T. Nauk Śc. Pam. 9 (*1877) Art. 4, 4 pp.; 11 (*1879) Art. 6, 3 pp.; Z. Mth. Ps. 22 (1877) 336-.
- Mendelejeff, D. I.* Nt. 15 (1877) 455-, 498-.
- apparatus. *Volpicelli, P.* Rm. At. 10 (1856-57) 181-, 393-, 430-; 11 (1857-58) 55-, 133-, 206-; 12 (1858-59) 28-, 76-, 276-.
- , *Hagen, E. B.* (xii) Z. Instk. 2 (1882) 252-.
- , *Thomas, B. F.* Am. As. P. (1883) 136-.
- , *Piarron de Mondésir,* —. Par. Ing. Civ. Mm. (1887) (Pt. 1) 267-.
- , *Rheam, W.* Nt. 49 (1893-94) 433.
- deduced from theoretical principles. *Mayer, J. T.* [1824] Gött. Cm. 6 (1823-27) 3-.
- and definition of density. *Uylenbroek, P. J.* Amst. I. (1841) 114-.
- deviations. *Kolk, H. W. S. van der.* Pogg. A. 116 (1862) 429-.
- , *Amagat, E. H.* C. R. 68 (1869) 1170-; Arch. Sc. Ps. Nt. 35 (1869) 169-.
- , *Budde, E.* J. Pr. C. 9 (1874) 30-.
- , *Winkelmann, A. A.* A. Ps. C. 5 (1878) 92-.
- , at low pressures (oxygen). *Bohr, C.* [1885] Kjöb. Dn. Vd. Selsk. Skr. 2 (1881-86) 401-; A. Ps. C. 27 (1886) 459-.
- effect of moisture. *Dubrunfaut,* —. C. R. 68 (1869) 1262-.

at high temperature. *Puschl, C.* Wien Ak. Sb. 97 (1889) (*Ab. 2a*) 142-; *Mh. C.* (1888) 93-.
— low pressure. *Fuchs, F.* A. Ps. C. 35 (1888) 430-.
— —. *Sutherland, W.* Ph. Mg. 43 (1897) 11-.
— —. *Battelli, —.* Rv. Sc.-Ind. 32 (1900) 210-.
pressure less than an atmosphere. *Ven, E. van der.* A. Ps. C. 38 (1889) 302-; *Haarl.* Ms. Teyl. Arch. 3 (1892) 349-, 589-.

Waals, J. D. van der. Amst. Ak. Vs. 8 (1900) 441-; Amst. Ak. P. 2 (1900) 379-.

CHARACTERISTIC EQUATION.

Caloric and expansive properties of elastic fluids. *Reech, F.* C. R. 46 (1858) 84-; 56 (1863) 1240-; 57 (1863) 505-.
Cartesian diver. *Bauer, K. L.* A. Ps. C. (*Erg.* 6) (1874) 332-.
— —. *Rebenstorff, H.* Dresden Isis Sb. (1900) (*Ab.*) 3-.

Davy, (Sir) H. R. I. J. 1 (1802) 269-.
Herapath, J. Thomson A. Ph. 8 (1816) 56-.
Meikle, H. Q. J. Sc. 1 (1829) 56-.
Potter, R. Ph. Mg. 6 (1853) 161-; 23 (1862) 52-.
Dupré, A. C. R. 59 (1864) 905-.
Heath, J. M. Ph. Mg. 39 (1870) 347-.
Gladbach, P. A. Ps. C. 145 (1872) 318-.
Mendelejeff, D. I. Berl. B. 7 (1874) 1455.
Kuhn, M. Carl Rpm. 11 (1875) 327-.
Mendelejeff, D. I. C. R. 82 (1876) 412-.
Waals, J. D. van der. Amst. Ak. Vs. M. 15 (1880) 199-; A. Ps. C. Beibl. 4 (1880) 749-.
Biehringer, (Dr.) —. Z. Mth. Ps. 26 (1881) 377-.
Gouilly, A. C. R. 93 (1881) 722-, 1134-.
Amagat, E. H. C. R. 94 (1882) 847-; A. C. 28 (1883) 500-.
Thiesen, M. A. Ps. C. 24 (1885) 467-.
Natanson, L. C. R. 109 (1889) 890-.
Antoine, C. C. R. 112 (1891) 284-.
Proell, R. Dresden Isis Sb. (1891) 29-.
Weinstein, B. A. Ps. C. 54 (1895) 544-.
Waals, J. D. van der. [1896] Amst. Ak. Vs. 5 (1897) 150-; *Fschr. Ps.* (1896) (*Ab. 2*) 199-.
Thiesen, M. A. Ps. C. 63 (1897) 329-.
Woodward, C. M. St. Louis Ac. T. 9 (1899) 53-.
Guye, P. A., & Friderich, L. Arch. Sc. Ps. Nt. 9 (1900) 505-.
carbon dioxide. *Clausius, R.* [1879] A. Ps. C. 9 (1880) 337-.
— —. *Sarrau, E.* C. R. 101 (1885) 1145-.
— —. *Walckenaer, C.* A. Mines 4 (1893) 420-.
— —. Rankine's form. *Turazza, D.* Ven. At. (1859-60) 53-.
corresponding states. *Waals, J. D. van der.* Amst. Ak. Vh. 20 (1880) (*Nos. 6 & 7*) 32 + 11 pp.; A. Ps. C. Beibl. 5 (1881) 27-, 250-; Amst. Ak. Vh. 21 (1881) *No. 5*, 10 pp.; A. Ps. C. 5 (1881) 567-.
— —. *Natanson, L.* C. R. 109 (1889) 855-.
form of Clausius. *Sarrau, E.* C. R. 101 (1885) 941-.
— — —. *Riecke, E.* Gött. Nr. (1894) 285-.
— derived from Joule-Thomson effect. *Schiller, N.* A. Ps. C. 40 (1890) 149-.
— of van der Waals. *Kraevič, K.* Rs. Ps.-C. S. J. 19 (*Ps.*) (1887) 1-; *J. de Ps.* 7 (1888) 271-.
— — — —. *Sonin, N. J.* [1889] Vars. S. Nt. Tr. (1889-90) (*C. R., Ps. C.*) *No. 5, 9-, No. 6, 1-;* *Fschr. Ps.* (1890) (*Ab. 2*) 247-.
— — — —. *Korteweg, D. J.* Nt. 45 (1892) 152-, 277-.
— — — —. *Boltzmann, L.* Amst. Ak. Vs. 7 (1899) 477-; Amst. Ak. P. 1 (1899) 398-.
— — — — (Boltzmann). *Waals, J. D. van der.* Amst. Ak. Vs. 7 (1899) 537-; Amst. Ak. P. 1 (1899) 468-.

CHANGE OF TEMPERATURE ACCOMPANYING CHANGE OF VOLUME.

Dalton, J. [1800] Manch. Ph. S. Mm. 5 (1802) (*Pt. 2*) 515-.
Wrede, E. F. Gilbert A. 44 (1813) 111-.
Navier, C. L. M. H. Par. S. Phlm. Bil. (1820) 97-.
Henry, J. [1825] Alb. I. T. 1 (*1830) (*Pt. 2*) 36.
Ivory, J. Ph. Mg. 1 (1827) 89-, 165-.
(*Ivory.*) *Meikle, H.* Q. J. Sc. (1828) (*Pt. 2*) 124-.
(*Meikle.*) *Ivory, J.* Ph. Mg. 4 (1828) 321-.
(*Ivory and Meikle.*) *Anon.* (vi 1064) Q. J. Sc. (1829) (*Pt. 1*) 277-.
Ewart, P. Ph. Mg. 5 (1829) 247-.
Joule, J. P. [1844] Ph. Mg. 26 (1845) 369-.
Rankine, W. J. M. Edinb. N. Ph. J. 51 (1851) 123-.
Assmann, C. Pogg. A. 85 (1852) 1-.
Koosen, J. H. Pogg. A. 89 (1853) 437-.
Cazin, A. A. C. 66 (1862) 206-.
Dupré, A. A. C. 67 (1863) 359-; C. R. 58 (1864) 539-.
Cantoni, G. Mil. I. Lomb. Rd. 4 (1867) 135-.
Moutier, J. C. R. 68 (1869) 95-; 69 (1869) 1137-.
Regnault, V. C. R. 69 (1869) 780-; Par. Ac. Sc. Mm. 37 (*pt. 2*) (1870) 579-.
Heath, (Rev.) J. M. Ph. Mg. 39 (1870) 288-.
Regnault, V. A. C. 24 (1871) 342-.
Jamin, J., & Richard, —. C. R. 75 (1872) 105-, 453-.
Thurston, R. H. Franklin I. J. 67 (1874) 267-.
Heath, (Rev.) J. M. Ph. Mg. 4 (1877) 14-.
Schmidt, G. Dinger 238 (1880) 267-, 361-.
Tait, P. G. [1881] Edinb. R. S. P. 11 (1882) 51-, 217-.
Rivière, C. J. de Ps. 3 (1884) 473-.
Natanson, E. Kosmos (Lw.) 12 (1887) 415-; A. Ps. C. 31 (1887) 502-.
Hazen, H. A. Science 19 (1892) 150-.
Witkowski, A. [1898] Krk. Ak. (*Mt.-Prz.*) Rz. 15 (1899) 247-; *Crc. Ac. Sc. Bil.* (1898) 282-.

form of van der Waals, corresponding states. *Young, S.* [1892-93] *L. Ps. S. P.* 11 (1892) 233-; 12 (1894) 447-; *Ph. Mg.* 33 (1892) 153-; 37 (1894) 1-.

— — — — —, — — — — —, *Meslin, G.* *C. R.* 116 (1893) 135-.

— — — — —, modified. *Boltzmann, L., & Mache,* —. *Wien Az.* 36 (1899) 87-.

— — — — —, physical meaning of 'b.' *Heilborn, E.* *Exner Rpm.* 27 (1891) 369-.

hydrogen. *Antoine, C.* *C. R.* 110 (1890) 1253-.

isopentane. *Young, S.* *L. Ps. S. P.* 13 (1895) 602-.

nitrogen. *Sarrau, É.* *C. R.* 110 (1890) 880-.

— — — — —, *Antoine, C.* *C. R.* 110 (1890) 1122-.

rarefied gases. *Baly, E. C. C., & Ramsay, W.* *L. Ps. S. P.* 13 (1895) 187-; *Ph. Mg.* 38 (1894) 301-.

various vapours. *Antoine, C.* *C. R.* 110 (1890) 632-; 114 (1892) 1177-.

water vapour. *Antoine, C.* *C. R.* 114 (1892) 162-.

— — — — —, *Manaira, A.* *N. Cim.* 1 (1895) 365-.

— — — — —, *Tumirz, O.* *Wien Ak. Sb.* 108 (1899) (Ab. 2a) 1058-.

Coefficients of increase of elasticity and volume in gases, independence. *Sluginov, N. P.* *Kazan S. Nt. (Ps.-Mth.) P.* 5 (1887) 169-.

Cohesion in relation to Carnot's function. *Croll, J. B. A. Rp.* (1862) (pt. 2) 21.

COMPRESSIBILITY OF GASES.

Burckhardt, J. K. *Zach M. Cor.* 9 (1804) 308-.

Ivory, J. *Tilloch Ph. Mg.* 66 (1825) 3-.

Örsted, H. C. [1825] *Edinb. J. Sc.* 4 (1826) 224-.

Regnault, V. *C. R.* 23 (1846) 787-.

Avogadro, A. [1851] *Tor. Mm. Ac.* 13 (1853) 171-.

Regnault, V. *R. S. P.* 6 (1853) 298-.

Akin, K. [1866] (xii) *Mag. Tud. Ak. Étk. (Term.)* 1 (1870) (No. 6) 7 pp.

Mendelyev, D. I. (xii) *Rs. C. S. J.* 4 (1872) 309-.

Hemilian, W., & Mendelejeff, D. *Berl. B.* 9 (1876) 1341-.

Cailletet, L. *C. R.* 88 (1879) 61-.

Moutier, J. *Par. S. Phlm. Bll.* 3 (1879) 184-.

Bouty, E. *J. de Ps.* 9 (1880) 12-.

Roth, F. *A. Ps.* C. 11 (1880) 1-.

Sarrau, É. *C. R.* 94 (1882) 639-, 718-, 845-.

Amagat, E. H. *A. C.* 28 (1883) 456-.

Puschl, C. *Wien Ak. Sb.* 96 (1888) (Ab. 2) 1028-.

Zilov, P. A. [1891] *Vars. S. Nt. Tr.* (1891-92) (*C. R., Ps. C.*) No. 6, 10-; *Fschr. Ps.* (1891) (Ab. 2) 248-.

about atmospheric pressure. *Leduc, A.* *C. R.* 123 (1896) 743-.

— — — — —, *Leduc, A., & Sacerdote, P.* *C. R.* 125 (1897) 297-.

about atmospheric pressure. *Leduc, A.* *C. R.* 125 (1897) 646-, 838.

and expansion. *Amagat, E.* *C. R.* 71 (1870) 67-; 73 (1871) 183-.

— — — — —, new method. *Amagat, E. H.* *C. R.* 111 (1890) 871-.

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— — — — —, *Amagat, E. H.* *C. R.* 87 (1878) 432-; 88 (1879) 336-; 89 (1879) 437-; *A. C.* 19 (1880) 345-; *C. R.* 107 (1888) 522-.

— — — — —, temperatures. *Blaserna, P.* *C. R.* 69 (1869) 132-.

— — — — —, low pressure. *Mendelejeff, D. I., Hemilian, W., & Boguski, J. G.* *Berl. B.* 9 (1876) 1312.

relation to mechanical theory of heat. *Dupré, A.* *A. C.* 1 (1864) 168-.

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- Calorimetric problems. *Berthelot, M. C. R.* 77 (1873) 971-.
- studies. *Dieterici, C. A.* Ps. C. 42 (1891) 513-.
- Calorimetry, nomenclature and notation. *Buchanan, J. Y.* Nt. 58 (1898) 30.
- Capacity for heat and latent heat, mathematical theory. *Herapath, J.* Thomson A. Ph. 2 (1821) 50-, 89-, 201-, 256-, 363-, 434-; 3 (1822) 16-.
- Cooling of bodies on Etna, actinometric measurement. *Bartoli, A., & Stracciati, E.* [1890] *Catania Ac. Gioen. Bll.* 16 (1891) 2-; *Rv. Sc.-Ind.* 25 (1893) 81-.
- Evaporative power of fuel, estimation. *Rankine, W. J. M.* [1866-67] *Glasg. Ph. S. P.* 6 (1868) 123-; *Les Mondes* 15 (1867) 627-, 669-.
- Heat, measurement. *West, G.* C. R. 78 (1874) 426-.
- , — by evaporation. *Müller-Erzbach, W.* Brem. Ab. 11 (1890) 221-.
- , quantities in mixtures of metals. *Rudberg, F.* Pogg. A. 71 (1847) 460-.
- Human calorimetry. *Lefèvre, J.* Par. S. Bl. Mm. 50 (1898) (C. R.) 1-.
- Mechanical effects produced in bodies by heat. *Résal, H.* C. R. 51 (1860) 449-.
- Specific heat. *Luckcock, J.* Tilloch Ph. Mg. 53 (1819) 44-.
- — — — — *Avogadro, A.* [1822] *Mod. Mm. S.* It. 19 (1823) 83-.
- — — — — *Joule, J. P.* Ph. Mg. 25 (1844) 334-.
- — — — — *Woestyn, A. C. A. C.* 23 (1848) 295-.
- — — — — *Castrini, E.* [1884] *Padova S. Sc. At.* 9 (1885) 5-.
- — — — — and affinity. *Avogadro, A.* [1823-25] *Tor. Mm. Ac.* 28 (1824) 1-; 29 (1825) 79-; *Brugnatelli G.* 8 (1825) 432-.
- Steam, condensation by currents of air. *Popper, J.* Dingler 268 (1858) 161-.
- Thermal and other physical properties of bodies, correlations. *Cantoni, G.* Rm. R. Ac. Linc. T. 4 (1880) 74-.

CALORIMETRY AND SPECIFIC HEAT.

1600 General. Units of Heat.

- Absolute quantity of heat contained in given body, determination. *Mayer, J. T.* [1828] *Gött. Cm.* 7 (1828-31) 3-.
- specific heat. *Moutier, J.* Par. S. Phlm. Bll. 12 (1875) 15-.
- Actual heat contained in body. *San-Roberto, P. di.* Mil. I. Lomb. Rd. 8 (1875) 876-.

UNITS OF HEAT.

- Berthelot, M.* J. de Ps. 10 (1891) 169-.
- Joly, J.* Nt. 52 (1895) 4.
- Griffiths, E. H.* Nt. 52 (1895) 30.
- Pickering, S.* Nt. 52 (1895) 80.
- Joly, J.* Nt. 52 (1895) 80.
- Griffiths, E. H.* Nt. 52 (1895) 535; Ph. Mg. 40 (1895) 431-.

1610 Calorimetric Methods

- (Choice.) *Bartoli, A.* Mil. I. Lomb. Rd. 29 (1896) 99-.
- Warburg, E. D. Nf. Vh.* (1899) (*Th. 2, Hälfte 1*) 62-; *Ps. Z. 1* (1900) 171-.
- Calory, determination of value. *Favre, P. A. A. C. 1* (1874) 438-.
- , Regnault's, and specific volumes of steam. *Starkweather, G. P.* Am. J. Sc. 7 (1899) 13-.
- Volume, pressure, temperature and specific heat, relations. *Main, P. T.* B. A. Rp. (1886) 100-; (1888) 465-.

1610 Calorimetric Methods.

- Absolute method. *Pettersson, O.* Nt. 30 (1884) 320-.
- Accuracy in method of mixtures, precautions for. *Wadsworth, F. L. O.* Am. J. Sc. 4 (1897) 265-.
- Aniline, employment in calorimetric measurements. *Bartoli, A.* Mil. I. Lomb. Rd. 28 (1895) 1032-.
- Bomb, calorimetric, use. *Berthelot, —.* C. R. 115 (1892) 201-.
- , —, — to find calorific value of coal. *Scheurer-Kestner, —.* C. R. 112 (1891) 233-.
- Calculated calorific intensity and evaporative power of coal, determination, and New Zealand coals. *Hector, (Sir) J. N. Z.* Col. Ms. Gl. Sv. Rp. 20 (1890) xxx-.

CALORIMETERS.

- air- (variation of Favre and Silbermann's). *Gezekhus [Hesekhus], N. A.* (xii) Rs. Ps.-C. S. J. 15 (*Ps., Pt. 1*) (1883) 10-; *Fschr. Ps.* (1885) (*Ab. 2*) 466.
- , *Lefèvre, J.* Par. S. Bl. Mm. 50 (1898) (*C. R.*) 415-.
- (Lefèvre). *Arsonval, — d'.* Par. S. Bl. Mm. 50 (1898) (*C. R.*) 444-.
- , differential. *Preobrazhenskii, V. V.* (xii) Rs. Ps.-C. S. J. 15 (*Ps., Pt. 1*) (1883) 67-; *J. de Ps. 3* (1884) 455.
- combustion. *Favre, P. A. C. R.* 66 (1868) 788-.
- description and use. *Montgolfier, J. M. J.* Mines 19 (1806) 67-.
- Dulong's. *Cabart, —.* C. R. 7 (1858) 872-.
- electric. *Rödti, A.* Tor. Ac. Sc. Mm. 37 (1886) 367-.
- , compared with Riess thermometer. *Rödti, A.* Ven. I. At. (1884-85) 2107-.
- evaporation- and condensation-. *Neesen, F.* Berl. Ps. Gs. Vh. (1887) 87-; (1888) 73-.
- glacial acetic acid. *Harker, J. A., & Hartog, P. J.* B. A. Rp. (1892) 662.
- ice-. *Volpicelli, P. G.* Arcad. 60 (1833) 50-.
- , *Brown, A. C.* [1870] Edinb. R. S. P. 7 (1872) 321-.
- , *Bunsen, R. W.* A. Ps. C. 141 (1870) 1-.
- , *Bohn, C. A.* Ps. C. 142 (1871) 618-.

Calorimeters 1610

- ice-, Bunsen's. *Wartha, V.* (xii) Mag. Tud. Ak. Éts. 9 (*No. 5*) (1875) 52-.
- , —, *Reichert, E.* Carl Rpm. 12 (1876) 77-.
- , —, *Stewart, B.* Manch. Lt. Ph. S. P. 18 (1879) 66-.
- , —, *Blümcke, A. A.* Ps. C. 26 (1885) 159-.
- , —, addition to. *Boys, C. V.* Ph. Mg. 24 (1887) 214-.
- , —, modified. *Gee, W. W., & Stroud, W. L.* Ps. S. P. 4 (1881) 52-; *Ph. Mg.* 10 (1880) 171-.
- , —, —, *Stewart, B., & Stroud, W. L.* Ps. S. P. 4 (1881) 342-; *Ph. Mg.* 12 (1881) 172-.
- , —, —, *Barrett, W. F.* [1885] *Dubl. S. Sc. P.* 5 (1886-87) 13-.
- , historical note. *Andrews, (Prof.) T. A.* Ps. C. 142 (1871) 320-.
- , — (Andrews). *Bunsen, R. W. A.* Ps. C. 142 (1871) 616-.
- , return of mercury-thread. *Neesen, F.* [1883] (xii) Berl. Ps. Gs. Vh. 2 (1884) 29-.
- for lecture purposes. *Baker, T. J.* B. A. Rp. (1886) 525-.
- Lewis Thompson's. *Scheurer-Kestner, —.* Mulhouse S. In. Bl. 58 (1888) 506-.
- , —, *H. Oestr. Z. Brgw.* 37 (1889) 212.
- mercury-. *Favre, P. A. J. de Ps.* 1 (1872) 332-; *Par. Bl. S. C.* 18 (1872) 50-, 385-; 19 (1873) 441-.
- (Favre). *Berthelot, M.* Par. Bl. S. C. 18 (1872) 57-, 388-.
- , *Favre, P. A. A. C. 1* (1874) 438-.
- for method of cooling. *Violle, J. C. R.* 94 (1882) 1510-.
- microcalorimeter. *Cybulski, N.* Crc. Ac. Sc. Bl. (1890) 294-; (1894) 92-.
- mixing-. *Pickering, S. U.* Ph. Mg. 29 (1890) 247-.
- mixtures, method. *Waterman, F. A.* Ph. Mg. 40 (1895) 413-.
- new. *Hannay, J. B.* [1878] *Manch. Lt. Ph. S. Mm.* 6 (1879) 242-.
- , *Barrett, W. F.* B. A. Rp. (1885) 938.
- , *Peabody, C. H.* Franklin I. J. 126 (1888) 134-.
- , *Gerstmann, H.* D. Ps. Gs. Vh. (1899) 194-.
- registering (applicable to man). *Arsonval, A. d'.* C. R. 100 (1885) 1400-; *Par. S. Bl. Mm.* 37 (1885) (*C. R.*) 50-, 55-.
- , automatic (applicable to living beings). *Arsonval, A. d'.* C. R. 102 (1886) 799-.
- respiration-. *Atwater, W. O., & Rosa, E. B.* Am. As. P. (1897) 127-; *Ps. Rv.* 9 (1899) 129-, 214-.
- for specific heats of liquids and solids. *Rumford, B. (Count).* [1813] A. C. 1 (*1884) 234-.
- steam-. *Bunsen, R. A.* Ps. C. 31 (1887) 1-.
- , *Joly, J.* R. S. P. 47 (1890) 218-.
- , *Neesen, F.* A. Ps. C. 39 (1890) 131-.
- , *Goodman, J.* [1900] *Sc. Abs.* 4 (1901) 81-.
- , and specific heats by comparative method. *Schükarew, A. A.* Ps. C. 59 (1896) 229-.

1610 Calorimetry

steam-, "throttling." *Fullan, M. T.* [1897] Sc. Abs. 1 (1898) 202-
for testing fuel on small scale. *Donkin, B. (jun.)*, & *Holliday, J.* I. CE. P. 102 (1890) 292-.

Calorimetric corrections. *Boulouch, R.* Bordeaux S. Sc. PV. (1897-98) 132-.

— measurements. *Bartoli, A.*, & *Stracciati, E.* Rm. R. Ac. Linc. Rd. 1 (1885) 541-, 573-.

— of solar radiation. *Bartoli, A.* N. Cim. 35 (1894) 239-.

—, temperature corrections. *Pfaundler, L.* A. Ps. C. 11 (1880) 237-.

— method (reclamation of priority for Jamin). *Akin, (Dr.) C. K.* C. R. 70 (1870) 1403-.

— researches. *Bunsen, R. W.* Ph. Mg. 41 (1871) 392-.

— thermometers. *Berthelot, M.* J. de Ps. 2 (1873) 18-.

Calorimetry at constant temperature. *Arsonval, A. d'.* C. R. 106 (1888) 1225-.

—, experimental error. *Pickering, S. U.* L. Ps. S. P. 8 (1887) 1-; Ph. Mg. 21 (1886) 324-.

— of iron at high temperatures. *Pionchon, —.* C. R. 102 (1886) 1454-; A. C. 11 (1887) 33-.

— metals at high temperatures. *Pionchon, —.* C. R. 102 (1886) 675-; 103 (1886) 1122-; A. C. 11 (1887) 33-.

Condensation method. *Joly, J.* R. S. P. 41 (1887) 352-.

Cooling method. *Regnault, V.* A. C. 9 (1843) 322-.

— —. *Bartoli, A.* Mil. I. Lomb. Rd. 28 (1895) 787-.

Correction for cooling. *Berthelot, M. J.* de Ps. 2 (1873) 345-; 10 (1881) 79-.

— — —. *Bartoli, A.*, & *Stracciati, E.* Catania Ac. Gioen. Bil. 26-28 (1892) 4.

— radiation. *Holman, S. W.* Am. Ac. P. 31 (1896) 245-.

Differential method. *Joly, J.* Nt. 30 (1884) 361.

Electric current, use. *Jamin, J.* C. R. 70 (1870) 657-.

Electrocalorimetry. *Stroud, W.*, & *Gee, W. W. H.* Elect. 21 (1888) 705-.

— *Evershed, S.*, & others. Elect. 21 (1888) 773 et seq.; 22 (1889) 24.

Heat of combustion. *Stohmann, F.*, & *Rechenberg, C. von.* Lndw. Jb. 13 (1884) 513-.

—, quantity, sensitive and convenient method of measuring. *Lussana, S.* Rv. Sc. [Ind.] 30 (1898) 176-.

Saturated liquids, complete study. *Mathias, E.* Toul. Fac. Sc. A. 10 (1896) E, 52 pp.

Specific heat. *Canestrini, E.* [1884] Padova S. Sc. At. 9 (1885) 5-.

Thermochemical work at high temperature, apparatus. *Joannis, —.* Bordeaux S. Sc. Mm. 4 (1888) xxiv-.

Thermoscope, double, for thermal experiments. *Looser, —.* Frkf. a. M. Ps. Vr. Jbr. (1893-94) 42-.

Water, anomalies. *Guillaume, C. É.* Par. S. Ps. Sé. (1898) 66*-.

Specific Heats 1620

Water equivalent of thermometers used in specific heat determinations. *Sozzani, A.* N. Cim. 5 (1897) 135-.

1620 Specific Heats of Solids and Liquids.

(See also Chemistry 7220.)

Avogadro, A. A. C. 55 (1833) 80-; 57 (1834) 113-.

Delarive, A. C. R. 10 (1840) 823-.

Cerruti, V. Rm. R. Ac. Linc. T. 1 (1877) 136-.

Morisot, —. C. R. 90 (1880) 814-.

Bohn, C. Z. Mth. Ps. 28 (1883) 83-.

Demonstration of inequalities. *Lachinov, D. A.* (xii) Rs. Ps.-C. S. J. 12 (Ps.) (1880) [(Pt. 1)] 131-.

Function *h*. *Nikolaev, V. V.* (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) [(Pt. 1)] 61-.

MEASUREMENT.

Joule, J. P. [1845] Manch. Ph. S. Mm. 7 (1846) 559-.

Thoulet, M. J. O., & *Lagarde, H.* (xii) Fr. S. Mn. Bil. 5 (1882) 179-.

Morisot, —. C. R. 97 (1883) 1426-.

Louguinine, W. Z. Instk. 16 (1896) 129-, 192. cooling method. *Neesen, —.* D. Nf. Tbl. (*1880) 135-.

electric method. *Joule, J. P.* [1847] Manch. Ph. S. Mm. 8 (1848) 375-.

— —. *Huntly, G. N.* Nt. 36 (1887) 438-.

— —. *Stroud, W.* Nt. 36 (1887) 483.

— —. *Pfaundler, L.* Wien Ak. Sb. 100 (1891) (Ab. 2a) 352-.

— —. *Schlamp, A.* Giessen Oberh. Gs. B. 31 (1896) 100-.

experimental fact. *Vargiu, G. I.* Les Mondes 10 (1866) 267-.

at high temperatures. *Ehrhardt, O.* A. Ps. C. 24 (1885) 215-.

— — —. *Sutherland, W.* Ph. Mg. 26 (1888) 298-.

Kopp's method. *Wüllner, A.* Bonn SB. Niedr. Gs. (1867) 28-.

by method of known chemical action. *Brusotti, F.* Rm. At. R. Ac. 25 (1872) 350-.

— mixture. *Bohn, C. A.* Ps. C. 122 (1864) 289-.

— —. *Poynting, J. H.* [1883] Birm. Ph. S. P. 4 (1885) 47-.

— —. *Gezechus [Hesekus], N.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 432-; J. de Ps. 7 (1888) 489-.

Specific heat and characteristic function for any body. *Phillips, É.* C. R. 86 (1878) 1290-, 1351-.

— — — — — (Phillips). *Lévy, M.* C. R. 86 (1878) 1391-.

— — near critical point, influence of pressure. *Heen, P. de.* Brux. Ac. Bil. 27 (1894) 232-.

— — and density in same series. *Moutier, J.* Par. S. Phlm. Bil. 7 (1883) 80-.

- Specific heat and elasticity. *Cantoni, G.* Mil. I. Lomb. Rd. 2 (1869) 201-, 231-, 334-.
- — — and other physical constants. *Tomlinson, H. R. S. P.* 38 (1885) 488-.
- — — energy of body. *Clausius, R. C. R.* 87 (1878) 718-.
- — — expansion. *Tredgold, T.* Tilloch Ph. Mg. 52 (1818) 251-.
- — —. *Phillips, É. C. R.* 71 (1870) 333-.
- — — latent heat, and heat of spontaneous expansion. *Fusinieri, A.* Brugnatelli G. 6 (1823) 131-.
- — — molecular pressure. *Barus, C.* Am. Ac. P. 26 (1891) 313-.
- — — state of aggregation, kinetic theory. *Walter, A.* [1881] A. Ps. C. 16 (1882) 500-.
- — — volume, laws. *Phillips, S. E.* Nt. 30 (1884) 288-.

SPECIFIC HEATS OF LIQUIDS.

- Groschans, J. A.* Arch. Néerl. 5 (1870) 1-, 193-.
- Baumgartner, G.* Carl Rpm. 17 (1881) 586-.
- Nadeždin, A. I.* Kiev S. Nt. Mm. 7 (1884) xcix-; Rs. Ps.-C. S. J. 16 (Ps.) (1884) 222-; Exner Rpm. 20 (1884) 446-.
- belonging to homologous series. *Schiff, R.* Gz. C. It. 16 (1886) 454-.
- calculation. *Pagliani, S.* Tor. Ac. Sc. At. 20 (1885) 54-.
- *Langlois, M.* C. R. 104 (1887) 420-.
- and cohesion and density. *Bartoli, A. N.* Cim. 6 (1879) 141-.
- internal forces. *Puschl, C.* Wien Ak. Sb. 98 (1890) (Ab. 2a) 173-.
- — — in water. *Puschl, C.* Wien Ak. Sb. 97 (1889) (Ab. 2a) 1118-.
- measurement. *Wartmann, É.* Arch. Sc. Ps. Nt. 38 (1870) 62-.
- *Grimaldi, G. P.* Rm. R. Ac. Linc. Rd. 7 (1891) (Sem. 2) 58-.
- *Bartoli, A., & Stracciati, E.* Catania Ac. Gioen. Bll. 23-24 (1892) 10-.
- *Litch, R. L.* Ps. Rv. 5 (1897) 182-.
- *Rosenhain, W.* Vict. R. S. P. 10 (1898) 97-.
- *Negreano, D.* C. R. 128 (1899) 875-.
- *Andrew's method, errors.* *Gumlich, E., & Wiebe, H. F.* A. Ps. C. 66 (1898) 530-.
- — — improved. *Pfaundler, L. A. Ps. C.* 67 (1899) 439-.
- near critical temperature. *Heen, P. de.* Brux. Ac. Bll. 15 (1888) 522-.
- solutions. *Mathias, E. C. R.* 107 (1888) 524-; J. de Ps. 8 (1889) 204-, 619-.
- *Tammann, G.* Z. Ps. C. 18 (1895) 625-.
- *Konovalov, D.* Rs. Ps.-C. S. J. 30 (C.) (1898) 353-; Par. S. C. Bll. 22 (1899) 3-.
- (Konovalov). *Biron, E.* Rs. Ps.-C. S. J. 30 (C.) (1898) 355-; Par. S. C. Bll. 22 (1899) 3-.
- not electrolytes. *Magie, W. F.* Ps. Rv. 9 (1899) 65-.
- and thermal effect in their formation. *Aleksyev, V. T.* [1883] (x) Rs. Ps.-C. S. J. 16 (Pt. 1) (1884) 109-; Berl. B. 17 (1884) (Ref.) 193-.
- variation with strength. *Mathias, E.* Par. S. Ps. Sé. (1888) 354-.

variation with temperature. *Heen, P. de, & Deruyts, F.* Brux. Ac. Bll. 15 (1888) 168-.

SPECIFIED LIQUIDS.

- ammonia, anhydrous. *Elleau, L. A., & Ennis, W. D.* Franklin I. J. 145 (1898) 189-, 280-.
- , liquefied. *Strombeck, E. von.* Franklin I. J. 130 (1890) 467-.
- , —. *Ludeking, C., & Starr, J. E.* Am. J. Sc. 45 (1893) 200-.
- aniline, variation with temperature. *Griffiths, E. H.* [1894] L. Ps. S. P. 13 (1895) 234-; Ph. Mg. 39 (1895) 47-, 143-.
- , —. *Bartoli, A.* Mil. I. Lomb. Rd. 28 (1895) 1032-.
- , "volume heat." *Griffiths, E. H.* Camb. Ph. S. P. 8 (1895) 303-.
- benzene. *Demerliac, —.* As. Fr. C. R. (1894) (Pt. 2) 325-.
- blood. *Hillerson, S., & Stein-Bernstein, D.* [1898] Pliste. Rs. 1 (1898-99) 43-.
- *Bordier, H. C. R.* 130 (1900) 799-; J. Pl. Pth. Gén. 2 (1900) 381-.
- brines of different specific gravity. *Strombeck, H. von.* Franklin I. J. 134 (1892) 154-.
- carbon compounds. *Schiff, R.* Z. Ps. C. 1 (1887) 376-.
- hydrocarbons (C_nH_{2n+2}). *Bartoli, A., & Stracciati, E.* Mil. I. Lomb. Rd. 29 (1896) 157-.
- *Pagliani, S.* N. Cim. 4 (1896) 146-.
- and alcohols. *Pagliani, S.* Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 1) 885-.
- lava. *Bartoli, A.* Catania Ac. Gioen. At. 3 (1891) 61-; Mil. I. Lomb. Rd. 29 (1896) 363-.
- mercury. *Hedelius, E., & Pettersson, O.* Stockh. Öfv. 35 (1878) No. 2, 35-; A. Ps. C. Beibl. 2 (1878) 398-.
- *Langlois, M.* C. R. 103 (1886) 1009-.
- (0° to 30°). *Bartoli, A., & Stracciati, E.* Mil. I. Lomb. Rd. 28 (1895) 469-.
- , variation with temperature. *Winkelmann, A. A.* A. Ps. C. 159 (1876) 152-.
- , — —. *Pettersson, O.* Stockh. Öfv. 35 (1878) No. 9, 3-; A. Ps. C. Beibl. 3 (1879) 739-.
- , — —. *Naccari, A.* Tor. Ac. Sc. At. 23 (1887-88) 594-.
- , — —. *Milthaler, J.* A. Ps. C. 36 (1889) 897-.
- , — —. *Heilborn, E.* Z. Ps. C. 7 (1891) 85-.
- , — —. *Bartoli, A., & Stracciati, E.* Catania Ac. Gioen. Bll. 26-28 (1892) 11.
- milk. *Fleischmann, W.* Münch. Ak. Sb. 4 (1874) 97-.
- oil of turpentine, isomers. *Regnault, V. A. C.* 9 (1843) 322-.
- organic liquids. *Schiff, R.* Gz. C. It. 17 (1887) 286-.
- potassium and calcium chlorides, solutions. *Drecker, J.* A. Ps. C. 34 (1888) 952-.
- saline solutions. *Person, C. C.* C. R. 31 (1850) 566-; A. C. 33 (1851) 437-, 448-.

saline solutions. *Gray, T.* Edinb. R. S. P. 10 (1880) 689-.

soda solutions, strong. *Blümcke, A.* A. Ps. C. 25 (1885) 417-.

sulphur dioxide, liquid. *Mathias, E.* C. R. 119 (1894) 404-.

sulphuric acid solutions. *Cattaneo, C.* N. Cim. 26 (1889) 50-.

water (near 4°C.). *Hirn, G. A.* C. R. 70 (1870) 592-.

— (0° to 100°C.). *Jamin, J., & Amaury,* —. C. R. 70 (1870) 661-.

— (near 4°C.). *Hirn, G. A.* C. R. 70 (1870) 831-.

—, *Wüllner, F. H. A.* A. Ps. C. 1 (1877) 592-; 10 (1880) 284-.

—, *Henrichsen, S.* A. Ps. C. 8 (1879) 83-.

—, *Neesen, F.* A. Ps. C. 18 (1883) 369-.

—, *Velten, A. W.* A. Ps. C. 21 (1884) 31-.

—, *Sutherland, W.* Ph. Mg. 26 (1888) 298-.

—, *Bartoli, A., & Stracciati, E.* Catania Ac. Gioen. Bil. 7 (1889) 3-.

—, *Eckholm, N.* Stockh. Ak. Hndl. Bh. 15 (Afd. 1) (1890) No. 6, 35 pp.

— (below 0°C.). *Martinetti, M.* Tor. Ac. Sc. At. 25 (1890) 827-.

—, *Bartoli, A., & Stracciati, E.* Catania Ac. Gioen. Bil. 18-19 (1891) 25-.

— (0° to 40°C.). *Johanson, A. M.* Stockh. Öfv. (1891) 325-; Fsch. Ps. (1891) (Ab. 2) 365-.

— (0° to 32°). *Bartoli, A., & Stracciati, E.* Catania Ac. Gioen. At. 4 (1892) Mem. 7, 96 pp.

— (— —) (Bartoli and Stracciati). *Lungo, C. del.* Catania Ac. Gioen. At. 6 (1893) Mem. 1, 3 pp.

— (0° to 31°). *Bartoli, A., & Stracciati, E.* Mil. I. Lomb. Rd. 26 (1893) 517-.

—, *Pettinelli, P.* [1898] J. de Ps. 8 (1899) 490.

— (0° to 100°C.). *Callendar, H. L., & Barnes, H. T.* Ps. Rv. 10 (1900) 202-.

— and alcohol mixtures. *Jamin, J., & Amaury,* —. C. R. 70 (1870) 1237-.

— — —, variation with temperature. *Blümcke, A.* A. Ps. C. 25 (1885) 154-.

— at constant volume. *Bartoli, A., & Stracciati, E.* Mil. I. Lomb. Rd. 27 (1894) 524-.

— near maximum density. *Pfaundler, L., & Platter, H.* D. Nf. Festschr. (*1869) 67-; Wien Sb. 62 (1870) (Ab. 2) 379-.

— — —, *Gerosa, G. G.* Rm. R. Ac. Linc. Mm. 10 (1881) 75-.

— and methyl alcohol mixtures. *Lecher, E.* [1877] Wien Sb. 76 (1878) (Ab. 2) 937-.

—, salt and fresh. *La Chabeaussière,* —. Mntp. Rec. Bil. 2 (1805) 286-.

—, sea. *Thoulet,* —, & *Chevallier,* —. C. R. 108 (1889) 794-.

—, — and lake. *Somigliana, C.* Mil. I. Lomb. Rd. 30 (1897) 154-.

—, supercooled. *Cardani, P., & Tomasini, F.* N. Cim. 21 (1887) 185-.

—, —, *Bartoli, A., & Stracciati, E.* N. Cim. 31 (1892) 133-.

water, in terms of international electric units. *Schuster, A., & Gannon, W.* [1894] Phil. Trans. (A) 186 (1896) 415-.

—, uncertainty. *Weber, W. E.* Pogg. A. 18 (1830) 608-.

—, variation. *Callendar, H. L., & Barnes, H. T.* B. A. Rp. (1899) 624-.

—, — with temperature. *Rankine, W. J. M.* [1851] Edinb. R. S. T. 20 (1853) 441-.

—, — — —, *Bosscha, J.* (vii) Pogg. A. (Jubelbd.) (1874) 549-.

—, — — —, *Rowland, H. A.* [1879] Am. Ac. P. 15 (1880) 75-.

—, — — —, *Dieterici, C.* A. Ps. C. 57 (1896) 333-.

—, — — —, *Pernet, J.* Zür. Vjschr. 41 (1896) (Festschr., Th. 2) 121-.

SPECIFIC HEATS OF SOLIDS.

Kurz, A. [1875] A. Ps. C. Ergänz. 7 (1876) 334-.

kinetic theory. *Eddy, H. T.* Science 2 (*1893) 424-, 850.

measurement. *Johnson, W. R.* Franklin I. J. 14 (1834) 306-.

—, *Amsler, J.* [1850] Zür. Mt. 2 (1850-52) 241-.

— at high temperatures. *Pionchon,* —. A. C. 11 (1887) 33-.

—, Regnault's method, criticism. *Pape, C.* A. Ps. C. 123 (1864) 277-.

— in small quantities. *Thoulet, J., & Lagarde, H.* C. R. 94 (1882) 1512-.

variation with temperature. *Zakrzewski, I.* Krk. Ak. (Mt.-Prz.) Rz. 3 (1891) 327-; Crc. Ac. Sc. Bil. (1891) 146-.

SPECIFIED SOLIDS.

alloys. *Abel, E. van.* J. de Ps. 9 (1900) 493-.

—, anomalous. *Person, C. C.* C. R. 25 (1847) 444-.

—, fusible. *Schüz, L.* A. Ps. C. 46 (1892) 177-.

—, iron-antimony. *Laborde, J.* C. R. 123 (1896) 227-.

aluminium. *Pionchon, J.* C. R. 115 (1892) 162-, 270.

antimony and compounds. *Pebal, L., & Jahn, H.* A. Ps. C. 27 (1886) 584-; 28 (1886) 696.

basalt. *Roberts-Austen, W. C., & Rücker, A.* W. B. A. Rp. (1891) 610-.

binary mixtures. *Battelli, A., & Martinetti, M.* Rm. R. Ac. Linc. Rd. 1 (1885) 621-.

boracite, variation with temperature. *Kroeker, K.* Gött. Nr. (1892) 122-.

building materials. *Hutchinson, J.* [1842] (vii Add.) C. S. P. (1843) 24-.

caoutchouc. *Gee, W. W. H., & Terry, H. L.* B. A. Rp. (1889) 516-; Manch. Lt. Ph. S. Mm. & P. 4 (1891) 38-.

carbon. *Le Chatelier, H.* C. R. 116 (1893) 1051-.

—, *Violle, J.* C. R. 120 (1895) 868-.

carbon, boron and silicon. *Weber, H. F.* A. Ps. C. 154 (1875) 367-, 553-.

— in different forms. *Delarive, A., & Marcet, F.* A. C. 2 (1841) 121-.

diamonds. *Carbonelli, C. E.* Genova S. Lig. At. 2 (1891) 354-.

ebonite, cork and palm wood. *Zinger, A., & Šteglajev, I.* Rs. Ps.-C. S. J. 27 (Ps.) (1895) 30-; J. de Ps. 5 (1896) 467-.

glasses. *Winkelmann, A.* A. Ps. C. 49 (1893) 401-.

— *Zubov, P.* Rs. Ps.-C. S. J. 28 (Ps.) (1896) 22-; J. de Ps. 6 (1897) 603.

ice. *Desains, É.* C. R. 20 (1845) 1345-; A. C. 14 (1845) 306-.

— *Person, C. C.* C. R. 20 (1845) 1457-.

— *Hess, H.* [1848] St. Pét. Ac. Sc. Bil. 9 (1851) 81-.

— *Langlois, M.* C. R. 102 (1886) 1451-.

iron (magnetised). *Wassmuth, A.* Wien Ak. Sb. 85 (1882) (Ab. 2) 997-.

— at high temperatures. *Hartley, W. N. I.* & S. I. J. (1897) (No. 1) 304-.

manganese steel. *Mitchell, A. C.* Edinb. R. S. T. 35 (1890) 947-.

marble. *Peirce, B. O., & Willson, R. W.* Nt. 61 (1899-1900) 367.

mellite. *Bartoli, A., & Stracciati, E.* N. Cim. 15 (1884) 5-.

metals. *Potter, R.* Edinb. J. Sc. 5 (1831) 75-.

— (Potter). *Johnston, J. F. W.* Edinb. J. Sc. 5 (1831) 265-.

— (Johnston). *Potter, R.* [1831] Edinb. J. Sc. 6 (1832) 163-.

— *Potter, R.* Edinb. J. Sc. 6 (1832) 166-.

— *Violle, J.* C. R. 85 (1877) 543-; 87 (1878) 981-; 89 (1879) 702-; J. de Ps. 7 (1878) 69-; 9 (1880) 81-.

— (15° to 320°). *Naccari, A.* [1887] Tor. Ac. Sc. At. 23 (1887-88) 107-.

— *Le Verrier.* C. R. 114 (1892) 907-.

— *Waterman, F. A.* Ps. Rv. 4 (1897) 161-.

— *Jaeger, W., & Diesselhorst, H.* Berl. Ak. Sb. (1899) 719-; Berl. Ps. Reichsanst. Ab. 3 (1900) 269-.

— graphite and alloys, at low temperatures. *Behn, U.* A. Ps. 1 (1900) 257-.

— of high fusing point. *Mache, H.* Wien Ak. Sb. 106 (1897) (Ab. 2a) 590-.

— at high temperatures. *Pionchon.* C. B. 103 (1886) 1122-.

— low temperatures. *Behn, U.* A. Ps. C. 66 (1898) 237-.

— *Trowbridge, C. C.* Science 8 (1898) 6-.

— quasi isotropic. *Voigt, W.* Gött. Nr. (1893) 211-.

— and other solids. *Weber, W. E.* Pogg. A. 20 (1830) 178-.

—, specific heat and internal work. *Joubin, P.* J. de Ps. 9 (1890) 554-.

— — — magnetism, relations. *Hermann, R.* Mosc. S. Nt. Bil. 7 (1834) 315-.

minerals. *Joly, J.* R. S. P. 41 (1887) 250-.

— *Sella, A.* Gött. Nr. (1891) 311-.

organic solids. *Heen, P. de.* Brux. Ac. Bil. 5 (1883) 757-.

platinum. *Violle, J. L. G.* [1877] (xn) Isère S. Bil. 8 (1879) 20-, 107-.

— *Hoadley, J. C.* Franklin I. J. 84 (1882) 91-.

—, silver, tin, lead and copper. *Bartoli, A., & Stracciati, E.* Mil. I. Lomb. Rd. 28 (1895) 524-.

quartz, variation with temperature. *Pionchon.* C. R. 106 (1888) 1344-.

rocks of the Campagna. *Morano, F.* Rm. R. Ac. Linc. Rd. 7 (1898) (Sem. 2) 61-, 357-.

—, igneous. *Barus, C.* Ph. Mg. 35 (1893) 296-.

— and minerals, Sicilian. *Bartoli, A.* N. Cim. 30 (1891) 231-.

salts soluble in water. *Rudberg, F.* Pogg. A. 35 (1835) 474-.

slags. *Hove, H. M.* Am. I. Mn. E. T. 18 (1890) 724-.

soil constituents, experimental determination. *Ulrich, R.* Forsch. Ag.-Ps. 17 (1894) 1-.

uranium. *Blümcke, A.* A. Ps. C. 24 (1885) 263-.

vulcanite. *Mayer, A. M.* Am. J. Sc. 41 (1891) 54-.

Thermal capacity. *Donnini, P.* N. Cim. 15 (1876) 214-.

True thermal capacity. *Göransson, B.* Lund Acta Un. 7 (1870) (Mth.) No. 4, 22 pp.

— — — and disgregation of a body. *Clausius, R.* Arch. Sc. Ps. Nt. 24 (1865) 117-.

— — — — — (Clausius). *San Roberto, P. di.* Arch. Sc. Ps. Nt. 25 (1866) 34-.

— — — — — *Budde, E.* A. Ps. C. 141 (1870) 426-.

— — — heat-content. *Robin, G.* [1879] Par. S. Phlm. Bil. 4 (1880) 8-.

Variation with temperature. *Wassmuth, A.* Mh. Mth. Ps. 1 (1890) 473-.

— — — *Sohncke, L.* Münch. Ak. Sb. 27 (1898) 337-.

Volatile bodies, relation between latent heat, specific heat and specific volume. *Trouton, F. T.* Nt. 27 (1883) 292.

Water, total heat, recalculated from experiments of Regnault and Rowland. *Shaw, W. N.* B. A. Rp. (1896) 162-.

1640 Specific Heats of Gases and Vapours.

(See also Chemistry 7220.)

Heat of permanent gases. *Plana, G.* [1842] Tor. Mm. Ac. 5 (1843) 283-.

Hydrostat, use. *Hirn, G. A.* A. Gén. Civ. 2 (1863) (pte. 2) 113-, 153-.

Kinetic theory of polyatomic gases. *Richarz, F.* Berl. Ps. Gs. Vh. (1891) 73-; A. Ps. C. 48 (1893) 467-.

Mixture of liquid and vapour, specific heat at constant volume. *Olearski, K.* [1892] Krk. Ak. (Mt.-Prz.) Rz. 6 (1893) 112-; Crc. Ac. Sc. Bil. (1892) 297-.

RATIO OF SPECIFIC HEATS.

- Greguss, G.* (xn) *Mag. Ak. Éts. (Mth. Term.)* 6 (1865) 63-.
- Müller, J. J.* *A. Ps. C.* 154 (1875) 113-.
- Moutier, J.* *Par. S. Phlm. Bll.* 2 (1878) 81-.
- Müller, P. A.* [1882] *A. Ps. C.* 18 (1883) 94-.
- Burton, C. V.* *Ph. Mg.* 24 (1887) 166-.
- Bogaevskij, L. G.* *Rs. Ps.-C. S. J.* 29 (*Ps.*) (1897) 97-; *Fschr. Ps.* (1897) (*Ab.* 2) 332.
- Boltzmann, L.* *C. R.* 127 (1898) 1009-.
- air. *Meikle, H.* *Edinb. N. Ph. J.* 2 (1827) 328-.
- *Rose-Innes, J.* *Ph. Mg.* 48 (1899) 286-.
- , and *Poisson's* law. *Kurz, A.* *Carl Rpm.* 16 (1880) 719-.
- argon. *Carbonelli, C. E.* *Genova S. Lig. At.* 7 (1896) 32-.
- calculation. *Moon, W.* *Ph. Mg.* 18 (1884) 372-.
- (*Moon*). *Lodge, O. J.* *Ph. Mg.* 18 (1884) 472.
- *Sluginov, N. P.* *Kazan S. Nt. (Ps.-Mth.)* P. 5 (1887) 170-.
- , *Clément* and *Désormes's* experiment. *Bauer, K. L.* *Carl Rpm.* 16 (1880) 43-.
- , — — —, history. *Maneuvrier, G.* *Par. S. Ps. Sé.* (1895) 233-.
- , — — — method. *Swyngedaw, R. J.* *de Ps.* 6 (1897) 129-.
- carbon dioxide. *Amagat, E. H.* *C. R.* 121 (1895) 863-, 968.
- compound gases. *Capstick, J. W.* [1895] *Phil. Trans. (A)* 186 (1896) 567-.

Measurement.

- Jamin, J., & Richard, —.* *C. R.* 71 (1870) 336-.
- Amagat, E. H.* *C. R.* 77 (1873) 1325-.
- Moutier, J.* *Par. S. Phlm. Bll.* 4 (1880) 170-.
- Paquet, E.* *J. de Ps.* 4 (1885) 30-.
- Amagat, —.* *J. de Ps.* 4 (1885) 174-.
- Lummer, O., & Pringsheim, E.* *Berl. Ps. Gs. Vh.* (1887) 136-; *B. A. Rp.* (1894) 565-.
- Pringsheim, E. D. Nf. Vh.* (1894) (*Th.* 2, *Hälfte* 1) 85-.
- Sack, P.* *Offenb. Vr. Nt. B.* 33-36 (1895) 71-.
- Maneuvrier, G.* *Par. S. Ps. Sé.* (1896) 243-.
- Maneuvrier, G., & Fournier, J. C.* *R.* 123 (1896) 228-.
- Leduc, A.* *C. R.* 125 (1897) 1089-, 1138.
- acetylene. *Maneuvrier, G., & Fournier, J. C.* *R.* 124 (1897) 183-.
- air. *Weisbach, J.* *Civing.* 5 (1859) 46-.
- *Maneuvrier, G.* *C. R.* 120 (1895) 1398-; *A. C.* 6 (1895) 321-; *Par. S. Ps. Sé.* (1895) 250-.
- , oxygen, carbon-dioxide and hydrogen. *Lummer, O., & Pringsheim, E.* [1898] *A. Ps. C.* 64 (1898) 555-; *Smiths. Ct.* 29 (1903) *Art.* vi, 29 pp.
- by expansion hygrometer. *Cozza, R.* *Arch. Sc. Ps. Nt.* 10 (1900) 132-.
- Kohlrausch's* experiment. *Boltzmann, L. A.* *Ps. C.* 141 (1870) 473-.
- monatomic gases. *Yvon-Villarceau, A. J. F.* *C. R.* 82 (1876) 1127-, 1175-.
- superheated steam. *Cohen, R.* *A. Ps. C.* 37 (1889) 628-.
- and phosphorus. *Lucchi, G. de.* *Ven. I. At.* 7 (1880-81) 1305-.
- by velocity of sound. *Kayser, H.* *A. Ps. C.* 2 (1877) 218-.
- relation to physical properties. *Violi, A.* *Rm. R. Ac. Linc. T.* 7 (1883) 112-.
- variation with temperature. *Leduc, A.* *C. R.* 127 (1898) 659-.
- — — and pressure. *Amagat, E. H.* *C. R.* 122 (1896) 66-; *Par. S. Ps. Sé.* (1896) 24-.
- Small oscillations of gases, influence of temperature. *Gromeka, J.* *Fschr. Mth.* (1888) 1098.

SPECIFIC HEATS OF GASES.

- Haycraft, W. T.* [1823] *Edinb. R. S. T.* 10 (1826) 195-.
- Delarive, A., & Marcet, F.* *A. C.* 35 (1827) 5-.
- Dulong, P. L.* [1828] *Par. Mm. Ac. Sc.* 10 (1831) 147-.
- Delarive, A., & Marcet, F.* *A. C.* 41 (1829) 78-.
- Apjohn, Jas. B. A. Rp.* (1835) (*pt.* 2) 30-.
- Delarive, A., & Marcet, F.* [1835] *A. C.* 75 (1840) 113-.
- Apjohn, Jas.* [1837-38] *Ir. Ac. T.* 18 (1838) 1-; *Ir. Ac. P.* 1 (1841) 206-.
- Regnault, G.* *Moigno Cosmos* 2 (1853) 539-.
- Schmidt, G.* *Dingler* 200 (1871) 19-.
- Berthelot, M.* *Rv. Sc.* 17 (1879) 6-.
- Margules, M.* *Wien Az.* 25 (1889) 135-.
- Lussana, S. N.* *Cim.* 36 (1894) 5-, 70-, 130-; 1 (1895) 327-; 3 (1896) 92-; *Ven. I. At.* (1896-97) 1018-; *N. Cim.* 6 (1897) 81-; 7 (1898) 365-.
- Petrini, H.* *Z. Ps. C.* 16 (1895) 97-.
- Leduc, A. C. R.* 127 (1898) 860-; *A. C.* 17 (1899) 484-.
- at constant volume. *Cazin, A.* *Les Mondes* 20 (1869) 672-.
- — — *Moutier, J.* *C. R.* 71 (1870) 807-.
- — — *Joly, J. R. S. P.* 45 (1889) 33-.
- — — *Bickerton, —.* *Aust. As. Rp.* (1891) 117.
- — —, measurement. *Graf, J. H.* *Bern Mt.* (1880) 71-.
- — —, new method. *Akin, (Dr.) C. K.* *Ph. Mg.* 27 (1864) 341-.
- — —, variation. *Wallner, F. H. A. A.* *A. Ps. C.* 4 (1878) 321-.
- error in *Apjohn's* formula. *Hudson, H.* *Ph. Mg.* 8 (1836) 21-.
- at high temperatures. *Berthelot, M., & Vieille, —.* *C. R.* 98 (1884) 770-.
- — — *Mallard, E., & Le Chatelier, H.* *Par. S. Ps. Sé.* (1888) 308-.
- — — *Stimpfl, G.* *Dingler* 290 (1893) 213-, 235-.
- — — *Fliegner, A.* *Zür. Vjschr.* 44 (1899) 192-.

1640 Specific Heat of Gases and Vapours.

Atomic Heat 1660

- laws. *Amagat, E. H.* C. R. 130 (1900) 1443-
measurement, new method. *Wiedemann, E.*
E. G. Arch. Sc. Ps. Nt. 51 (1874) 73-;
56 (1876) 273; A. Ps. C. 157 (1876) 1-
and properties of isothermals. *Amagat, E. H.*
C. R. 122 (1896) 120-
— refractive power of gases, relation. *Avogadro,*
A. [1817-26] Mod. Mm. S. It. 18 (1818)
154-; Tor. Mm. Ac. 33 (1829) 49-
variation. *Prevost, P.* Gen. Mm. S. Ps. 4
(1828) 255-, 479-
— *Winkelmann, A. A.* A. Ps. C. 159 (1876)
177-
— *Wittwer, W. C.* Z. Mth. Ps. 24 (1879)
193-
— *Linde, C.* Münch. Ak. Sb. 27 (1898) 485-
— *Sohncke, L.* A. Ps. C. 66 (1898) 111-

SPECIFIED GASES.

- air. *Thomson, (Sir) W.* Camb. and Dubl.
Mth. J. 8 (1853) 250-
— *Kurz, A.* A. Ps. C. 151 (1874) 173-
— *Casalunga, D. A.* Par. Ing. Civ. Mm.
(1878) 109-
— *Kurz, A.* Exner Rpm. 20 (1884) 161-
—, carbon dioxide and hydrogen at constant
volume. *Joly, J.* [1890] Phil. Trans. (A)
182 (1892) 73-
— at constant pressure. *Joule, J. P.* Ph.
Mg. 6 (1853) 143-
— — — *Leduc, A.* C. R. 126 (1898)
1860-
— — — volume. *Kohlrausch, F.* A. Ps. C.
136 (1869) 618-
— — — *Witte, L.* A. Ps. C. 138 (1869)
155-; 140 (1870) 657-; 141 (1870) 317-
— — — (Kohlrausch). *Kurz, A.* A. Ps.
C. 138 (1869) 335-
— and steam. *Rankine, W. J. M.* [1850-57]
Edinb. R. S. T. 20 (1853) 191-; Edinb. R.
S. P. 3 (1857) 5-, 287-
carbon dioxide, compressed. *Margules, M.*
Wien Ak. Sb. 97 (1889) (Ab. 2a) 1385-
— at constant volume. *Joly, J.* [1894]
Phil. Trans. (A) 185 (1895) 943-
— — —, as function of temperature.
Joly, J. [1894] Phil. Trans. (A) 185 (1895)
961-
— —, variation at high temperatures. *Valérius,*
H. Brux. Ac. Bll. 48 (1879) 601-
chlorine. *Kundt, —.* D. Nf. Tbl. (*1879) 184.

SPECIFIC HEATS OF VAPOURS.

- Lubbock, J. W.* Ph. Mg. 31 (1847) 90-; 9
(1855) 25-
(saturated.) *Moutier, J. J.* de Ps. 2 (1873) 178-
(—) *Müller, J. J.* A. Ps. C. (*Jubelbd.*) (1874)
227-
(—) *Poinier, P. P.* Franklin I. J. 69 (1875)
227-
(variation.) *Wiedemann, E. E. G.* A. Ps. C.
2 (1877) 195-
Pellat, H. J. de Ps. 7 (1878) 117-
(saturated.) *Waals, J. D. van der.* Amst. Ak.
Vs. M. 12 (1878) 169-; A. Ps. C. Beibl. 2
(1878) 328-

- (saturated.) *Bouty, E. J.* de Ps. 4 (1885) 28-
Morera, G. Rm. R. Ac. Linc. Rd. 7 (1891)
(Sem. 2) 119-
(saturated.) *Mathias, E.* C. R. 119 (1894) 849-;
Toul. Fac. Sc. A. 12 (1898) E, 17 pp.

SPECIFIED VAPOURS.

- acetic acid and nitrogen tetroxide. *Threlfall,*
R. Ph. Mg. 23 (1887) 223-
ether. *Tsuruta, K.* Ph. Mg. 48 (1899) 288-
mercury. *Kundt, A., & Warburg, E.* [1875]
A. Ps. C. 157 (1876) 353-
— *Naumann, A.* Berl. B. 8 (1875) 1063-
— (Naumann). *Kundt, A., & Warburg, E.*
Berl. B. 8 (1875) 1514-
steam. *Stefan, J.* Pogg. A. 110 (1860) 593-
— *Gray, J. M. F. L.* Ps. S. P. 5 (1884)
87-; Ph. Mg. 13 (1892) 337-
— *Antoine, C.* C. R. 109 (1889) 366-
— *Tumlirz, O.* Wien Ak. Sb. 108 (1899)
(Ab. 2a) 1395-
—, applied to steam engine theory. *Frank, A.*
Hann. Archt.-Vr. Z. 37 (1891) 337-
— at constant pressure. *Tumlirz, O.* Wien
Ak. Sb. 106 (1897) (Ab. 2a) 654-
—, superheated. *Ewing, J. A., & Dunkerley,*
S. B. A. Rp. (1897) 554-
water vapour and carbon dioxide at high
temperatures. *Berthelot, M., & Vieille, —.*
C. R. 98 (1884) 852-

- Steam in gas generators. *Schoeffel, R.* Berg-
Hm. Ztg. 43 (1884) 205.
— — —, use, thermochemistry. *Schmidt,*
A. Berg. Hm. Ztg. 43 (1884) 25-
Temperature, law. *Meikle, H.* Thomson A.
Ph. 12 (1826) 366-
Vapours, total heat. *Antoine, C.* A. C. 26
(1892) 426-

1660 Chemical Constitution and Specific Heat (Dulong and Petit Law, etc.). (See also Chemistry 7220.)

ATOMIC HEAT.

- Hermann, R.* Mosc. S. Nt. N. Mm. 3 (1834)
135-
Schmidt, G. [1865] Wien Sb. 52 (1866) (Ab. 2)
417-
Aluimov, I. P. [1872] (xii) Rs. C. Ps. S. J.
5 (Pt. 1) (1873) 63-
Rabuteau, —. Par. S. Bl. Mm. 34 (*1882)
(C. R.) 376-
Additivity. *Meyer, S.* Wien Ak. Sb. 109
(1900) (Ab. 2a) 405-
Atomic heat of gases, expansion and mechanical
equivalent. *Violi, A.* Rm. R. Ac. Linc. T.
7 (1883) 243-
— and kinetic theory of gases. *Donnini, P.*
N. Cim. 5 (1879) 97-
Calculation on mechanical theory of heat.
Sandrucci, A. Rv. Sc.-Ind. 18 (1886) 129-

DULONG AND PETIT LAW.

- Potter, R.* Edinb. J. Sc. 5 (1831) 75-.
- Stefan, J.* Wien SB. 36 (1859) 85-.
- Moutier, J.* [1876] Par. S. Phlm. Bl. 1 (1877) 3-.
- Willotte, H.* C. R. 89 (1879) 540-, 568-.
- Moutier, J.* Rv. Sc. 18 (1880) 1174-; Par. Éc. Pol. J. Cah. 53 (1883) 31-.
- Rydberg, V. R.* Sk. Nf. F. (1892) 364-.
- Richarz, F. A.* Ps. C. 48 (1893) 708-; 67 (1899) 702-.
- exceptions. *Carbonelli, C. E.* Genova S. Lig. At. 3 (1892) 3-.
- and mechanical theory. *Mann, F.* Würzb. Ps. Md. Sb. (1890) 91-, 97-.
- probable extension. *Cantoni, G.* Rm. R. Ac. Linc. Rd. 2 (1886) (Sem. 2) 3-.
- theoretical deduction. *Staißmüller, H. A.* Ps. C. 65 (1898) 670-.
- variation. *Hirn, G. A.* C. R. 76 (1873) 191-.
- and Westyn's law, mechanical interpretation. *Ledieu, A. C. H.* C. R. 78 (1874) 30-.
- Naumann's theory.* *Budde, E.* Bonn SB. Niedr. Gs. 27 (1870) 101-; D. C. Gs. B. 3 (1870) 726-.

Atomic volume, constant, consequences of hypothesis. *Buys-Ballot, C. H. D.* Utr. Prv. Gn. Aant. (1881) 6-.

Composition of vapours, calculation from their coefficients of expansion and latent heats of liquefaction. *Langlois, M.* C. R. 102 (1886) 1231-.

Molecular heat of bodies. *Cantoni, G.* Rm. R. Ac. Linc. Rd. 2 (1886) (Sem. 2) 43-.

— — dissociable gaseous compounds. *Ponsot, —.* C. R. 131 (1900) 990-.

— — gases. *Le Chatelier, H.* C. R. 104 (1887) 1780-.

— — polyatomic gases. *Fliegner, A.* Zür. Vjschr. 45 (1900) 137-.

Specific heat of compound gases. *Avogadro, A.* Bb. It. 4 (1816) 478-; 5 (1817) 73-; Bb. Un. 29 (1840) 142-.

— — and density. *Sluginov, N. P.* Rs. Ps. C. S. J. 19 (Ps.) (1887) 17-.

— —, laws. *Dupré, A.* C. R. 58 (1864) 163-.

— — of metals. *Waterman, F. A.* Ps. Rv. 4 (1897) 161-.

Thermal capacity of gases, and their composition. *Mollet, J. J.* de Ps. 90 (1820) 113-.

— — —, law. *Sluginov, N. P.* J. de Ps. 9 (1880) 48-.

— —, molecular velocity and melting point of an element. *Sandrucci, A.* N. Cim. 19 (1886) 64-.

1670 Heats of Fusion.

- Desprez, C.* C. R. 11 (1840) 806-; Pogg. A. 52 (1841) 177-.
- Person, C. C.* C. R. 23 (1846) 162-, 336-; A. C. 21 (1847) 295-; 24 (1848) 129-; 27 (1849) 250-.

- (Person.) *Delarive, A.* Bb. Un. Arch. 9 (1848) 5-.
- Person, C. C.* C. R. 29 (1849) 300-; Pogg. A. 74 (1849) 409-, 509-; 76 (1849) 426-, 586-.
- Morris, C.* J. Sc. 3 (1881) 584-, 640-.
- Change of state, theory of disappearance of heat. *Irvine, W.* Nicholson J. 6 (1803) 25-.
- — —, variation in heat. *Moutier, J.* [1877] Par. S. Phlm. Bl. 2 (1878) 68-.
- Heat of fusion and pressure. *Tammann, G.* A. Ps. C. 67 (1899) 871-.
- — — thermal capacity. *Pickering, S. U.* R. S. P. 49 (1891) 11-.
- Latent heat, anomalous result of liberation. *Erman, P.* Berl. Ab. (1825) 107-.
- — and coefficient of elasticity. *Person, C.* C. C. R. 27 (1848) 258-; A. C. 24 (1848) 265-.
- — of freezing, and means of utilising. *Lecoq, H.* Auvergne A. Sc. 24 (1851) 432-.
- — liquids and vapours. *Dyer, J. C.* Manch. Lt. Ph. S. P. 7 (1868) 198-.
- — and sensible heat. *Vermehr, J. L. H. C.* Leijd. A. Ac. (1830-31) 42 pp.
- — of water below 0°, with remarks on formation of ice in sea. *Pettersson, O.* Stockh. Öfv. 35 (1878) No. 2, 53-; A. Ps. C. Beibl. 2 (1878) 399-.

SPECIFIED SUBSTANCES.

- Aluminium. *Pionchon, J.* C. R. 115 (1892) 162-, 270.
- Benzene. *Demerliac, —.* As. Fr. C. R. (1894) (Pt. 2) 325-.
- Binary alloys of lead, tin, bismuth and zinc. *Mazzotto, D.* Mil. I. Lomb. Mm. 16 (1891) 1-.
- mixtures. *Battelli, A., & Martinetti, M.* Rm. R. Ac. Linc. Rd. 1 (1885) 621-.
- Formic and acetic acids, crystallisation. *Pettersson, O.* Stockh. Öfv. 35 (1878) No. 9, 17-.
- Ice. *Desains, P., & La Provostaye, F. de.* C. R. 16 (1843) 837-; Pogg. A. 59 (1843) 163-; 62 (1844) 30-.
- *Wartmann, É.* [1844] Laus. Bl. S. Vd. 1 (1842-45) 287-.
- *Hess, H.* [1848] St. Pét. Ac. Sc. Bl. 9 (1851) 81-.
- *Person, C. C.* C. R. 30 (1850) 526-; A. C. 30 (1850) 73-.
- *Ångström, A. J.* Pogg. A. 90 (1853) 509-.
- *Jamin, J.* C. R. 70 (1870) 715-.
- *Langlois, M.* C. R. 102 (1886) 1451-.
- *Zakrzewski, I.* [1892] Krk. Ak. (Mt.-Prz.) Rz. 4 (1893) 247-; A. Ps. C. 47 (1892) 155-.
- , experiments of Laplace and Lavoisier. *Renou, E.* C. R. 70 (1870) 929-, 1043.
- — — — (Renou). *Jamin, J.* C. R. 70 (1870) 969-.
- Lead and tin and alloys. *Rudberg, F.* Stockh. Ak. Hndl. (1829) 157-; Pogg. A. 18 (1830) 240-; 19 (1830) 125-.

Mercury. *Person, C. C.* C. R. 25 (1847) 334-;
A. C. 24 (1848) 257-.
— *Langlois, M.* C. R. 103 (1866) 1009-.
Pig-iron and other metals. *Minary, —, & Rézal, —.* A. Mines 19 (1861) 401-.
Platinum. *Violle, J. L. G.* [1877] (xii) Isère S. Bll. 8 (1879) 20-, 107-.
Wax, metals, etc. *Irvine, W.* Nicholson J. 9 (1804) 45-.

1680 Heats of Vaporisation.

Despretz, C. A. C. 24 (1823) 323-.
Person, C. C. C. R. 17 (1843) 495-.
Andréus, T. [1847] C. S. J. 1 (1849) 27-.
Legrand, J. N. C. R. 42 (1856) 213-.
Groshans, J. A. Arch. Néerl. 5 (1870) 1-, 193-.
Moutier, J. Par. S. Phlm. Bll. 1 (1877) 17-;
4 (1880) 247-.
Puschl, K. [1880] Wien Ak. Sb. 82 (1881) (Ab. 2) 1102-.
Morris, C. J. Sc. 3 (1881) 584-, 640-.
Walter, A. [1881] A. Ps. C. 16 (1882) 500-.
Bouty, E. J. de Ps. 4 (1885) 26-.
Fuchs, K. Exner Rpm. 26 (1890) 345-.
Jüger, G. Wien Ak. Sb. 100 (1891) (Ab. 2a) 1122-.
Bakker, G. Z. Ps. C. 10 (1892) 558-.
Tsuruta, K. J. de Ps. 2 (1893) 272-.
Pagliani, S. N. Cim. 2 (1895) 312-.
Louguinine, W. A. C. 7 (1896) 251-.
Müner, S. R. Ph. Mg. 43 (1897) 291-, 464.
Thiesen, M. Berl. Ps. Gs. Vh. (1897) 80-.
Groshans, J. A. A. Ps. C. 64 (1898) 778-.
Louguinine, W. A. C. 13 (1898) 289-.
Caloric, quantity necessary to produce equal volumes of vapours. *Apjohn, Jas.* Ir. Ac. P. 5 (1853) 272-.
Change of state, theory of disappearance of heat. *Irvine, W.* Nicholson J. 6 (1803) 25-.
— — — — — variation in heat. *Moutier, J.* [1877] Par. S. Phlm. Bll. 2 (1878) 68-.
Heat of gases and vapours. *Poisson, S. D.* A. C. 23 (1823) 337-.
— — — — — vaporisation, and expansion. *Groshans, J. A.* A. Ps. C. 64 (1898) 789-.
— — — — — influence of electrification. *Fontaine, É. J.* de Ps. 6 (1897) 16-.
— — — — — and internal condition. *Puschl, K.* Wien Ak. Sb. 75 (1877) (Ab. 2) 745-.
— — — — — specific heat; and alcoholic engines. *Meikle, H.* Tilloch Ph. Mg. 63 (1826) 34-.
— — — — — theory of elastic fluids. *Pouillet, C. S. M.* C. R. 24 (1847) 915-.
— — — — — vapour density found by vapour calorimeter. *Allen, H. N.* [1890] Nebr. Un. Stud. 1 (1888-92) 195-.
— — — — — pressures. *Rodzevič, N. M.* Rs. Ps.-C. S. J. 30 (Ps.) (1898) 183-; J. de Ps. 9 (1900) 55-.
Latent and specific heat of water-vapour as means of heating. *Taddei, G.* (xii) Firenze Ac. Georg. At. 11 (1833) 65-.
Law. *Person, C. C.* C. R. 23 (1846) 524-.
— *Le Chatelier, H.* Par. S. C. Bll. 47 (1887) 4, 289.
— *Tumirz, O.* Wien Ak. Sb. 101 (1892) (Ab. 2a) 184-.

Law, Van der Waals's. Darzens, G. C. R. 124 (1897) 610-.
Measurement. *Trouton, F.* Nt. 30 (1884) 187.
— *Pagliani, S.* Rm. R. Ac. Linc. Rd. 3 (1894) (Sem. 1) 249-.
— *Louguinine, —.* Par. S. Ps. Sé. (1899) 66*-.
— at 0° C. by Bunsen's ice calorimeter. *Svensson, A.* Stockh. Öfv. (1895) 537-; Fsehr. Fs. (1895) (Ab. 2) 398.
— by calorimetry. *Mathias, E.* C. R. 106 (1888) 1146-.
— — — — — steam calorimeter. *Wirtz, K.* A. Ps. C. 40 (1890) 438-.
Relation to other magnitudes. *Kraevič, K. D.* Rs. Ps.-C. S. J. 21 (Ps.) (1889) 137-; J. de Ps. 9 (1890) 535.
— — — — — physical properties. *Aubel, E. van.* J. de Ps. 5 (1896) 70-.
— — — — — pressure. *Clausius, R.* Pogg. A. 82 (1851) 274-.
— — — — — temperature. *Heen, P. de.* Brux. Ac. Bll. 8 (1884) 210-.
— — — — — and pressure. *Ure, Andr.* Phil. Trans. (1818) 338-.
— — — — — (Ure). *Tredgold, T.* Tilloch Ph. Mg. 66 (1825) 277.
— — — — — *Linebarger, C. E.* Am. J. Sc. 49 (1895) 380-.
— — — — — thermal capacity of liquids. *Nadeždin, A. I.* [1885] Kiev S. Nt. Mm. 8 (1) (1886) ii-.

SPECIFIED SUBSTANCES.

Air and carbon dioxide. *Behn, U.* A. Ps. 1 (1900) 270-.
Ammonia, liquefied. *Strombeck, H. von.* Franklin I. J. 130 (1890) 467-; 131 (1891) 470-.
Benzene. *Griffiths, E. H., & Marshall, (Miss) D.* [1895] L. Ps. S. P. 14 (1896) 16-; Ph. Mg. 41 (1896) 1-.
Carbon dioxide near critical temperature. *Mathias, E.* C. R. 109 (1889) 470-.
Hydrochloric acid. *Tsuruta, K.* Ph. Mg. 35 (1893) 435-.
Liquefied gases. *Mathias, E. A. C.* 21 (1890) 69-; Par. S. Ps. Sé. (1890) 122-.
— — — — — *Bakker, G.* J. de Ps. 6 (1897) 131-.
Liquids at boiling points. *Marshall (Miss) D., & Ramsay, W.* [1895] L. Ps. S. P. 14 (1896) 57-; Ph. Mg. 41 (1896) 38-.
Mercury. *Langlois, M.* C. R. 103 (1886) 1009-.
Organic compounds. *Jahn, H.* Z. Ps. C. 11 (1893) 787-.
Volatile bodies, relation between latent heat, specific heat and specific volume. *Trouton, F. T.* Nt. 27 (1883) 292.
— liquids. *Chappuis, J. C.* R. 104 (1887) 897-; 106 (1888) 1007-; A. C. 15 (1888) 498-.
Water. *Pambour, F. M. G. de.* Pogg. A. 59 (1843) 587-.
— *Murphy, J. J.* (xii) Belfast NH. S. P. (1875-76) 42-.

1690 Heats of Transformation

- Water (at 0°). *Dieterici, C.* A. Ps. C. 37 (1889) 494-.
- , *Ekhholm, N.* Stockh. Ak. Hndl. Bh. 15 (Afd. 1) (1890) No. 6, 35 pp.
- , *Hartog, P. J., & Harker, J. A.* [1893] Nt. 49 (1893-94) 5.
- , *Griffiths, E. H.* [1895] Phil. Trans. (A) 186 (1896) 261-.
- , *Nipher, F. E.* St. Louis Ac. T. 6 (1895) xvi.
- , *Harker, J. A.* Manch. Lt. Ph. S. Mm. & P. 10 (1896) 38-.
- from saturated salt solutions. *Trouton, F. T.* [1899] Ir. Ac. T. 31 (1896-1901) 345-.
- Zinc and cadmium. *Sutherland, W.* Ph. Mg. 46 (1898) 345-.

1690 Heats of Dissolution.

(See also Chemistry 7230.)

- Ammonia, heat of absorption by water. *Strombeck, H. von.* Franklin I. J. 131 (1891) 71-.
- Heat of dissolution of gases in liquids. *Pickering, S. U.* Ph. Mg. 34 (1892) 35-.
- solution, especially of $\text{CdSO}_4 \cdot 8/3 \text{H}_2\text{O}$. *Holsboer, H. B.* [1900] Amst. Ak. Vs. 9 (1901) 399-; Amst. Ak. P. 3 (1901) 467-.

1695 Heats of Transformation.

- Moutier, J.* C. R. 76 (1873) 365-.
- Alloys, heat of combination of metals in formation. *Galt, A. B.* A. Rp. (1898) 787-.
- , —, —, —, —, —. *Brit. Ass. Comm.* B. A. Rp. (1899) 246-.
- , thermal changes in formation. *Mazzotto, D.* Mil. I. Lomb. Rd. 18 (1885) 165-.
- Ammonium nitrate. *Bellati, M., & Romanese, R.* Ven. I. At. (1885-86) 1395-.
- Coagulation of milk. *Berminzone, M. R.* Genova S. Lig. At. 11 (1900) 277-.
- Iron and steel at a bright red heat, peculiarities. *Newall, H. F.* Ph. Mg. 24 (1887) 435-.
- , —, critical points. (Latent heat of hardening.) *Osmond, F. I. & S. I. J.* (1890) (No. 1) 38-.
- wire, molecular changes at low red heat. *Barrett, W. F.* Ph. Mg. 46 (1873) 472-.
- Metals, change of condition at high temperatures. *Pionchon, —.* A. C. 11 (1887) 33-.
- Potassium nitrate. *Bellati, M., & Romanese, R.* Ven. I. At. (1884-85) 653-.
- , temperature of transformation in presence of other nitrates. *Bellati, M., & Lussana, S.* Ven. I. At. (1890-91) 995-.

RECALESCENCE.

- Shand, R.* Tel. J. 26 (1890) 247.
- investigation methods. *Smith, F. J.* Ph. Mg. 31 (1891) 433-.
- iron. *Forbes, G.* [1874] Edinb. R. S. P. 8 (1875) 363-.
- , *Tomlinson, H.* L. Ps. S. P. 9 (1888) 107-; Ph. Mg. 25 (1888) 103-.
- , *Hopkinson, J.* R. S. P. 45 (1889) 455-.

Change of State 1800

- iron. *Thomson, E.* Tel. J. 24 (1889) 471.
- , *Terešin, S. J., & Rozing, B. L.* Rs. Ps. C. S. J. 26 (Ps.) (1894) 200-.
- and steel, anomalous changes during recalescence. *Svedelius, G. E.* Jern-Kont. A. 51 (1897) 202-; Ph. Mg. 46 (1898) 173-.
- and magnetism. *Hopkinson, J.* R. S. P. 48 (1891) 442-.
- steel. *Newall, H. F.* Ph. Mg. 25 (1888) 510-.
- , *Thomson, E.* Tel. J. 24 (1889) 616-.

- Silver and copper sulphides and selenides. *Bellati, M., & Lussana, S.* Ven. I. At. (1888-89) 1051-.
- iodide, dimorphism. *Mallard, E., & Le Chatelier, —.* Par. S. Ps. Sé. (1885) 18-.

PHENOMENA OF CHANGE OF STATE.

1800 General.

- Wills, T.* Phm. J. 5 (1875) 990-.
- Berthelot, M.* Rv. Sc. 17 (1879) 6-.
- Absorption of gases, resulting change in density and volume of liquid. *Ångström, K.* Stockh. Öfv. (1887) 415-.
- Artificial rain. *Errera, L.* [1896] Ciel et Terre 17 (1896-97) 353-.
- Bodies in gaseous and cloudy states. *Ladame, H.* [1859] Neuch. Bl. 5 (1859-61) 155-.
- Calorimetric study of a salt. *Monnet, E.* Bordeaux S. Sc. PV. (1896-97) 15-; Bordeaux S. Sc. Mm. 3 (1899) 41-.
- Carbon dioxide, solid, experiment. *Prytz, K.* Ph. Mg. 39 (1895) 308.
- Change of state as affecting communication of heat. *Gill, J.* Ph. Mg. 32 (1866) 420-.
- , —, effect of pressure. *Ponsot, A.* C. R. 123 (1896) 595-.
- , —, and free energy. *Moutier, J.* Par. Éc. Pol. J. 57 (1887) 99-.
- Condensers, theory. *Dwelschawers-Dery, V.* Rv. Un. Mines 5 (1889) 225-.
- Density of saturated vapour and laws of solidification and evaporation of solvent. *Raoult, E. M.* Z. Ps. C. 13 (1894) 187-.
- Disintegration of electrically heated platinum and palladium wire. *Stewart, W.* A. Ps. C. 66 (1898) 88-.
- , —, —, wires, and metallic vapours formed. *Toepler, M.* A. Ps. C. 65 (1898) 873-.
- , —, glowing metals. *Berliner, A.* A. Ps. C. 33 (1888) 289-.
- , —, —, platinum. *Kayser, H.* A. Ps. C. 34 (1888) 607-.
- Evaporation, melting and sublimation. *Planck, M.* A. Ps. C. 15 (1882) 446-.
- Forms taken by bodies during dissolution in fluids. *Bartoli, A., & Pupasogli, E. G.* [1885] Pisa S. Tosc. At. (Mm.) 7 (1886) 134-.
- Freezing as an aid to sinking foundations. *Reichenbach, O.* B. A. Rp. (1886) 799-.
- , —, —, —, shafts. *Lebreton, F. A.* Mines 8 (1885) 111-.

1800 Change of State

Gases and vapours. *Tilman, H. J.* Liège A. Ac. (1822-23) 61 pp.
 — — — *Dove, H. W.* Pogg. A. 23 (1831) 290-.

HEAT DEVELOPED ON MOISTENING SOLIDS, POUILLET'S PHENOMENON.

Pouillet, C. S. M. A. C. 20 (1822) 141-.
 Fibrous substances. *Cobbett, L.* Camb. Ph. S. P. 10 (1900) 372-.
 Porous solids. *Cantoni, G.* Mil. I. Lomb. Rd. 3 (1866) 135-.
 Powders. *Meissner, F.* A. Ps. C. 29 (1886) 114-.
 — *Martini, T.* Ven. I. At. (1896-97) 502-.
 — *Lugergren, S.* [1898] Stockh. Ak. Hndl. Bh. 24 (Afd. 2) (1899) No. 5, 14 pp.
 — *Martini, T.* Ven. I. At. (1897-98) 927-.
 — *Ercolini, G.* N. Cim. 9 (1899) 110-.
 — (Ercolini). *Martini, T.* N. Cim. 9 (1899) 334-.
 — (Martini). *Ercolini, G.* N. Cim. 9 (1899) 446-.
 — (Ercolini). *Martini, T.* N. Cim. 10 (1899) 42.
 — *Martini, T.* Ven. I. At. (1899-1900) (Pt. 2) 615-.
 — *Bellati, M.* Ven. I. At. (1899-1900) (Pt. 2) 931-.

Heat required to raise elementary bodies from absolute zero to state of fusion. *Schenk, R.* B. A. Rp. 42 (1872) (Sect.) 82-.
 Ice divide, movement during melting of inland ice. *Schiptz, O. E.* N. Mg. Ntvd. 34 (1895) 102-.
 — formation, mathematical theory. *Stefan, J.* Mh. Mth. Ps. 1 (1890) 1-.
 Liquid and gaseous states. *Golicyn, B.* Fshr. Ps. (1889) (Ab. 2) 209.
 — — — *Heen, P. de.* Brux. Ac. Bil. 27 (1894) 885-.
 Matter, condition under extreme heat or cold. *Anon.* (vr 180) Bb. It. 80 (1835) 285-.
 —, forces determining condition. *Eyk, S. S. van der.* Holland. Mg. 1 (1803) 241-.
 —, 3 states. *Volpicelli, P.* Rm. At. I (1847-48) 129-.
 —, different states. *Bogaevskij, L.* St. Pét. Ac. Sc. Mm. 5 (1897) No. 13, 104 pp.
 Orthobaric curves for homogeneous fluids, concordance. *Natanson, W.* Krk. Ak. (Mt.-Prz.) Rz. 3 (1891) 390-.
 Physico-chemical matters. *Bellani, A.* (vr Adds.) Majocchi A. Fis. C. 1 (1841) 269-.
 Priority of some observations and experiments. *Bellani, A.* (vr Adds.) Majocchi A. Fis. C. 18 (1845) 49-.
 Solidification and evaporation of liquids in form of drops. *Sluginov, N. P.* (xii) Rs. Ps.-C. S. J. 12 (Ps.) (1880) [(Pt. 1)] 172-.
 Solution of solids in gases. *Villard, P.* C. R. 120 (1895) 182-.
 — — — — *Arctowski, H.* Z. Anorg. C. 12 (1896) 413-.
 — — — — and liquids in gases. *Villard, P.* Par. S. Ps. Sé. (1896) 234-.

Fusion and Solidification 1810

Thermal and anti-thermal lines. *Oumoff, —.* Par. S. Ps. Sé. (1896) 212.
 Transition cell, new kind. *Cohen, E.* Mbl. Nt. (1898) 17-.
 — — — way of using. *Cohen, E., & Bredig, G.* [1894] Mbl. Nt. (1894-95) 31-.
 — temperatures in electromagnetic field. *Du Bois, H.* Berl. Ps. Gs. Vh. (1898) 148-.
 Vacua, high, application of liquid hydrogen to production. *Dewar, J.* [1898] R. S. P. 64 (1899) 231-.
 Vapours, theory. *Résal, H.* C. R. 73 (1871) 325-.
 Vulcanism. *Arrhenius, S.* Stockh. Gl. För. F. 22 (1900) 395-.
 Water, explosion. *Smyth, C. P.* [1873] Manch. Lt. Ph. S. P. 13 (1873-74) 41-.
 —, fundamental properties as solid, liquid and gas. *Kramer, A. de.* II Polit. I (1839) 297-.

1810 Fusion and Solidification (General).

(See also Chemistry 7205.)

Poynting, J. H. Birm. Ph. S. P. 2 (1881) 354-.
 Adhesion at melting point. *Wald, E.* Z. Ps. C. 7 (1891) 514-.
 Alloys, fusibility. *Le Chatelier, —.* Par. S. Ps. Sé. (1894) 266.
 —, fusion. *Person, C. C.* C. R. 23 (1846) 926-.
 —, lead tin, fusion. *Wiesengrund, B.* A. Ps. C. 52 (1894) 777-.
 Amalgams, liquefaction. *Mazzotto, D.* Ven. I. At. (1892-93) 1527-.
 —, solidification. *Mazzotto, D.* Ven. I. At. (1892-93) 1311-.
 Bismuth, behaviour on solidification. *Marx, C. M.* Schweigger J. 58 (= Jb. 28) (1830) 454-.
 —, fused, anomalous density. *Lüdeking, C.* A. Ps. C. 34 (1888) 21-.
 Bubble formation in frozen liquids. *Karsten, G.* [1893] Schl.-Holst. Nt. Vr. Schr. 10 (1895) 309-.
 Colloidal reversible systems, gelation. *Hardy, W. B.* R. S. P. 66 (1900) 95-.
 Electric currents, fusion of metals by. *Joule, J. P.* [1856] Manch. Ph. S. Mm. 14 (1857) 49-.
 Energy- and volume-surfaces of crystal in solid and liquid state. *Tammann, G.* Z. Ps. C. 21 (1896) 17-; Dorpat Sb. 12 (1901) 270-; A. Ps. 1 (1900) 275-; Arch. Néerl. 5 (1900) 108-.
 Extrusion of freezing water from earth. *Thomson, (Prof.) James.* B. A. Rp. 41 (1871) (Sect.) 34.
 Fire clays, fusibility. *Hofman, H. O.* [1895-98] Am. I. Mn. E. T. 25 (1896) 3-; 28 (1899) 435-.
 — — — — *Hofman, H. O., & Stoughton, B.* [1898] Am. I. Mn. E. T. 28 (1899) 440-.
 — — — — refractoriness. *Hofman, H. O., & Demond, C. D.* [1894] Am. I. Mn. E. T. 24 (1895) 42-, 846-.

FREEZING.

- Despretz, C. C. R. 5 (1837) 19-.
- of alcohol. Walker, Rich. Tilloch Ph. Mg. 42 (1813) 117-.
- artificial. Fourcroy, A. F. de, & Vauquelin, —. A. C. 29 (1798) 281-.
- and boiling. Dufour, C. Moigno Cosmos 18 (1861) 650-.
- of water. Majocchi, G. A. (vi Add.) Majocchi A. Fis. C. 1 (1841) 272-.
- — — simultaneously. Quick, R. W. Ps. Rv. 9 (1899) 121-.
- — — in vacuo. Bohnenberger, G. C. Tübinger Bl. 1 (1815) 113-.
- cavern at Orenburg, phenomena. Hope, T. C. [1843] Edinb. R. S. P. 1 (1845) 429-.
- of colloids. Ambron, H. Leip. Mth. Ps. B. 43 (1891) 28-.
- and cooling of liquids. Perkins, J. Lieb. A. 22 (1837) 214-.
- crystallisation, phenomena. Bellani, A. Brugnattelli G. 10 (1827) 190-, 253-.
- experiments on sea-water and magnetic fluid. Sanctis, B. de. Tilloch Ph. Mg. 60 (1822) 199-.
- and ice crystals. Galli, I. Rm. N. Linc. Mm. 11 (1895) 25-.
- Leslie's process. Clément, —, & Désormes, —. A. C. 78 (1811) 183-.
- machine, with Pictet's fluid. Helmholtz, H. von. Berl. Ps. Gs. Vh. (1887) 97-, 112-.
- — — (Helmholtz). Pictet, R. Berl. Ps. Gs. Vh. (1887) 105 (bis)-.
- , — sulphurous acid. Pictet, R. Mon. Sc. 18 (1876) 744-.
- and melting. Aitken, J. (of Darroch). [1875] Sc. S. Arts T. 9 (1878) 240-.
- of water. Mousson, A. Pogg. A. 105 (1858) 161-.
- — —, causes. Dyer, J. C. [1861] Manch. Ph. S. P. 2 (1860-62) 43-.
- — — in small vessel, and geode of ice filled with liquid. Dauger, —, & Viquesnel, —. Fr. S. Mét. An. 11 (*1863) Pt. 2, 160-.
- of mercury. Anon. (vi 939) Par. Éc. Pol. J. (1^o cah.) (1795) 123-.
- — —. Waha, M. de. Lux. I. P. 17 (1879) 191-.
- — —, by natural cold. Hall, E. Silliman J. 31 (1837) 161-.
- metals, Réaumur's experiments. Longmire, J. B. Thomson A. Ph. 5 (1823) 343.
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- — —. *Battelli, A.* Ven. I. At. (1884-85) 1781-.
- — —. *Damien, B. C. C.* R. 112 (1891) 785-.
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- — —, —. (Tammann). *Heydweiller, A. A.* Ps. C. 66 (1898) 1194-.
- — —, —. *Tammann, G. A.* Ps. C. 68 (1899) 558-; 629-; A. Ps. 2 (1900) 1-, 424; 3 (1900) 161-.
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- — —, —. *Amagat, E. H.* C. R. 105 (1887) 165-.
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- Bischof, G.* Leonhard u. Bronn N. Jb. (1843) 1-.
- Billet, F.* L'I. 23 (1855) 292.
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- — —, —. *(alleged expansion.)* *Mallet, R.* R. S. P. 22 (1874) 366-; 23 (1875) 209-.
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- , cast. *Musket, D.* Tilloch Ph. Mg. 18 (1804) 1-.
- , — *Anderson, R., & Hannay, J. B.* [1879] Edinb. R. S. P. 10 (1880) 359-.
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(See also Chemistry 7210;
Meteorology 1050.)

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- variation. *Bostock, J.* QJ. Sc. 19 (1825) 148.
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- — — — *Wisse, S. A. C.* 28 (1850) 118-.
- — — Madrid. *Rico y Sinobas, M.* Madrid Rv. 7 (1857) 361-.
- —, and thermometric fixed points. *Broch, O. J.* Par. Poids et Mes. Tr. Mm. 1 (*1881) A. 41-.
- zinc. *Violle, J.* C. R. 94 (1882) 720-.
- — and cadmium. *Berthelot, D.* C. R. 131 (1900) 380-.

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- , visibility. *Du Bois-Reymond, E.* Berl. Ps. Gs. Vh. (1886) 30-.
- Bubbles, movement in levels and in liquid enclosures in minerals. *Mensbrugghe, G. van der.* Brux. Ac. Bil. 44 (1877) 356-.
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—, —, phenomena. *Aitken, J.* *R. S. P.* 51 (1892) 408-.

—, comparative efficiency of + and - charged ions as nuclei. *Wilson, C. T. R.* [1899] *Phil. Trans. (A)* 193 (1900) 289-.

—, effect of nuclei. *Tait, —.* *Edinb. R. S. P.* 13 (1886) 78-.

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- under high gas pressure. *Schiller, N.* Rs. Ps.-C. S. J. 29 (Ps.) (1897) 7-; *J. de Ps.* 6 (1897) 610-; *A. Ps. C.* 60 (1897) 755-.
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- — —. *Reillinger, —.* D. Nf. Tbl. (*1875) 208.
- — —. *Mascart, É. É. N.* C. R. 86 (1878) 575-.
- — —. *Wirtz, W.* A. Ps. C. 37 (1889) 516-.
- — high temperature. *Longchamp, —.* Rv. Sc. 15 (1847) 92-.
- — pressure. *Winkelmann, A.* A. Ps. C. 33 (1888) 445-.
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- and solution, comparative study. *Heen*, P. de. Brux. Ac. Bil. 23 (1892) 136-.
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- and surface tension, common cause. *Mensbrugge*, G. van der. C. R. 115 (1892) 1059-; Brux. Ac. Bil. 24 (1892) 543-; 25 (1893) 233-; 26 (1893) 37-; Brux. S. Se. A. 17 (1893) (*Pt. 1*) 53-; 18 (1894) (*Pt. 1*) 49-.
- — and ebullition, mechanical theory. *Mensbrugge*, G. van der. Brux. Ac. Bil. 9 (1885) 346-; 10 (1885) 405-.
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- theory. *Herapath*, J. Thomson A. Ph. 7 (1824) 349-.
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- *Poggendorff*, J. C. Pogg. A. 35 (1835) 202-.
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- Heating of water, Williams's theory. *Meidinger*, H. Dingler 161 (1861) 1-.
- Hypsometry, barometric. *Gilbert*, G. K. [1877] Smiths. Misc. Col. 20 (1881) Art. 2, 131-.
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- Iceland spar, motions of liquid in cavities. *Sang*, E. [1873] Edinb. R. S. P. 8 (1875) 87-.
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- — — — — (—). *Swan*, W. [1874] Edinb. R. S. P. 8 (1875) 249-.
- Isopentane, physical constants. *Young*, S., & *Thomas*, G. L. L. Ps. S. P. 13 (1895) 666-.
- Liquefaction of steam in cylinder of engine working expansively. *Rankine*, W. J. M. Glasg. T. I. Eng. 5 (1861-62) 61-.
- Liquids, heating by vapour. *Giordano*, G. Nap. Rd. 9 (1870) 59-.
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- Manometer for vapours, mercurial. *Zavaglia*, S. (XII) Rv. Sc.-Ind. 5 (1873) 189-.
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- tension of vapours of some liquids, and their coefficients of expansion. *Naccari*, P., & *Pagliani*, S. Tor. Ac. Sc. At. 16 (1880) 407-.
- Molecular force, radius and boiling point. *Hall*, T. P. Science 21 (1893) 145.
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Tregaskis, R. Edinb. J. Sc. 10 (1829) 282.
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Soret, J. L. Bb. Un. Arch. 13 (1850) 100-; 14 (1850) 26-.
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Fabian, O. Carl Rpm. 12 (1876) 397-.
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 ——. relative volume of liquid and vapour. *Young, S. L.* Ps. S. P. 13 (1895) 271-; Ph. Mg. 38 (1894) 569-.
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 — and static. *Kahlbaum, G. W. A.* Berl. B. 18 (1885) 3146-.
 — — — (Kahlbaum). *Ramsay, W., & Young, S.* Berl. B. 19 (1886) 69-.
 — — —. *Kahlbaum, G. W. A.* Arch. Sc. Ps. Nt. 24 (1890) 351-.
 graphical method. *Rankine, W. J. M.* Civing. 12 (1866) 223-.
 by manometer. *Kelvin, (Lord).* Edinb. R. S. P. 21 (1897) 429-.
 microscopical, in very small vessels. *Lehmann, O.* Z. Kr. 12 (1887) 406-.
 by rate of evaporation. *Müller-Erbach, W. A.* Ps. C. 31 (1887) 1040-.
 — — — (Müller-Erbach). *Schulze, R.* A. Ps. C. 32 (1887) 329-.
 — — —. *Müller-Erbach, W. A.* Ps. C. 34 (1888) 1047-; D. Nf. Vh. (1890) (*Th.* 2) 18-; Z. Instk. 10 (1890) 88-.
 relation to internal friction. *Heen, P. de.* Brux. Ac. Bil. 10 (1885) 251-.
 — — strength of electric field. *Sokolov, A. P.* Rs. Ps.-C. S. J. 26 (*Ps.*) (1894) 311-; Fschr. Ps. (1894) (*Ab.* 2) 330.
 over solids and liquids. *Fischer, W. A.* Ps. C. 28 (1886) 400-.
 of solids and liquids, transition between. *Ramsay, W., & Young, S. L.* Ps. S. P. 8 (1887) 119-; Ph. Mg. 23 (1887) 61-, 138.
 — substance in solid and liquid states. *Ponsot, A.* C. R. 119 (1894) 791-.
 — — — — — apparatus for showing that they are not same. *Gernez, —.* Par. S. Ps. Sé. (1888) 189-.
 — — — — — at same temperature. *Ramsay, W., & Young, S.* B. A. Rp. (1884) 622-.
 in terms of critical constants. *Guye, P. A.* [1892] Arch. Sc. Ps. Nt. 29 (1893) 96-.
 theoretical determination. *Rudanowsky, A. P.* Fschr. Ps. (1890) (*Ab.* 2) 244-.
 in *vacuo* and in gases. *Regnault, V. C. R.* 39 (1854) 301-, 345-, 397-.
 variation near critical point. *Raveau, —.* Par. S. Ps. Sé. (1893) 57-.

1840 Pressure of Vapours

and volume. *Clausius, R. A.* Ps. C. 14 (1881) 279-, 692-; C. R. 93 (1881) 619-.
 ——. *Lungo, C. del.* Rm. R. Ac. Linc. Rd. 7 (1891) (*Sem.* 1) 141-.

SPECIFIED VAPOURS.

acetic acid. *Moutier, J.* [1880] Par. S. Phlm. Bll. 5 (1881) 31-.
 amyl alcohol. *Grassi, G.* Nap. Rd. 26 (1887) 148-.
 argon. *Ramsay, W., & Young, S.* [1895] Phil. Trans. (A) 186 (1896) 257-.
 benzene. *Ferche, J. A.* Ps. C. 44 (1891) 265-.
 carbon dioxide. *Blaserna, P.* Rm. R. Ac. Linc. Rd. 2 (1893) (*Sem.* 2) 365-.
 chloral. *Engel, R., & Moitessier, A. C.* R. 90 (1880) 97-.
 cyanogen. *Chappuis, J., & Rivière, C.* C. R. 104 (1887) 1504-; A. C. 14 (1888) 286-.
 ether. *Gay-Lussac, L. J.* Gilbert A. 29 (1808) 113-.
 —, table for. *Zeuner, G.* Zür. Vjschr. 8 (1863) 160-.
 ice and water. *Boldrini, C.* (vi *Adds.*) Rm. Cor. Sc. 4 (1856) 239-.
 mercury. *Avogadro, A.* [1831] Tor. Mm. Ac. 36 (1833) 215-.
 —. *Benedix, A.* Pogg. A. 92 (1854) 632-.
 —. *Regnault, C. C. R.* 73 (1871) 1462-.
 —. *Hagen, E. B. A. Ps.* C. 16 (1882) 610-.
 —. *Hertz, H. R. A. Ps.* C. 17 (1882) 193-.
 —. *Rayleigh, (Lord).* B. A. Rp. (1882) 441-.
 —. *McLeod, H. B. A. Rp.* (1883) 443-.
 —. *Ramsay, W., & Young, S.* C. S. J. 49 (1886) 37-.
 —. *Morley, E. W.* Am. As. P. (1890) 91-.
 — (0° to 100°). *Pfaundler, L. A. Ps.* C. 63 (1897) 36-.
 —. *Cailletet, L., Colardeau, —, & Rivière, —.* C. R. 130 (1900) 1585-.
 —, and its diffusibility. *Biot, —.* Mâcon Ac. A. 12 (1895) 108-.
 —, effect on barometer. *Shortrede, R.* As. S. M. Not. 26 (1866) 307.
 —, measurement by rate of evaporation. *Müller-Erbach, W.* D. Ps. Gs. Vh. (1900) 127-.
 organic liquids. *Willner, A.* Bonn SB. Niedr. Gs. (1866) 66-.
 oxygen. *Estreicher, T.* [1895] Krk. Ak. (*Mt.-Prz.*) Rz. 10 (1896) 140-; Ph. Mg. 40 (1895) 454-.
 sulphuric acid. *Perkins, C. A.* Am. J. Sc. 40 (1890) 301-.

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Arzberger, J. Wien Jb. Pol. I. 1 (1819) 144-.
Avogadro, A. Brugnattelli G. 2 (1819) 187-.
Creighton, W. Tilloch Ph. Mg. 53 (1819) 266-.
August, E. F. Pogg. A. 13 (1828) 122-.
 (at high temperatures.) *Arago, D. F. J., & Dulong, —.* Par. Bll. S. Encour. 29 (1830) 295-.

Water Vapour 1840

(at high temperatures.) *Gérard, —.* Edinb. J. Sc. 3 (1830) 90-.
 (— — —). *Anon.* (vi 593) G. Arcad. 45 (1830) 1-.
 (— — —). *Dulong, P. L.* (vi *Adds.*) Par. Mm. Ac. Sc. 11 (1832) 897-.
Egen, P. N. C. Pogg. A. 27 (1833) 9-.
Biot, J. B. C. R. 12 (1841) 150-.
 (-6° to 104°·6 C.) *Magnus, G.* Berl. B. (1843) 282-.
Apjohn, Jas. Ir. Ac. P. 2 (1844) 104-.
Magnus, G. Pogg. A. 61 (1844) 225-.
Majocchi, G. A. (vi *Adds.*) Majocchi A. Fis. C. 16 (1844) 225-.
Regnault, V. A. C. 11 (1844) 273-; C. R. 18 (1844) 537-.
 (at low temperatures.) *Muncke, G. W.* Pogg. A. 67 (1846) 376-.
 (about zero.) *Kirchhoff, G.* Pogg. A. 103 (1858) 206-.
 (at zero.) *Moutier, J.* Par. S. Phlm. Bll. 12 (1875) 38-.
Broch, O. J. Par. Poids et Mes. Tr. Mm. 1 (*1881) A. 17-.
 (up to 200 atmospheres.) *Antoine, C. C. R.* 113 (1891) 328-.
Hinrichs, G. Z. Ps. C. 8 (1891) 680-.
 (-50° to +20° C.) *Juhlin, J.* [1891] Stockh. Ak. Hndl. Bh. 17 (*Afd.* 1) (1892) No. 1, 72 pp.; *Fachr. Ps.* (1891) (*Ab.* 2) 351-.
Antoine, —. C. R. 116 (1893) 870-.
 (82° to 100°.) *Wiebe, H. F.* Z. Instk. 13 (1893) 329-.
 (below zero.) *Thiesen, M.* A. Ps. C. 67 (1899) 690-.
 (-12° to +25°.) *Thiesen, M., & Scheel, K.* Berl. Ps. Reichsanst. Ab. 3 (1900) 71-.
 in presence of hygroscopic substances. *Müller-Erbach, W.* Carl Rpm. 17 (1881) 652-.
 Regnault's experiment, temperature determinations in. *Boscha, J.* Amst. Vs. Ak. 5 (1871) (*Ntk.*) 332-; Arch. Néerl. 7 (1872) 117-.
 —, uncertainty below 100°. *Wild, H.* [1893] St. Pét. Ac. Sc. Bll. 36 (1894) 1-.
 — table, corrections. *Moritz, A.* [1854-69] St. Pét. Ac. Sc. Bll. 13 (1855) 41-; 14 (1870) 80-.
 table for. *Zeuner, G.* Sch. Pol. Z. 8 (1863) 1-.
 —. *Fliegner, A.* Civing. 20 (1874) 441-.
 — each $\frac{1}{100}^{\circ}$ from 93° to 101° C. *Crahay, J. G.* Brux. Ac. Bll. 15 (1848) (*pte.* 2) 363-.

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Tregaskis, R. Edinb. J. Sc. 10 (1829) 72-.
Bary, E. C. R. 20 (1845) 1574-.
Russell, J. S. Edinb. R. S. P. 1 (1845) 227-.
 [*Shortrede non*] *Shortreed, R.* R. S. P. 5 (1848) 738-.
Waterston, J. J. B. A. Rp. (1853) (*pt.* 2) 11-.
Rankine, W. J. M. Ph. Mg. 8 (1854) 530-.
Coste, L. M. P. C. R. 43 (1856) 90-.
Groshans, J. A. Pogg. A. 104 (1858) 651-.
Buff, H. Lieb. A. 2 (1863) (*Suppl. Bd.*) 137-.
Nikolai, L. (xn) Kazan Un. Mm. 4 (1868) 497-.

- Herrmann, E. Wien Sb. 64 (1871) (Ab. 2) 623-.
- Massieu, F. C. R. 75 (1872) 872-.
- St. Loup, L. A. C. 27 (1872) 211-.
- Winkelmann, A. A. Münch. Ak. Sb. 9 (1879) 371-; A. Ps. C. 9 (1880) 208-, 358-.
- Pictet, R. C. R. 90 (1880) 1070-.
- Heen, P. de. Brux. Ac. Bil. 11 (1886) 165 (bis)-.
- Koláček, F. A. Ps. C. 29 (1886) 347-.
- Unwin, W. C. L. Ps. S. P. 8 (1887) 22-; Ph. Mg. 21 (1886) 299-.
- Antoine, C. C. R. 107 (1888) 681-, 778-, 836-.
- Bartoli, A., & Stracciati, E. [1889] Catania Ac. Gioen. At. 2 (1890) 1-.
- Saloff, N. de. C. R. 109 (1889) 663-.
- Heen, P. de. Brux. Ac. Bil. 19 (1890) 394-.
- Laar, J. J. van. Z. Ps. C. 11 (1893) 433-.
- Kraevič, K. D. Ph. Mg. 37 (1894) 33-.
- (Kraevič.) FitzGerald, G. F. Ph. Mg. 37 (1894) 89.
- Donnan, F. G. Nt. 52 (1895) 619.
- Bakker, G. [1895] Nt. 53 (1895-96) 79.
- Bogaeviskij, L. Rs. Ps.-C. S. J. 29 (Ps.) (1897) 87-; Fschr. Ps. (1897) (Ab. 2) 176.
- Schlemüller, W. Wien Ak. Sb. 106 (1897) (Ab. 2a) 9-.
- Moulin, [H.] Par. S. Ps. Sé. (1900) 160-.
- Biot's law, and law of corresponding boiling points. Mewes, R. Dingler 315 (1900) 424-.
- Dalton's law. Laval, E. Bordeaux S. Sc. Mm. 5 (1883) 107-.
- , modification. Heen, P. de. Brux. Ac. Bil. 9 (1885) 281-.
- Determination of $\frac{dp}{dt}$. Perot, A. C. R. 104 (1887) 1366-.
- Deviation from laws of elastic fluids. Waterston, J. J. Ph. Mg. 14 (1857) 279-.
- Dupré and Rankine's formula. Juliusburger, P. A. Ps. 3 (1900) 618-.
- Esters. Nadeždin, A. Exner Rpm. 23 (1887) 759-.
- Regnault's law. Dupré, A. C. R. 58 (1864) 806-.
- Water Vapour.*
- Dalton, J. [1801] Manch. Ph. S. Mm. 5 (1802) 535-.
- (Dalton's experiments.) Soldner, J. Gilbert A. 17 (1804) 44-; 25 (1807) 411-.
- Roche, —. QJ. Sc. 2 (1829) 168-.
- Biot, J. B. L'I. 1 (1833) 223-.
- (Dulong's formula.) Spassky, M. Pogg. A. 30 (1833) 331-.
- Farey, J. CE. I. T. 1 (1836) 85-.
- Webster, T. CE. I. T. 1 (1836) 219-.
- Mossotti, O. F. Mod. S. It. Mm. 21 (1837) 335-.
- Wrede, F. J. Sk. Nf. F. 2 (1840) 242-; Pogg. A. 53 (1841) 225-.
- Strehlke, F. Pogg. A. 58 (1843) 334-.
- Holtzmann, C. H. A. Pogg. A. 67 (1846) 382-.
- Alexander, J. H. Silliman J. 6 (1848) 210-, 317-.
- Rankine, W. J. M. Edinb. N. Ph. J. 47 (1849) 28-.
- Curr, J. R. S. P. 5 (1850) 941-, 960.
- Kessler, F. Danzig Schr. 6 (Heft 4) (1862) 34 pp. (Alexander's formula.)
- Potter, R. Ph. Mg. 29 (1865) 98-.
- Edmonds, T. R. Ph. Mg. 29 (1865) 169-.
- Cazin, A., & Hirn, G. A. (ix) Par. S. Phlm. Bil. 4 (1867) 19-.
- Duperray, J. G. C. R. 72 (1871) 723-.
- Morton, A. (x) Glasg. I. Eng. T. 14 (1871) 203-.
- Bertrand, J. C. R. 105 (1887) 389-.
- Kraevič, K. D. Rs. Ps.-C. S. J. 20 (Ps.) (1888) 39.
- Colard, O. Rv. Un. Mines 27 (1894) 106.
- Manaira, A. N. Cim. 1 (1895) 365-.
- Tumlirz, O. Wien Ak. Sb. 105 (1896) (Ab. 2a) 1059-.
- Gnusin, D. Mose. S. Sc. Bil. 96 (No. 1) (1899) 10-; Fschr. Ps. (1899) (Ab. 2) 376-.
- Pumping hot water. Coles, H. J. I. CE. P. 75 (1884) 211-.
- Saturation, theory of law. Planck, M. A. Ps. C. 13 (1881) 535-.
- SPHEROIDAL STATE.*
- Klaproth, M. H. Scherer J. C. 7 (1801) 646-.
- Döbereiner, J. W. A. Gén. Sc. Ps. 4 (1820) 263; Schweigger J. 29 (1820) 43-.
- Muncke, G. W. Pogg. A. 13 (1828) 235-.
- Fischer, N. W. Pogg. A. 19 (1830) 514-; 21 (1831) 163-.
- Muncke, G. W. Pogg. A. 22 (1831) 208-.
- Buff, H. Pogg. A. 25 (1832) 591-.
- Baudrimont, A. A. C. 61 (1836) 319-; C. R. 1 (1836) 290-.
- Laurent, A. C. R. 3 (1836) 149-; A. C. 62 (1836) 327-.
- Boutigny, P. H. Eure Rec. S. Ag. 10 (1839) 362-; C. R. 10 (1840) 397-.
- Desmarest, J. L. J. Phm. 26 (1840) 746-.
- Emsmann, H. Pogg. A. 2 (1840) 444-.
- Boutigny, P. H. Eure Rec. S. Ag. 1 (1841) 167-.
- Marchand, R. F. Erdm. J. Pr. C. 23 (1841) 137-.
- Person, C. C. C. R. 15 (1842) 492-.
- Boutigny, P. H. A. C. 9 (1843) 350-; 11 (1844) 16-.
- (Boutigny.) Belli, G. Mil. I. Lomb. G. 5 (1843) 162-.
- (Matter, fourth state, Boutigny's work.) Bresson, —. (vii) Rouen Bil. S. Em. (1843) 116-.
- Cima, A. Pisa Misc. Md. Chir. (1843) (pte. 2) 248-.
- Belli, G. Mil. I. Lomb. G. 5 (1844) 399-.
- Fusini, A. A. Sc. Lomb. Ven. 13 (1844) 205-.
- Armstrong, W. G. Ph. Mg. 27 (1845) 257-.
- (Boutigny.) Bellani, A. (vi Add.) Majocchii A. Fis. C. 20 (1845) 49-.
- Kersting, R. [1845] (viii) Riga Cor.-Bl. 1 (1846) 147-.

- Moritz, A. Pogg. A. 72 (1847) 112.
 Boutan, A. Rouen Tr. Ac. (1848) 32.
 Légal, J. C. R. 30 (1850) 182-451-.
 Boutigny, P. H. C. R. 31 (1850) 279-.
 Laroque, F. Toul. Mm. Ac. 6 (1850) 147-.
 Palmstedt, C. Stockh. Öfv. 7 (1850) 281-.
 Person, C. C. C. R. 31 (1850) 899-.
 Schnauss, J. Pogg. A. 79 (1850) 432-.
 Zantedeschi, F. Zantedeschi A. Fis. (1849-50) 37-.
 (Boutigny.) Buff, H. Lieb. A. 77 (1851) 1-.
 Kerckhoff, P. J. van. Pogg. A. 84 (1851) 136-.
 Laroque, F. Toul. Mm. Ac. 1 (1851) 167-.
 Nöschel, A. (viii) Riga Cor.-Bl. 4 (1851) 145-161-.
 Poleck, T. Bresl. Schl. Gs. Übs. (1852) 27-.
 (Boutigny's.) Brame, C. L'I. 21 (1853) 281.
 Church, A. H. Ph. Mg. 7 (1854) 275-.
 Boutigny, P. H. J. Phm. 29 (1856) 355-.
 Delprat, F. A. T. [1857] Utr. Aant. Prv. Gn. (1857-58) 23-.
 Osann, G. Würzb. Vh. 9 (1859) 52-.
 Boutigny, P. H. C. R. 50 (1860) 675-.
 Meunier, S. Presse Sc. 2 (1860) 68-.
 Artur, J. F. C. R. 53 (1861) 371-.
 Boutigny, P. H. C. R. 53 (1861) 1062-.
 Luca, S. de. Pisa A. Un. Tosc. Sc. Cosm. 5 (1858-61) 141-.
 Berger, —. Pogg. A. 119 (1863) 594-.
 Demain, S. C. R. 56 (1863) 1103-.
 Nöschel, A. Riga Cor.-Bl. 15 (1866) 73-.
 Budde, E. [1869] Bonn S.B. Niedr. Gs. 26 (1869) 35-; A. Ps. C. 142 (1871) 158-.
 Colley, R. A. Ps. C. 143 (1871) 125-.
 (Budde.) Berger, (Dr.) —. A. Ps. C. 147 (1872) 472-.
 (Colley.) Berger, (Dr.) —. A. Ps. C. 147 (1872) 474-.
 Barrett, W. F. [1877] Dubl. S. Sc. P. 1 (1878) 83-.
 Moss, R. J. [1877] Dubl. S. Sc. P. 1 (1878) 87-.
 Garnett, W. Nt. 17 (1878) 466.
 D'yakonov, D. I. (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) [Pt. 1] 542-.
 Luvini, G. Tor. Ac. Sc. At. 19 (*1883) 579-.
 Gossart, É. C. R. 104 (1887) 1270-; Caen S. L. Bl. 1 (1887) 75-, 136-; 2 (1888) 97-.
 Kristensen, K. S. Ts. Ps. C. 27 (1888) 161-; Ph. Mg. 28 (1889) 220.
 Scheck, —. Kassel Vr. Nt. B. 36 & 37 (1891) 51-.
 (at 30° C.) Ehrenfeld, C. H. Science 21 (1893) 199-.
 Pflaum, H. Riga Cor.-Bl. 37 (1894) 105-.
 Maltézos, C. Athènes Obs. Nat. A. 1 (1896) 231-.
 Stark, J. A. Ps. C. 65 (1898) 306-.
 application to analysis of stains from Marsh's apparatus. Boutigny, P. H. C. R. 21 (1845) 1068-.
 in boilers. Boutigny, P. H. B. A. Rp. (1845) (pt. 2) 27-.
 —. Normandy, A. Ph. Mg. 7 (1854) 283-.
 —. Witz, A. C. R. 114 (1892) 411-.
 —. Swarte, — de. C. R. 114 (1892) 1419-.

- in boilers. Witz, A. C. R. 115 (1892) 38.
 —, explosions. Campi, (conte) G. (xii) Firenze Ac. Georg. At. 24 (1846) 335-.
 —, —. Provenzali, F. S. Rm. N. Linc. At. 36 (1883) 175-.
 —, prevention. Taddei, G. (xii) Firenze Ac. Georg. At. 24 (1846) 339-.
 cause of travelling motion. Stoney, G. J. B. A. Rp. (1878) 442.
 drops on heated liquid. Chomel, —. C. R. 19 (1844) 581-.
 — of melted slag floating on water. Faraday, M. Q.J. Sc. 1 (1828) 221-.
 electric investigation. Gezekhus [Hesekus], N. A. (xii) Rs. C. Ps. S. J. 8 (Ps.) (1876) [Pt. 1] 311-, 356-; (x) A. Ps. C. Beibl. 1 (1877) 449-.
 — and other properties of bodies in. Wartmann, É. Laus. Bl. S. Vd. 2 (1846-48) 341-.
 electrification on leaving. Rijke, P. L. Pogg. A. 98 (1856) 500-.
 evaporation. Person, C. C. Rouen Tr. Ac. (1843) 115-.
 —. Riddell, J. L. Silliman J. 26 (1858) 71.
 freezing of water in red hot vessels. West, W. [1845] W. Yorks. P. Gl. S. 2 (1842-48) 285-.
 heat acquired by water in red hot vessel. Lechevalier, V. J. Phm. 16 (1830) 666-.
 laws. Boutigny, P. H. C. R. 90 (1880) 1074-.
 mathematical theory. Gossart, E. C. R. 105 (1887) 518-.
 mechanical theory. Favé, L. C. R. 84 (1877) 906-.
 momentary incombustibility of living organic tissue. Boutigny, P. H. C. R. 28 (1849) 593-; A. C. 27 (1849) 54-; C. R. 29 (1849) 471-; J. Phm. 16 (1849) 24-, 424-.
 — — — — (Boutigny). Bellani, A. Polli A. 9 (1849) 169-, 222-, 276-; Mil. G. I. Lomb. 2 (1850) 3-.
 — — — — (Bellani). Polli, G. Polli A. 10 (1850) 158-.
 — — — — (Bellani). Polli, G. Polli A. 10 (1850) 48-.
 — — — —; plunging hand into boiling tar. Davenport, R. Thomson A. Ph. 9 (1817) 111-.
 — — — —; — — — molten metal.
 Come, —. C. R. 30 (1850) 298-.
 temperature. Peltier, A. Par. S. Phm. PV. (1841) 5-.
 —. Luca, S. de. N. Cim. 11 (1860) 60-; C. R. 51 (1860) 141-.
 —. Missaghi, G. N. Cim. 11 (1860) 175-.
 —. Boutigny, P. H. J. Phm. 39 (1861) 273-.
 —. Luca, S. de. C. R. 53 (1861) 101-; N. Cim. 13 (1861) 154-; Nap. Rd. 1 (1862) 70-; C. R. 55 (1862) 245-.
 —. Bell, L. Science 4 (1884) 5.
 —. Finocchi, E. Rv. Sc.-Ind. 20 (1888) 79-.
 in vacuo. Laroque, F. Toul. Mm. Ac. 1 (1851) 395-.
 —. Luvini, J. C. R. 98 (1884) 1536-.

State of matter characterised by independence of pressure and specific volume. Heen, P. de. Brux. Ac. Bl. 24 (1892) 267-.

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cloudy condensation. Aitken, J. Nt. 49 (1893-94) 340-.

— Barus, C. Nt. 49 (1893-94) 363-.

— Bidwell, S. Nt. 49 (1893-94) 388.

condensation. Callendar, H. L., & Nicolson, J. T. B. A. Rp. (1897) 418-.

— in engines. Delafond, F. C. R. 100 (1885) 237-.

— — Anon. Elect. 29 (1892) 593-.

— — Donkin, B. (jun.) Am. Eng. & Railroad J. 67 (1893) 287.

expansion. Koch, L. Franklin I. J. 40 (1860) 378-.

—, adiabatic. Charpentier, P. C. R. 98 (1884) 85-, 425-.

—, law. Tate, T. CE. I. P. 6 (1847) 343-.

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flow, formulæ. Parenty, H. C. R. 116 (1893) 1120-.

—, and of mixture of steam and water. Guzzi, P. Mil. I. Lomb. Rd. 21 (1888) 725-.

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heating of bodies by contact with. M'Caustland, R. Philad. Md. Ps. J. 1 (1805) 110-.

— liquids by. Gilbert, L. W. Gilbert A. 16 (1804) 503-.

humidity, measurement. Hirn, G. A. Civing. 15 (1869) 493-.

—, Guzzi, P. Franklin I. J. 74 (1877) 355-.

—, Knight, J. B. Franklin I. J. 74 (1877) 358-.

—, apparatus. Rateau, —. A. Mines 11 (1897) 495-.

—, —, Goodman, —. Nt. 62 (1900) 610.

jets, form, pressure and temperature. Parenty, H. C. R. 118 (1894) 183-.

—, rate of condensation. Palmer, A. de F. (jun.) Am. J. Sc. 2 (1896) 247-.

mixture of saturated and surcharged, experiments with. Isherwood, B. F. Franklin I. J. 27 (1854) 257-.

output and coal consumption. Fischer, F. Dingler 250 (1883) 72-.

physical constants. Schmidt, G. [1867] Prag Ab. 1 (1868) 50 pp.

production in relation to heating surface. Havrez, P. Cuyper Rv. Un. 11 (1862) 39-.

properties, mechanical. Resal, H. A. Mines 8 (1865) 475-.

—, new. Lowe, J. Franklin I. J. 66 (1873) 250-.

— and use. Burg, A. von. (ix) Wien Vr. Nw. Kennt. Schr. 12 (1872) 279-.

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- and dirigible balloons. *Errera, L.* [1898] *Ciel et Terre* 19 (1898-99) 229-.
- — — low temperatures. *Dessau, B.* [1900] *Ps. Z.* 2 (1901) 20-, 37-, 60-.
- , safety cylinder for. *Fournier, J. C. R.* 124 (1897) 353-.
- — — stop-cock for cylinders. *Ducretet, E., & Lefeune, L.* *C. R.* 123 (1896) 810-.
- — — and their saturated vapours, densities. *Cailletet, L., & Mathias, E.* *Par. S. Ps. Sé.* (1886) 171-.
- — — — —, determination. *Amagat, E. H.* *C. R.* 114 (1892) 1093-, 1322-; *Par. S. Ps. Sé.* (1892) 242.
- Liquid air. *Dewar, J.* [1896] *R. I. P.* 15 (1899) 133-.
- — — — —, *Arsonval, A. d'.* *C. R.* 126 (1898) 1683-.
- — — — —, *Tucker, S. A.* *Sch. Mines Q. N. Y.* 19 (1898) 344-.
- Liquid air. *Witkowski, A.* *Kosmos (Lw.)* 25 (1900) 568-.
- — — applications. *Anon.* *Cztg. Opt.* 19 (1898) 195-.
- — — — —, *Belforti, U.* *Rv. Sc.-Ind.* 31 (1899) 65-.
- — — — —, *Linde, C.* *Ps. Z.* 1 (1900) 173-.
- — — — — and production. *Dommer, F.* *Rv. Sc.* 11 (1899) 385-.
- — — — —, *Anon.* [1899] *Sc. Abs.* 3 (1900) 107.
- — — behaviour. *Wroblewski, S.* *Wien Ak. Sb.* 92 (1886) (Ab. 2) 639-; *Mh. C.* (1885) 621-.
- — — change on evaporation. *Gruzinov, A. A.* *Rs. Ps.-C. S. J.* 32 (Ps.) (1900) 107-; *C. S. J.* 78 (1900) (Abs., Pt. 2) 720.
- — — preparation and properties. *Lefeuvre, J.* *Gén. Civ.* 33 (1898) 235-.
- — — as source of power. *Abbe, C. U. S.* *Mly. Weath. Rv.* 27 (1899) 110-.
- — — — —, *Tripler's apparatus.* *Tripler, C. E.* *Sc. Abs.* 1 (1898) 484.
- — — use as explosive. *Larsen, A.* [1900] *I. Mn. E. T.* 19 (1901) 164-.
- — — — —, vacuum vessels. *Dewar, J.* [1898] *R. I. P.* 14 (1896) 1-.
- hydrogen, critical and boiling point temperatures. *Olzowski, K.* *Krk. Ak. (Mt.-Prz.) Rz.* 9 (1895) 404-; *Ph. Mg.* 40 (1895) 202-.
- — — preparation of high vacua by. *Dewar, J. A. C.* 17 (1899) 12-.
- nitrogen and carbon monoxide, freezing points. *Olzowski, K.* *C. R.* 100 (1885) 350-.
- Mixed gases, compression. *Cailletet, L. C. R.* 90 (1880) 210-.
- — — liquefaction. *Cailletet, L., & Hautefeuille, P. C. R.* 92 (1881) 901-.
- — — — —, *Kuenen, J. P.* *Amst. Ak. V. S.* 3 (1895) 90-; *Arch. Néerl.* 1 (1898) 331-.
- — — — —, *Caubet, F.* *Bordeaux S. Sc. PV.* (1897-98) 256-; *C. R.* 130 (1900) 167-, 828-, 131 (1900) 108-, 1200-.
- — — — — and critical phenomena (ethane and nitrous oxide). *Kuenen, J. P.* *L. Ps. S. P.* 13 (1895) 523-; *Ph. Mg.* 40 (1895) 173-.
- — — — — — — — — —, *Kuenen, J. P.* *L. Ps. S. P.* 15 (1897) 235-; *Ph. Mg.* 44 (1897) 174-; *Z. Ps. C.* 24 (1897) 667-.
- — — — — retrograde condensation. *Kuenen, J. P.* *Amst. Ak. V. S.* [1] (1893) 15-.
- — — — — — — — — — — (Kuenen's experiments). *Kamerlingh Onnes, H., & Reinganum, M.* [1900] *Amst. Ak. V. S.* 9 (1901) 213-, 307-; *Amst. Ak. P.* 3 (1901) 289-, 374.
- Mixture of carbon dioxide and hydrogen, retrograde condensation. *Verschauffelt, J.* *Amst. Ak. V. S.* 7 (1899) 281-, 389-; *Amst. Ak. P.* 1 (1899) 288-, 323-.
- Nitrous oxide, liquefaction and solidification. *Natterer, J.* *Pogg. A.* 62 (1844) 132-.
- Oxygen, extraction from air. *Claude, G. C. R.* 131 (1900) 447-.
- , liquid, density. *Pictet, R. C. R.* 86 (1878) 37-.
- , — — — (probable). *Olearski, K.* [1883] (xii) *Krk. Ak. (Mt.-Prz.) Rz. & Sp.* 11 (1884) 188-.
- — — — —, pressure at different temperatures. *Olzowski, K. C. R.* 100 (1885) 350-.

1870 Specified Gases

Physical and chemical phenomena at low temperatures. *Sluginov, N. P.* Kazan S. Ps.-Mh. Bl. 3 (1893) (Prot.) 23-.

Seleniuretted hydrogen, physical properties at low temperature and under pressure. *Olszewski, K.* Krk. Ak. (Mt.-Prz.) Rz. 20 (1890) 282-; *Crc. Ac. Sc. Bl.* (1890) 57-.

Solidification of gases. *Mareska, J.* Brux. Ac. Bl. 10 (1843) 75-.

— — nitrogen and temperature obtained by means of boiling oxygen. *Wroblewski, S. von.* C. R. 97 (1883) 1553-.

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Acetylene. *Cailletet, L.* C. R. 85 (1877) 851-.

Air. *Koch, —.* Würtb. Jh. 55 (1899) lxxvii-.

— *Carnelutti, —.* Rv. Sc.-Ind. 32 (1900) 31-.

— and hydrogen, liquefaction and solidification. *Hartley, W. N.* Pop. Sc. Rv. 17 (1878) 155-.

—, liquefaction by expansion. *Claude, G. C. R.* 131 (1900) 500-.

—, — — Linde's method. *Ewing, J. A. S.* Abs. 1 (1898) 396-.

—, — and oxygen making, theory of Linde's method. *Lorenz, H.* Civing. 41 (1895) 633-.

—, — by self-intensive refrigeration. *Hampson, W.* Nt. 55 (1896-97) 485.

—, liquefied, temperature under very small pressures. *Olszewski, K. C. R.* 99 (1884) 184-.

—, separation into constituents on liquefaction. *Wroblewski, S. C. R.* 101 (1885) 635-.

Ammonia. *Joannis, —.* [1889] Bordeaux S. Sc. Mm. 5 (1890) xxviii-.

Argon, liquefaction and solidification. *Olszewski, K.* [1895] Phil. Trans. (A) 186 (1896) 253-.

Carbon dioxide. *Ridolfi, C.* Brugnatelli G. 6 (1823) 455-.

— — *Thilorier, —.* L'I. 2 (1834) 197-.

— —, liquefaction and solidification. *Mitchell, J. K.* Franklin I. J. 22 (1838) 289-.

— —, liquid, for production of pressure. *Lehmann, O.* Z. Kr. 12 (1887) 409-.

— monoxide, liquefaction under very small pressures. *Olszewski, K. C. R.* 99 (1884) 706-.

— — and oxygen. *Cailletet, L. C. R.* 85 (1877) 1213-.

Hydrogen. *Pictet, R. C. R.* 86 (1878) 106-.

— *Olszewski, K. C. R.* 98 (1884) 913-.

— *Wroblewski, S. Berl. Ak. Sb.* (1884) 61.

— *Travers, M. W.* [1900] L. Ps. S. P. 17 (1901) 561-.

— antimonide, liquefaction and solidification. *Olszewski, K. Krk. Ak. (Mt.-Prz.) Rz.* 15 (1887) 211-.

— and helium. *Dewar, J. C. R.* 126 (1898) 1408-; 1538.

—, liquefaction, possibility. *Wroblewski, S. C. R.* 98 (1884) 504-.

—, —, —. *Olszewski, K. C. R.* 98 (1884) 365-.

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Hydrogen, liquefaction and solidification, Pictet's experiments. *Krzyżanowski, K.* [1889] Krk. Ak. (Mt.-Prz.) Rz. 20 (1890) 1-; *Crc. Ac. Sc. Bl.* (1889) No. 1, xxviii-.

—, —, thermodynamic uniformity and use of vacuum vessels. *Kamerlingh Onnes, —.* *Amst. Ak. Vs.* 4 (1896) 236-, 271-.

Nitrogen dioxide. *Cailletet, L. C. R.* 85 (1877) 1016-.

— — and methane, liquefaction and solidification. *Olszewski, K. C. R.* 100 (1885) 940-.

— and ethylene, liquefaction under very small pressures. *Olszewski, K. C. R.* 99 (1884) 133-.

Oxygen. *Pictet, R. C. R.* 85 (1877) 1214-, 1220-.

— and hydrogen. *Pictet, R. Arch. Sc. Ps. Nt.* 61 (1878) 16-.

—, liquefaction by ethylene. *Cailletet, L. C. R.* 100 (1885) 1033-; *Par. S. Ps. Sé.* (1885) 71-.

— and nitrogen. *Olszewski, K., & Wroblewski, S. von. C. R.* 96 (1883) 1140-, 1225-.

— — — and carbonic oxide. *Olszewski, K., & Wroblewski, S. von. A. Ps. C.* 20 (1883) 243-.

Ozone. *Chappuis, J., & Hautefeuille, P. C. R.* 91 (1890) 522-, 815-; 94 (1882) 1249-.

Propylene, trimethylene and allylene. *Molčanovskij, N. V.* [1888] Kiev S. Nt. Mm. 10 (1889) xci-.

1880 Continuity of State. Critical State, Critical Point, etc. Characteristic Equations.

(See also Chemistry 7000, 7212.)

CHARACTERISTIC EQUATIONS.

Waals, J. D. van der. [1896] *Amst. Ak. Vs.* 5 (1897) 150-; *Fschr. Ps.* (1896) (Ab. 2) 199-.

Berthelot, D. *Arch. Néerl.* 5 (1900) 417-, 679.

constant 'b' of van der Waals. *Guye, P. A.* *Arch. Sc. Ps. Nt.* 23 (1890) 197-.

— — van der Waals's law, significance. *Boltzmann, —, & Mache, —.* *Camb. Ph. S. T.* 18 (1900) 91-.

covolume in. *Berthelot, D. C. R.* 130 (1900) 115-.

of gases in relation to solutions. *Jäger, G.* *Wien Ak. Sb.* 101 (1892) (Ab. 2a) 553-.

internal pressure term in van der Waals's and Clausius's formulæ. *Berthelot, D. C. R.* 130 (1900) 69-.

and law of corresponding states. *Raveau, C.* *Par. S. Ps. Sé.* (1896) 274-.

new. *Amagat, E. H. C. R.* 128 (1899) 538-.

—, saturation case. *Amagat, E. H. C. R.* 128 (1899) 649-; *Par. S. Ps. Sé.* (1899) 51-.

- theories of van der Waals. *Guye, P. A.* Arch. Sc. Ps. Nt. 22 (1889) 540-.
- of van der Waals. *Kraevič, K.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 1-; J. de Ps. 7 (1888) 271.
- — — (isothermal). *Korteweg, D. J.* Nt. 45 (1892) 152-, 277.
- — — *Boltzmann, L.* Amst. Ak. Vs. 7 (1899) 477-; Amst. Ak. P. 1 (1899) 398-.
- — — (Boltzmann). *Waals, J. D. van der.* Amst. Ak. Vs. 7 (1899) 537-; Amst. Ak. P. 1 (1899) 468-.

CONTINUITY OF STATE.

- limit of liquid state. *Hannay, J. B.* R. S. P. 31 (1881) 520-; 33 (1882) 294-; Nt. 26 (1882) 370.
- liquid and gaseous. *Andrews, T.* Phil. Trans. 159 (1869) 575-.
- — — *Thomson, (Prof.) James.* [1871] R. S. P. 20 (1872) 1-.
- — — *Waals, J. D. van der.* [1873] (xi) A. Ps. C. Beibl. 1 (1877) 10-.
- — — *Andrews, T.* R. S. P. 23 (1875) 514-.
- — — *Bouty, E. J. de* Ps. 6 (1877) 368-.
- — — *Walter, A. D.* Nf. B. (*1877) 106-.
- — — *Hannay, J. B.* C. R. 92 (1881) 1336-.
- — — *Ramsay, W., & Young, S.* R. S. P. 42 (1887) 3-.
- — — (Clausius's formula for change). *Fitz-Gerald, G. F.* R. S. P. 42 (1887) 216-.
- — — *Nadždin, A.* Exner Rpm. 23 (1887) 617-, 685-.
- — — (transition at all temperatures). *Ramsay, W., & Young, S.* L. Ps. S. P. 8 (1887) 194-; Ph. Mg. 23 (1887) 435-; L. Ps. S. P. 9 (1888) 33-; Ph. Mg. 24 (1887) 196-.
- — — *Ramsay, W., & Young, S.* Ph. Mg. 23 (1887) 547-.
- — — *Duhem, P.* Lille Tr. Mm. 1 (1889-91) Mém. 5, 105 pp.
- — — *Ramsay, W.* [1891] R. I. P. 13 (1893) 365-.
- — — *Sarrau, E.* Rv. Sc. 48 (1891) 97-.
- — —, in isothermal transformation. *Preston, T.* Dubl. S. Sc. T. 6 (1898) 119-.
- — — and solid. *Thomson, (Prof.) James.* [1871-73] B. A. Rp. 41 (1871) (Sect.) 31-; 42 (1872) (Sect.) 24-; R. S. P. 22 (1873-74) 27-.
- — — solid. *Barus, C.* Am. J. Sc. 42 (1891) 125-.
- — — *Heydweiller, A.* A. Ps. C. 64 (1898) 725-.
- Critical coefficient and constitution at critical point. *Guye, P. A.* Par. S. Ps. Sé. (1890) 39-.
- — — formula $\frac{n-1}{d}$. *Nasini, R.* Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 2) 127-.
- — — constant and molecular refraction, relation. *Guye, P. A.* Par. S. Ps. Sé. (1890) 17-.

CRITICAL CONSTANTS.

- of carbon dioxide. *Amagat, E. H.* C. R. 114 (1892) 1093-, 1322-; Par. S. Ps. Sé. (1892) 242.
- 2 classes of curves connecting. *Mathias, E.* C. R. 130 (1900) 1748-; Par. S. Ps. Sé. (1900) 165-.
- determination. *Cailletet, L., & Colardeau, E.* C. R. 112 (1891) 563-.
- *Mathias, E.* [1900] Sc. Abs. 4 (1901) 378-.
- of gases. *Leduc, A., & Sacerdote, P.* C. R. 125 (1897) 397-.
- hydrochloric acid and methyl chloride vapours. *Vincent, C., & Chappuis, J.* C. R. 100 (1885) 1216-.
- nitrogen. *Olsewski, K.* C. R. 98 (1884) 913-.
- vapours. *Vincent, C., & Chappuis, J.* C. R. 101 (1885) 427-.
- Critical data of liquids. *Heilborn, E.* Z. Ps. C. 7 (1891) 601-.
- — — and chemical constitution. *Heilborn, E.* Z. Ps. C. 6 (1890) 578-.
- — — Pennsylvania paraffins. *Bartoli, A., & Stracciati, E.* N. Cim. 16 (1884) 104-.
- Critical density, determination. *Mathias, E.* C. R. 115 (1892) 35-.
- — — *Young, S., & Thomas, G. L.* L. Ps. S. P. 12 (1894) 134-; Ph. Mg. 34 (1892) 507-.
- — —, law of Cailletet and Mathias. *Young, S. L.* Ps. S. P. 17 (1901) 480-; Ph. Mg. 50 (1900) 291-.
- — —, supposed existence. *Heen, P. de.* Brux. Ac. Bil. 33 (1897) 119-.
- — — and theory of corresponding states. *Mathias, E.* Toul. Fac. Sc. A. 6 (1892) M, 34 pp.
- — — isothermal line and densities of saturated vapour and liquid in isopentane and carbon dioxide. *Verschaffelt, J. E.* Amst. Ak. Vs. 8 (1900) 651-; Amst. Ak. P. 2 (1900) 588-.
- — — phenomena. *Zambiasi, G.* Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 1) 21-.
- — —, influence of curvature in surface at high temperatures. *Waals, J. D. van der.* Amst. Ak. Vs. 3 (1895) 133-.
- — —, — — — gravity. *Kuenen, J. P.* Amst. Ak. Vs. 4 (1896) 41-; Arch. Néerl. 1 (1898) 342-.
- CRITICAL POINT.
- Cagniard-Latour, (le baron) C.* A. C. 21 (1822) 127-; 22 (1823) 410-; 23 (1823) 267-.
- Ramsay, W.* [1880] R. S. P. 31 (1881) 194-.
- Nadždin, A. I.* (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) [(Pt. 1)] 157-, 536-; 15 (Ps., Pt. 1) (1883) 25-; (x) A. Ps. C. Beibl. 7 (1883) 678-.
- Jamin, J. C.* C. R. 96 (1883) 1448-.
- (priority claim.) *Ramsay, W.* C. R. 97 (1883) 448-.

1880 Critical Point

adiabatic expansion near. *Natanson, W.* Krk. Ak. (Mt.-Prz.) Rz. 8 (1895) 220-; Crc. Ac. Sc. Bil. (1895) 130-.

adiabatics of system of liquid and gas. *Raveau, C.* Par. S. Ps. Sé. (1892) 266-.

anomalies. *Kuenen, J. P.* Amst. Ak. Vs. [2] (1894) 85-; Arch. Néerl. 1 (1898) 274-.

—, experiments. *Kuenen, J. P.* Amst. Ak. Vs. 3 (1895) 19-, 57-; Arch. Néerl. 1 (1898) 279-.

behaviour near. *Golicyn, B. A.* Ps. C. 50 (1893) 521-.

— at. *Gouy, —.* C. R. 116 (1893) 1289-.

capillarity near (carbon dioxide). *Verschaffelt, J.* Amst. Ak. Vs. 5 (1897) 94-; J. de Ps. 6 (1897) 445-.

—, *Eldik, A. van.* [1897] Amst. Ak. Vs. 6 (1898) 18-, 74-; J. de Ps. 7 (1898) 159-.

—, *Bakker, G. Z.* Ps. C. 35 (1900) 598-.

of carbon dioxide. *Garnett, W.* Nt. 16 (1877) 23.

condensation at. *Fuchs, K.* Exner Rpm. 26 (1890) 497-.

determination. *Guldberg, C. M.* Christiania F. (1882) No. 20, 10 pp.

—, *Pellat, H. J.* de Ps. 1 (1892) 225-.

—, Cailletet and Colardeau's method. *Grimaldi, G. P.* Rm. R. Ac. Linc. Rd. 1 (1892) (Sem. 1) 79-.

—, criterion. *Dickson, J. D. H.* Ph. Mg. 10 (1880) 40-.

— of density near. *Heen, P. de.* Brux. Ac. Bil. 31 (1896) 147-.

— volumes of liquids and vapours above. *Heen, P. de.* Brux. Ac. Bil. 27 (1894) 580-.

effect of weight on fluids at. *Gouy, —.* C. R. 115 (1892) 720-.

electric conductivity at. *Bartoli, A.* Rm. R. Ac. Linc. Rd. 2 (1886) (Sem. 2) 129-.

errors for pure substances and mixtures. *Hirsch, R. von.* A. Ps. 1 (1900) 655-.

of ethyl ether, refractivity near. *Golicyn, B., & Wilip, J.* St. Pét. Ac. Sc. Bil. 11 (1900) 117-.

lecture experiment. *Barus, C.* Am. J. Sc. 2 (1896) 1-.

meniscus formation, influence of time. *Heen, P. de.* Brux. Ac. Bil. 25 (1893) 14-.

of mixed gases. *Ansdell, G.* [1882] R. S. P. 34 (1883) 113-.

— some organic compounds. *Altschul, M. Z.* Ps. C. 11 (1893) 577-.

phenomena. *Zambiasi, G.* Rm. R. Ac. Linc. Rd. 1 (1892) (Sem. 2) 423-.

physical state near. *Cailletet, L., & Colardeau, E.* C. R. 108 (1889) 1280-.

properties of liquids near. *Golicyn, B. B.* St. Pét. Ac. Sc. Bil. 10 (1899) xxxiv-.

— pure gases near. *Villard, P.* Par. S. Ps. Sé. (1894) 244-.

— — — — (Villard). *Wesendonck, K. A.* Ps. C. 55 (1895) 577-.

state of matter near. *Cailletet, L., & Colardeau, E.* A. C. 18 (1889) 269-.

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state of matter near. *Lepsius, B.* Frkt. a. M. Ps. V. Jbr. (1890-91) 27.

— — at. *Battelli, A.* Ven. I. At. (1891-92) 1615-; (1892-93) 685-.

— — near. *Dwelschawers-Dery, F. V.* Brux. Ac. Bil. 30 (1895) 570-.

and vapour pressure of water. *Cailletet, L., & Colardeau, E.* C. R. 112 (1891) 1170-; Par. S. Ps. Sé. (1891) 172-.

variation in vapour pressure near. *Raveau, —.* Par. S. Ps. Sé. (1893) 57-.

Critical pressure, calculation. *Dutoit, P., & Friderich, L.* Arch. Sc. Ps. Nt. 5 (1898) 574-.

— of ice. *Butlerow, A.* St. Pét. Ac. Sc. Bil. 27 (1881) 273-.

— for solids, so-called. *Richter, — von.* Bresl. Schl. Gs. Jbr. (1885) 132-.

— solution point, influence of pressure. *Lee, N. J. van der.* Z. Ps. C. 33 (1900) 622-.

CRITICAL STATE.

Ramsay, W. R. S. P. 30 (1880) 323-.

Stolyetov, A. G. (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) [(Pt. 1)] 167-; (xi) J. de Ps. 1 (1882) 543-.

(Stolyetov.) *Zaionchevskii, V.* (xii) Rs. Ps.-C. S. J. 14 (Ps.) (1882) [(Pt. 1)] 386-.

Stolětov, A. G. Mosc. S. Sc. Bil. 78 (No. 1) (1892) 1-; Fschr. Ps. (1892) (Ab. 2) 190-; Rs. Ps.-C. S. J. 25 (Ps.) (1893) 303-; 26 (Ps.) (1894) 26-; J. de Ps. 3 (1894) 571-; 4 (1895) 579.

Battelli, A. Rm. R. Ac. Linc. Rd. 2 (1893) (Sem. 1) 171-.

Ramsay, W. Z. Ps. C. 14 (1894) 486-.

Wesendonck, K. Z. Ps. C. 15 (1894) 262-.

Zambiasi, G. Rm. R. Ac. Linc. Rd. 4 (1895) (Sem. 2) 127-.

Dieterici, C. A. Ps. C. 69 (1899) 685-; Ps. Z. 1 (1900) 73-.

accidental character. *Heen, P. de.* Brux. Ac. Bil. 27 (1894) 348-.

carbon dioxide, coloured by iodine. *Villard, P.* Par. S. Ps. Sé. (1894) 242-.

condensation in mixtures near. *Hartman, C. M. A.* [1900] Amst. Ak. Vs. 9 (1901) 60-; Amst. Ak. P. 3 (1901) 66-.

theory. *Reis, P.* Humb. 7 (1888) 369-, 409-.

CRITICAL TEMPERATURES.

Moutier, J. Par. S. Phm. Bil. 2 (1878) 75-.

Pawlewski, B. Berl. B. 15 (1882) 460-.

Nadeždin, A. I. [1885] Kiev S. Nt. Mm. 8 (1) (1886) 1.

Prytz, K. Ts. Ps. C. 26 (1887) 33-.

Golicyn, B. B. Rs. Ps.-C. S. J. 22 (Ps.) (1890) 265-; Fschr. Ps. (1890) (Ab. 2) 248-; J. de Ps. 1 (1892) 474-.

Ladenburg, —. Bresl. Schl. Gs. Jbr. (1890) (At. B.) 20-.

Bulatov, A. Rs. Ps.-C. S. J. 31 (Ps.) (1899) 69-.

behaviour near. *Clark, J. W.* [1880] L. Ps. S. P. 4 (1881) 41-; Ph. Mg. 10 (1880) 145-.

- and boiling point. *Bartoli, A.* N. Cim. 16 (1884) 74-; 20 (1886) 139-.
- — —, hydrogen. *Olszewski, K.* Krk. Ak. (Mt.-Prz.) Rz. 9 (1895) 404-; Ph. Mg. 40 (1895) 202-.
- causes underlying. *Avenarius, M.* [1876] St. Pét. Ac. Sc. Bil. 22 (1877) 378-.
- change of state near. *Cailletet, L., & Haute-feuille, P.* C. R. 92 (1881) 840-.
- and change of state. *Walterhöfer, O.* Humb. 5 (1886) 404-.
- of compound esters. *Pawlewski, B.* (xii) Kosmos (Lw.) 7 (1882) 1-, 130-, 303-; (x) Berl. B. 15 (1882) 2460-; 16 (1883) 2633-.
- — — (Pawlewski). *Nadeždin, A.* Rs. Ps.-C. S. J. 16 (Ps.) (1884) 74-.
- as criterion of chemical purity. *Altschul, M.* Berl. Ps. Gs. Vh. (1895) 1-.
- — — — —. *Pictet, R.* C. R. 120 (1895) 43-.
- determination. *Golicyn, B. B.* Mosc. S. Sc. Bil. 73 (No. 2) (1891) 5-; Fsch. Mth. (1891) 1188-.
- *Chappuis, J.* C. R. 118 (1894) 976-.
- in opaque tubes. *Nadeždin, A. I.* [1885] Kiev S. Nt. Mm. 8 (1) (1886) xvii-; St. Pét. Ac. Sc. Bil. 30 (1886) 327-.
- of volume of liquid at. *Žuk, K. N.* [1885] Kiev S. Nt. Mm. 8 (1) (1886) xviii-.
- of hydrogen. *Natanson, W.* Krk. Ak. (Mt.-Prz.) Rz. 7 (1895) 374-; Crc. Ac. Sc. Bil. (1895) 93-.
- liquid, influence of pressure of gas. *Schiller, N. N.* [1894] Kiev S. Nt. Mm. 15 (1) (1896) lix-.
- mixtures. *Straus, O. E.* (xii) Rs. Ps.-C. S. J. 12 (Ps.) (1880) [(Pt. 1)] 207-.
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- of oxygen. *Wróblewski, Z.* [1883] (xii) Krk. Ak. (Mt.-Prz.) Rz. & Sp. 11 (1884) liii-; (xi) C. R. 97 (1883) 309-.
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- of water. *Straus, O. E.* (xii.) Rs. Ps.-C. S. J. 14 (Ps.) (1882) (Pt. 1) 510-.
- pressure of water vapour at. *Cailletet, L., & Colardeau, E.* C. R. 112 (1891) 1170-; Par. S. Ps. Sé. (1891) 172-.
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- — — methyl alcohol. *Ramsay, W., & Young, S.* [1887] Phil. Trans. (A) 178 (1888) 313-.

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— of complex solid in presence of gas and liquid. *Waals, J. D. van der.* *Amst. Ak. Vs.* 5 (1897) 482-; *Arch. Néerl.* 1 (1898) 78-.

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- Modifications in specific volume of saturated vapour and of liquid due to changes of temperature, relation. *WaaIs, J. D. van der.* Arch. Néerl. 5 (1900) 407-.
- "Phase doctrine," application to iron and steel. *Roozeboom, H. W. B.* I. & S. I. J. (1900) (No. 2) 311-.
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- Leslie's. Watson, H. H.* B. A. Rp. (1834) 569.
- and hair-. *Lüdicke, M. A. F.* Gilbert A. 10 (1802) 110-.
- , de Saussure's and de Luc's, comparison. *Böckmann, C. W.* Gilbert A. 15 (1803) 355-.
- Majocchi's. Regnault, V.* A. C. 19 (1847) 82-.
- portable. *Hayes, A. A.* Silliman J. 17 (1830) 351-.
- registering. *Baumhauer, E. H. von.* Pogg. A. 93 (1854) 343-.
- , *Vivian, E.* (viii) Devon. As. T. (pt. 2) (1863) 50.
- , *Nodon, A.* C. R. 102 (1886) 1371-.
- , maximum and minimum. *Donovan, M.* Ir. Ac. P. 1 (1874) 476-, 556-; 2 (1877) 166-.
- Regnault's. Donovan, M.* [1869] Ir. Ac. P. 10 (1870) 459-.
- de Saussure's. *Pictet, M. A.* Bb. Un. 27 (1824) 22-.
- , improvement. *Cagnazzi, L. de S.* Nap. At. Ac. 1 (1819) 43-.
- sensitive. *Kater, H.* As. Researches 9 (1807) 24-, 391-.
- , *Holtz, W.* N.-Vorp. Mt. 17 (1886) 63-.
- silk-. *Parrot, G. F.* (viii) Pander Btr. Ntk. 1 (1820) 75-.
- slow-acting. *Franklin, B.* Am. Ph. S. T. 2 (1786) 51-.
- vegetable. *Soares-Barbosa, A.* Lisb. Mm. Ac. Sc. 1 (1797) 262-.
- wet bulb. *Marriott, W.* [1876] Met. S. QJ. 3 (1877) 283-.
- , formula for dew-point. *Apjohn, Jas.* Ph. Mg. 6 (1835) 182-; 7 (1835) 266-, 470-; 9 (1836) 187-.
- , hygrometric scale. *P., —.* Gleanings Sc. 1 (1829) 77-.
- , portable form. *Passerini, N.* Firenze Ac. Georg. At. 22 (1899) 41-.
- , theory. *Apjohn, Jas.* [1834] Ir. Ac. T. 17 (1837) 275-, 283-.
- and dry bulb. *Kämtz, L. F.* Pisa Misc. Md. Chir. 2 (1843) 207-.
- , —, —, *Marriott, W.* [1874] Met. S. QJ. 2 (1875) 271-.

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- wet and dry bulb. *Miller, S. H.* [1876] Met. S. QJ. 3 (1877) 150-.
- , —, —, experimental investigation. *Macé de Lépinay, J.* J. de Ps. 10 (1881) 17-.
- , —, —, formula. *Apjohn, Jas.* B. A. Rp. (1843) (pt. 2) 36-.
- , —, —, psychrometric tables for. *Coffin, J. H.* [1856] Smiths. Misc. Col. 1 (1862) 20 pp.
- , —, —, reliability. *Hazen, H. A.* Science 1 (*1883) 502-.
-
- Hygroscope. *Benout, —.* QJ. Sc. 1 (1830) 195-.
- , fir branch. *Doümet, N.* Par. Bil. S. Bt. 13 (1866) xlii-.
- , metal spiral. *Mithoff, O.* Cztg. Opt. 5 (1884) 137-.
- Hygrosopic motions of plants (anisotropy). *Verschäffelt, J.* [1891] Mbl. Nt. (1891-92) 13-.
- properties of Canadian fossil fuels. *Hoffmann, G. C.* [1899] Cn. R. S. P. & T. 7 (1890) (Sect. 3) 41-.
- , —, cat-gut and hempen cord. *Corti, B.* Mod. Mm. S. It. 11 (1804) 642-.
- , —, mica. *Riess, P.* Pogg. A. 67 (1846) 354-.
- , —, textile fabrics. *Schlesing, T. (fils).* C. R. 116 (1893) 808-.
- , —, tissues. *Quekett, E. J.* [1840] Mcr. S. T. 1 (1844) 23-.
- Moist bulb problem. [*Shortrede non*] *Shortreed, R.* R. S. P. 5 (1848) 740-.
- Psychrometer, aspiration-. *Assmann, R.* Z. Instk. 12 (1892) 1-.
- , —, *Ellinger, H. O. G.* N. Ts. Fs. K. 2 (1897) 53-.
- , dry and wet bulb, and an improved chemical hygrometer. *Pembrey, M. S.* Ph. Mg. 35 (1893) 525-.
- , *Loew's. Scheurer, A., & Wild, E.* Mulhouse S. In. Bill. 68 (1898) 266-.
- , portable. *Passerini, N.* Rv. Sc.-Ind. 32 (1900) 43-.
- Psychrometers, theory. *Pernter, J. M.* [1883] Exner Rpm. 20 (*1884) 154-.
- Psychrometric tables and formula (vapour tension, dew-point and relative humidity), for whirled psychrometer. *Ferrel, W.* [U. S.] Chief Sig. Off. A. Rp. (1886) 233-.
- Saturation deficit. *Weihrauch, K.* Met. Z. 2 (1885) 260-.
- , —, *Meyer, H.* Met. Z. 4 (1887) 113-, [56].
- Temperature of vapour, Dalton's law. *Buquoy, G. von.* Oken Isis (1824) 751-.
- Vapour in atmosphere, determination. *Ekelund, A. W.* Sk. Nf. F. 1 (1839) 119-.
- pressure in arable land. *Hervé-Mangon, C. F.* Cosmos 6 (1870) 75-.
- , —, atmosphere. *Apjohn, Jas., & Lloyd, H.* Ir. Ac. P. 1 (1841) 433-.
- , —, —, *Renour, P.* C. R. 47 (1858) 354-.
- , —, —, Dalton's theory. *Lamont, J.* Ph. Mg. 24 (1862) 350-.

1900 Sublimation

- Vapour pressure in atmosphere, maximum. *Pierre, V.* Wien SB. (1849) 267-, (Ab. 2) 30-.
- — —, method of measuring. *Pierre, V.* Wien SB. (1850) (Ab. 2) 63-.
- pressures, Regnault's, tests, and extension to lower temperatures. *Hazen, H. A.* [U. S.] Chief Sig. Off. A. Rp. (1890) 658-.
- — — — —. *Marvin, C. F.* [U. S. Chief Sig. Off. A. Rp. (1891)] 351-.

1900 Vaporisation of Solids. Sublimation.

- Camphor, motion towards light. *Tomlinson, C.* Ph. Mg. 24 (1862) 358-.
- — —. *Draper, J. W.* Ph. Mg. 25 (1863) 342-.
- Carbon dioxide snow, thermometric and cryogenic application. *Du Bois, H., & Wills, A. P.* D. Ps. Gs. Vh. (1899) 168-.
- Solids and vapours. *Bancroft, W. D.* Ps. Rv. 3 (1896) 401-.
- Vaporisation of fire-proof substances. *Hermstadt, S. F.* Berl. Ab. (1814-15) (Ps.) 63-.
- — — ice. *Schübler, G.* Würtb. Ab. 1 (1826) 211-.
- — — and snow. *Carradori, G.* Brugnatelli G. 5 (1812) 203-.
- — — iron at ordinary temperature. *Pellat, H.* C. R. 126 (1898) 1338.
- — — limits. *Faraday, M.* Phil. Trans. (1826) 484-; R. I. P. 1 (1831) 70-.
- — — of metals by electricity. *Hopkins, (Rev.) G. H.* Nt. 10 (1874) 190-.
- — — at ordinary temperature. *Pellat, H.* C. R. 123 (1896) 104-.
- — — solids. *Baumgartner, G.* Carl Rpm. 13 (1877) 525-.
- Vapour pressure of solids and liquids, transition between. *Ramsay, W., & Young, S.* L. Ps. S. P. 8 (1887) 119-; Ph. Mg. 23 (1887) 61-, 138.
- Volatilisation of solids, influence of pressure. *Ramsay, W., & Young, S.* [1883] Phil. Trans. 175 (1885) 37-.
- Water vapour, sudden change to ice. *Bugge, —.* (vi Adds.) N. Al. J. C. 2 (1804) 701-.

1920 Solutions and Liquid Mixtures: Melting-Point, Boiling-Point, Vapour Pressure, etc.

- Acetic acid and water, distillation. *Aignan, —, & Chabot, P.* [1893] Bordeaux S. Sc. Mm. 4 (1894) xv-.
- Alcohol and carbon dioxide mixtures, density. *Blümcke, A.* A. Ps. C. 30 (1887) 243-.
- Alloys, eutectic, constitution. *Charpy, G.* Par. S. Ps. Sé. (1897) 87-.
- — —, fusibility. *Le Chatelier, —.* Par. S. Ps. Sé. (1894) 266.
- American petroleum and Russian kerosene, fractional distillation. *Wanklyn, J. A., & Cooper, W. J.* Ph. Mg. 40 (1895) 225-.
- Aqueous solutions, temperature of vapour from. *Zantedeschi, F.* Aten. It. 3 (1854) 14-.

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- Boiling of mixtures of 2 liquids, and "bumping" of such mixtures. *Magnus, G.* Pogg. A. 38 (1836) 481-.
- — — point curves. *Speyers, C. L.* Am. J. Sc. 9 (1900) 341-.
- — — of solutions, measurement. *Raoult, F. M.* Isère S. Bil. 27 (1892) 633-.
- — — salt solutions, temperature of vapour from. *Rudberg, F.* Lieb. A. 16 (1835) 143-.
- — — — —. *Wüllner, A.* Pogg. A. 110 (1860) 387-.
- — — — —. *Gill, J.* Ph. Mg. 32 (1866) 481-.
- — — — —. *Müller, F. C. G.* Berl. B. 9 (1876) 1629-.
- — — — —. *Wüllner, F. H. A. A.* Berl. B. 10 (1877) 256-.
- — — — —. *Pfaundler, L.* Berl. B. 10 (1877) 463-.
- — — — —. *Müller, F. C. G.* Berl. B. 10 (1877) 1327-.
- — — — —. *Kahlbaum, G. W. A.* Basel Vh. 8 (1890) 418-.
- — — — —. *Sakurai, J.* [1893] Tök. Coll. Sc. J. 6 (1894) 1-.
- — — — —, and from mixed liquids. *Magnus, G.* Berl. Mb. (1861) 157-.
- Bubble formation in frozen liquids. *Karsten, G.* [1893] Schl.-Holst. Nt. Vr. Schr. 10 (1895) 309-.
- Carbon disulphide and carbon tetrachloride, distillation of mixtures. *Brown, F. D.* C. S. J. 39 (1881) 304-.
- Change of volume due to solution of salts in water. *Heritsch, A.* A. Ps. C. 36 (1889) 115-.
- Constitution of cryohydrates. *Ponsot, A.* Par. S. Ps. Sé. (1894) 278-.
- Corresponding states of salt solutions. *Bender, C.* A. Ps. C. 22 (1884) 179-; 31 (1887) 872-.
- Eutectic mixtures. *Guthrie, Fred. L.* Ps. S. P. 6 (1885) 124-; Ph. Mg. 17 (1884) 462-.
- Evaporation of solutions. *Laval, E.* Bordeaux S. Sc. Mm. 2 (1886) 37-.
- — —, saline. *Pfaundler, L.* D. Nf. Tbl. (*1875) 208.
- — — — —. *Moutier, J.* Par. S. Phlm. Bil. 5 (1881) 146-.
- — — — —. *Marguerite-Delacharlonny, P.* As. Fr. C. R. (1887) (Pt. 1) 198.
- — — — —, and water. *Lesage, P.* As. Fr. C. R. (1892) (Pt. 2) 238-; C. R. 115 (1892) 473.

FREEZING POINT OF SOLUTIONS AND LIQUID MIXTURES.

- Rüddorf, F.* Pogg. A. 114 (1861) 63-; 116 (1862) 55-.
- Guldberg, C. M.* C. R. 70 (1870) 1349-.
- Raoult, F. M.* C. R. 98 (1884) 1047-; J. de Ps. 3 (1884) 16-; 5 (1886) 64-; Rv. Sc. 37 (1886) 673-.
- Ponsot, A.* Par. S. C. Bil. 17 (1897) 578.
- Apparatus, use for molecular weight determination. *Nernst, W.* Z. Ps. C. 6 (1890) 573-.

Binary mixtures. *Dahms, A.* [1894] A. Ps. C. 54 (1895) 486-; 60 (1897) 119-.

Colloidal solutions. *Liubavin, N. N.* Rs. Ps.-C. S. J. 21 (C.) (1889) 397-; C. S. J. 58 (1890) (Abs.) 685-.

Depression by dissolved gases. *Prytz, K. J.* de Ps. 2 (1893) 353-; 3 (1894) 584.

Determination.

Bijlert, A. van. Z. Ps. C. 8 (1891) 343-.

Loomis, E. H. A. Ps. C. 51 (1894) 500-.

(*Loomis.*) *Kohlrausch, F.* A. Ps. C. 51 (1894) 524-.

Jones, H. C. A. Ps. C. 53 (1894) 392-.

Ponsot, A. C. R. 118 (1894) 977-.

Loomis, E. H. A. Ps. C. 57 (1896) 521-.

Raoult, F. M. C. R. 124 (1897) 851-.

Ponsot, A. C. R. 124 (1897) 1227-; Par. S. C. Bll. 17 (1897) 741-; Par. S. Ps. Sé. (1897) 26-.

(*Raoult.*) *Battelli, A., & Stefanini, A.* N. Cim. 9 (1899) 5-.

(—) *Ponsot, A.* Par. S. C. Bll. 21 (1899) 356-.

(*Ponsot.*) *Raoult, —.* Par. S. C. Bll. 21 (1899) 610-.

Ponsot, A. Par. S. C. Bll. 21 (1899) 764-.

(source of error.) *Raoult, F. M.* Isère S. Bll. 30 (1899) 19-.

(precision cryoscopy.) *Raoult, F. M.* Isère S. Bll. 30 (1899) 337-.

Chruščov, P. C. R. 131 (1900) 883-.

apparatus. *Raoult, —.* Isère S. Bll. 25 (1887) 363.

of dilute solutions. *Arrhenius, S.* Stockh. Ak. Hndl. Bh. 14 (Afd. 1) (1889) No. 9, 23 pp.

— — — *Leduc, A.* C. R. 120 (1895) 436-; Par. S. Ps. Sé. (1895) 86-.

exceptions to Raoult's law. *Hoff, J. H. van't.* Par. S. C. Bll. 5 (1891) 932.

influence of temperature of freezing mixture. *Raoult, F. M.* C. R. 122 (1896) 1315-.

platinum thermometer method. *Chruščov, P., & Sitnikov, A.* Ftsch. Ps. (1898) (Ab. 2) 290.

progress. *Raoult, F. M.* Isère S. Bll. 25 (1887) 245-.

test of ionisation coefficients of solutions of sodium and potassium sulphates. *Archibald, E. H.* [1899] N. Scotia I. Sc. P. & T. 10 (1903) 33-.

and theory of solutions. *Abegg, R.* A. Ps. C. 64 (1898) 486-.

— — — (*Abegg.*) *Dieterici, C.* A. Ps. C. 64 (1898) 809-.

use for determining constitution. *Bilz, W.* N.-Vorp. Mt. 31 (1900) xv-.

Dilute solutions. *Loomis, E. H.* Ps. Rv. 1 (1894) 199-, 274-, 381; 3 (1896) 270-, 293-.

— — *Nernst, W., & Abegg, R.* Ph. Mg. 41 (1896) 196-.

— — *Ponsot, —.* J. de Ps. 5 (1896) 337-; A. C. 10 (1897) 79-.

— — *Loomis, E. H.* Ps. Rv. 4 (1897) 273-.

— —, and vapour pressure. *Ponsot, A. C.* R. 120 (1895) 434-, 520.

Electrolytes. *MacGregor, J. G.* Cn. R. S. P. & T. 6 (1900) (Sect. 3) 3-.

— —, diagram of depressions. *MacGregor, J. G.* [1900] N. Scotia I. Sc. P. & T. 10 (1903) 211-.

— —, mixtures. *Barnes, J.* [1900] N. Scotia I. Sc. P. & T. 10 (1903) 139-.

Molecular depression. *Ponsot, A.* C. R. 122 (1896) 668-.

— — by chlorides in solution. *Engel, —.* Par. S. Ps. Sé. (1893) 245-.

— — weight determination by lowering freezing point. *Raoult, —.* Rv. Sc. 2 (1894) 321-.

Non-electrolytes. *Loomis, E. H.* Ps. Rv. 9 (1899) 257-.

Non-metallic mixtures. *Palazzo, L., & Battelli, A.* Tor. Ac. Sc. At. 19 (*1883) 674-.

Specified Substances.

acid solvents. *Raoult, F. M.* C. R. 96 (1883) 1653-.

alcoholic liquors. *Raoult, F. M.* C. R. 90 (1880) 865-.

alkaline solvents. *Raoult, F. M.* C. R. 97 (1883) 941-.

benzene, molecular depression by alcohols. *Paternò, E.* Berl. B. 22 (1889) 1430-.

— — — iodoform. *Paternò, E.* Berl. B. 22 (1889) 465-.

brines. *Buchanan, J. Y.* Edinb. R. S. P. 14 (1888) 129-.

cane-sugar solutions and ethyl alcohol, cryoscopic relations. *Jones, H. C.* Ph. Mg. 40 (1895) 383-.

formic acid mixtures with water. *Novák, V.* Ph. Mg. 44 (1897) 9-.

gaseous solutions. *Barthélemy, A.* C. R. 70 (1870) 146-.

hydrochloric and sulphuric acids, solutions. *Barnes, J.* Cn. R. S. P. & T. 6 (1900) (Sect. 3) 37-.

mixtures of alcohol and water. *Pictet, R.* C. R. 119 (1894) 678-.

— —, alcoholic, and their maximum density. *Rossetti, F.* Ven. At. 15 (1869-70) 1297-.

sea water. *Ashe, W. A.* Science 9 (1887) 592.

— —, and melting point of sea water ice. *Ashe, W. A.* Science 10 (1887) 36.

silver copper alloys (curves). *Heycock, C. T., & Neville, F. H.* Phil. Trans. (A) 189 (1897) 25-.

sodium chloride solutions. *Pickering, S. U.* Ph. Mg. 37 (1894) 162-.

— — — *Ponsot, A.* C. R. 120 (1895) 317-.

— — —, determination of freezing point. *Ponsot, A.* C. R. 123 (1896) 189-.

— — — — — *Raoult, F. M.* C. R. 123 (1896) 475-, 631-.

— — — — — (*Raoult.*) *Ponsot, A.* C. R. 123 (1896) 557-.

sulphuric acid, dilute. *Hillmayr, W.* Wien Ak. Sb. 106 (1897) (Ab. 2a) 5-; Mh. C. 18 (1897) 27-.

— — of various strengths. *Pictet, R.* C. R. 119 (1894) 642-.

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water, oily and otherwise. *Dufour, H.* Laus. S. Vd. Bll. 35 (1899) xxiii-
 wine and dilute alcohol. *Boussingault, J. B.* Erdm. J. Pr. C. 47 (1849) 181-.

Freezing of aqueous solutions. *Dufour, L.* Laus. Bll. S. Vd. 6 (1860) 474-.

— solutions at constant temperature. *Colson, A.* C. R. 120 (1895) 991-.

Isothermals of carbon dioxide and sulphur dioxide mixtures. *Blümcke, A.* A. Ps. C. 36 (1889) 911-.

Lard and rosin mixture, melting point. *Olmsted, D.* Am. As. P. (1850) 33-.

Liquid mixtures, composition of vapour. *Winkelmann, A.* A. Ps. C. 39 (1890) 1-.

—, properties. *Lehfeldt, R. A.* [1898] L. Ps. S. P. 16 (1899) 83-, 289-; Ph. Mg. 46 (1899) 42-; 47 (1899) 284-.

Liquids, temperature variation on mixing. *Bussy, A. A. B., & Buignet, H.* C. R. 59 (1864) 673-, 785-.

—, — — — (Bussy and Buignet). *Favre, P.* A. C. R. 59 (1864) 783-.

—, — — —. *Jamin, J. C. R.* 70 (1870) 1309-; 71 (1870) 23-.

—, — — —, also contraction. *Klebnikof, P.* St. Pét. Ac. Sc. Bll. 6 (1863) 445-.

Micromanometer, investigations with. *Smits, A.* Amst. Ak. Vs. 5 (1897) 292-; Arch. Néerl. 1 (1898) 97-.

Mixtures, thermal study. *Favre, P. A. C. R.* 73 (1871) 717-.

—, thermochemistry. *Favre, P. A.* (vn) Marseille Mm. S. Em. 1 (1861) 117-.

Molecular equilibrium in mixed liquids. *Duclaux, É.* J. de Ps. 5 (1876) 13-.

Mutual solubility of salts. *Le Chatelier, H.* Par. S. Ps. Sé. (1894) 268-.

Orthobaric curves for homogeneous fluids, concordance. *Natanson, W.* Krk. Ak. (Mt.-Prz.) Rz. 3 (1891) 390-; Ph. Mg. 33 (1892) 152.

Osmotic equilibrium. *Ponsot, —.* Par. S. Ps. Sé. (1895) 121-.

— pressure and freezing point. *Arrhenius, S.* A. Ps. C. 51 (1894) 493-.

— — — — and electric conductivity. *Reicher, L. T.* Mbl. Nt. (1888) 108-.

— — — — of solutions. *Dieterici, C. A.* Ps. C. 52 (1894) 263-.

Partial and osmotic pressure of mixture of volatile liquids. *Guglielmo, G.* Rm. R. Ac. Linc. Rd. 1 (1892) (Sem. 1) 242-.

Raoult's law of lowering of vapour pressure, theoretical explanation. *Donnan, F. G.* Ph. Mg. 34 (1892) 411-.

Salt solutions and attached water. *Guthrie, Fred. L.* Ps. S. P. 6 (1885) 169-; Ph. Mg. 18 (1894) 22-, 105-.

— — raised to boiling point by steam at 100°. *Spence, P. B. A.* Rp. 39 (1869) (Sect.) 75-.

— — — —. *Müller, F. C. G.* Berl. B. 9 (1876) 1629-.

— — — —. *Wüllner, F.* H. A. A. Berl. B. 10 (1877) 256-.

— — — —. *Buchanan, J.* Y. [1898] Sc. Met. S. J. 11 (1900) 42-.

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Solution of solids, rate. *Carbonelli, C. E.* Genova S. Lig. At. 3 (1892) 265-.

Solvent, rapid evaporation, particles of dissolved substance carried into atmosphere by. *Marquerite-Delacharlonny, P.* C. R. 103 (1886) 1128-.

Steam and brines, boiling mixtures. *Buchanan, J. Y.* [1898] Edinb. R. S. T. 39 (1900) 529-.

VAPOUR PRESSURE OF LIQUID MIXTURES.

Wüllner, A. A. Ps. C. 129 (1866) 353-.

Konovalev, D. P. [1881-83] A. Ps. C. 14 (1881) 34-, 219-; (xii) Rs. Ps.-C. S. J. 16 (Pt. 1) (1884) 11-.

Jönsson, P. Lund. Un. Acta 24 (1887-88) (Mth.) No. ii, 16 pp.; 25 (1888-89) (Mth.) No. ii, 18 pp.; Fsch. Ps. (1887) (Ab. 2) 373-; (1888) (Ab. 2) 341.

Müller-Erzbach, W. Exner Rpm. 24 (1888) 575-.

Kahlbaum, G. W. A. Basel Vh. 9 (1893) 573-.

Müller, W. L., & Rosebrugh, T. R. [1897] Cn. I. P. 1 (1898) 87-.

Dolezalek, F. Z. Ps. C. 26 (1898) 321-.

Binary mixtures. *Magnus, G.* Pogg. A. 93 (1854) 579-.

— *Duclaux, É.* A. C. 14 (1878) 305-; C. R. 86 (1878) 592-.

— *Taylor, A. E.* J. Ps. C. 4 (1900) 290-, 355-, 675-.

— *Zawidzki, J. von.* Z. Ps. C. 35 (1900) 129-.

— and ternary mixtures. *Schreinemakers, F. A. H.* Z. Ps. C. 35 (1900) 459-; Amst. Ak. Vs. 8 (1900) 704-; Amst. Ak. P. 3 (1901) 1-.

Carbon dioxide and sulphur dioxide. *Blümcke, A.* A. Ps. C. 34 (1888) 10-.

— — — — (Blümcke). *Pictet, R.* A. Ps. C. 34 (1888) 734-.

Maximum pressures. *Isambert, —.* C. R. 98 (1884) 1327-.

Mutually soluble mixtures. *Ostwald, W.* A. Ps. C. 63 (1897) 336-.

Ternary mixtures. *Ostwald, W.* Leip. Mth. Ps. Ab. 25 (1899) 411-.

— *Schreinemakers, F. A. H.* Arch. Néerl. 5 (1900) 214-.

Volatile liquids. *Linebarger, C. E.* Am. C. S. J. 17 (1895) 615-, 690-.

Water, ice and freezing saline solution, relation between vapour pressures. *Ponsot, A. C.* R. 119 (1894) 731-.

— and sulphuric acid. *Kirchhoff, G.* Pogg. A. 104 (1858) 612-.

— — — — (Kirchhoff). *Wüllner, A.* Pogg. A. 105 (1853) 478-.

VAPOUR PRESSURE OF SOLUTIONS.

Babo, C. H. L. von. [1853-57] Freiburg B. 1 (1853) 13-, 277-.

Wüllner, A. Pogg. A. 103 (1858) 529-; 105 (1858) 85-.

(*Wüllner.*) *Kirchhoff, G.* Pogg. A. 106 (1859) 322-.

(*Kirchhoff.*) *Wüllner, A.* Pogg. A. 106 (1859) 632-.

Pauchon, E. C. R. 89 (1879) 752-.

Tammann, G. A. Ps. C. 24 (1885) 523-.

Emden, R. A. Ps. C. 31 (1887) 145-.

Tammann, G. St. Pét. Ac. Sc. Mm. 35 (1887) No. 9, 172 pp.; A. Ps. C. 36 (1889) 692-.

(Tammann.) Emden, R. A. Ps. C. 38 (1889) 447-.

Müller-Erbach, W. Z. Ps. C. 4 (1889) 1-.

Ostwald, W. Humb. 8 (1889) 1-.

Raoult, F. M. J. de Ps. 8 (1889) 5-.

Charpy, G. C. R. 111 (1890) 102-.

Ewan, T., & Ormandy, W. R. C. S. J. 61 (1892) 769-.

Dieterici, C. A. Ps. C. 50 (1893) 47-.

Marchis, L. J. de Ps. 3 (1894) 193-, 257-.

(tonometry.) Raoult, F. M. [1895] Isère S. Bl. 29 (1897) 139-.

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- — —, Swedish. *Andrée, S. A.* [1882] Stockh. Ak. Hndl. Bh. 7 (1883) No. 8, 26 pp.
- Carbon, thermal and electric conductance. *Cellier, L.* A. Ps. C. 61 (1897) 511-.
- Cements, etc. *Lees, C. H., & Chorlton, J. D.* Ph. Mg. 41 (1896) 495-.
- Charcoal. *Guyton de Morveau, L. B.* A. C. 26 (1798) 225-.
- Copper. *Quick, R. W., & Lanphear, B. S.* Am. As. P. (1894) 114-.
- — — *Child, C. D., & Quick, R. W.* Ps. Rv. 2 (1895) 412-; 3 (1896) 1-.
- — — and iron. *Ångström, A. J.* Stockh. Öfv. 19 (1862) 21-; *Pogg.* A. 118 (1863) 423-.
- — — and platinum. *Fischer, N. W.* Pogg. A. 52 (1841) 632-.
- — — sulphate, conduction in. *Pape, C.* A. Ps. C. 1 (1877) 126-.
- — — tin alloys, induction-balance effect, analogy with. *Roberts-Austen, W. C.* L. Ps. S. P. 3 (1880) 156-; *Ph. Mg.* 8 (1879) 551-.
- Cotton, wool, etc. *Coleman, J. J.* Glasg. Ph. S. P. 15 (1884) 90-.
- — — and silk. *Schulmeister, J.* [1877] Wien Ak. Sb. 76 (1878) (Ab. 2) 283-.
- Crystals. *Senarmont, H. de.* A. C. 21 (1847) 457-; C. R. 25 (1847) 459-, 707-; A. C. 22 (1848) 179-.
- — — (Senarmont). *Biot, J. B.* C. R. 25 (1847) 829-.
- — — *Jannettaz, É.* Par. S. Gl. Bil. 1 (1873) 117-.
- — — *Lodge, O. J.* Ph. Mg. 5 (1878) 110-; L. Ps. S. P. 2 (1879) 201-.
- Crystals. *Soret, C.* C. R. 114 (1892) 535-; Arch. Sc. Ps. Nt. 27 (1892) 373-.
- — — and bad conductors. *Lees, C. H.* [1892] Phil. Trans. (A) 183 (1893) 481-.
- — — conditions satisfied by coefficients. *Kowalski, J.* Prace Mt.-Fiz. 2 (1890) 100-; Fschr. Ps. (1890) (Ab. 2) 380-.
- — — conduction in. *Jannettaz, É.* A. C. 29 (1873) 5-; Par. S. Ps. Sé. (1876) 53-; C. R. 114 (1892) 1352-.
- — — *Voigt, W.* Gött. Nr. (1896) 236-.
- — — isothermals. *Röntgen, W. C.* A. Ps. C. 151 (1874) 603-; 152 (1874) 367; (xii) Z. Kr. 3 (1879) 17-.
- Dielectrics. *Knott, C. G., & Smith, C. M.* Edinb. R. S. P. 8 (1875) 623-.
- Ebonite. *Stefan, J.* [1876] Wien Ak. Sb. 74 (1877) (Ab. 2) 438-.
- — — and glass. *Dina, A.* Mil. I. Lomb. Rd. 32 (1899) 205-.
- Fabrics for clothing. *Senbier, J.* [1804] Turin Mm. Ac. (1804-05) 51-.
- — — uniforms. *Bordier, H., & Kolb, P.* As. Fr. C. R. (1898) (Pt. 2) 183-.
- Fire brick. *Penrock, J. D.* [1896] Am. I. Mn. E. T. 26 (1897) 263-.
- Flints. *Herschel, A. S.* Nt. 41 (1890) 175-.
- Glaciers, phenomena. *Herschel, (Sir) J. F. W.* Gl. S. P. 3 (1842) 699-.
- Glass and sand. *Penrose, C. B.* [1880] Am. Ac. P. 16 (1881) 47-.
- Glasses. *Focke, T. M.* A. Ps. C. 67 (1899) 132-.
- — — *Winkelmann, A.* A. Ps. C. 67 (1899) 160-, 794-.
- Gneiss. *Weber, R. H.* Zür. Vjschr. 23 (1878) 209-.
- Gypsum, axes of elasticity and conductivity. *Jannettaz, É.* C. R. 75 (1872) 940-, 1062-; Par. S. Ps. Sé. (1876) 121-.
- Ice. *Schumacher, C. A. von.* Sk. Nf. F. 5 (1847) 244-.
- — — *Delarive, L.* Gen. S. Ps. Mm. 17 (1864) 265-.
- — — *Forbes, G.* Edinb. R. S. P. 8 (1873) 62-.
- — — *Pfaff, I. B. A. F.* Erlang. Ps. Md. S. Sb. 6 (1874) 155-.
- — — *Coppinger, R. W.* R. S. P. 27 (1878) 183-.
- — — *Andrews, T.* R. S. P. 40 (1886) 544-.
- — — *Mitchell, A. C.* Edinb. R. S. P. 13 (1886) 592-.
- — — *Straneo, P.* Rm. R. Ac. Linc. Rd. 6 (1897) (Sem. 2) 262-, 299-.
- Iron. *Pazienti, A.* Ven. At. 10 (1864-65) 458-.
- — — *Tait, P. G.* B. A. Rp. 39 (1869) 175-.
- — — *Hansemann, G., & Kirchhoff, G.* A. Ps. C. 9 (1890) 1-.
- — — *Hall, E. H.* Ps. Rv. 10 (1900) 277-.
- — — bar, rate of conduction in. *Decharme, C. J.* [1876] (xii) M.-et-L. S. Ac. Mm. 34 (1878) 1-, 126; (ix) C. R. 82 (1876) 731-, 815-.
- — — cast. *Osmond, I. T.* Ps. Rv. 2 (1895) 211-.
- — — *Hall, E. H., & Ayres, C. H.* Am. Ac. P. 34 (1899) 281-.

- Iron, cast, and nickel, cast. *Hall, E. H.* Am. Ac. P. 27 (1893) 262-.
- , conductance as function of magnetisation. *Schweitzer, A.* Zür. Ps. Gs. Jbr. (1899 & 1900) 13.
- and copper. *Stewart, R. W.* [1893] Phil. Trans. (A) 184 (1894) 569-.
- — and German silver. *Mitchell, A. C.* Edinb. R. S. T. 33 (1888) 535-.
- — German silver. *Weber, Hein.* A. Ps. C. 146 (1872) 257-.
- , influence of magnetism on conductance. *Maggi, P. G.* Bb. Un. Arch. 14 (1850) 132-.
- , —, —, —, —. *Bellati, M., & Naccari, A.* [1876] Ven. I. At. 3 (1877) 83-.
- , —, —, —, —. *Penrose, C. B., & Trowbridge, J.* Am. Ac. P. 13 (1883) 210-.
- , —, —, —, —. *Battelli, A.* Tor. Ac. Sc. At. 21 (1885) 799-.
- , —, —, —, —. *Fossati, E.* Rv. Sc.-Ind. 21 (1889) 6-, 17-, 42-.
- , —, —, —, —. *Korda, D.* [1899] C. R. 128 (1899) 418-, 575; Mth. Term. Éts. 17 (1899) 169-; Mth. Nt. B. Ung. 17 (1901) 313-.
- , magnetic. *Holmgren, K. A.* Stockh. Öfv. 19 (1862) 163-.
- and steel, influence of magnetism on conductance. *Tomlinson, H.* R. S. P. 27 (1878) 109-.
- — —, thermal and electric conductance. *Schulze, F. A.* A. Ps. C. 63 (1897) 23-.
- , thermal and electric conductance. *Hall, E. H.* [1900] Am. Ac. P. 36 (1901) 119-.
- , wrought. *Forbes, J. D.* [1865] Edinb. R. S. T. 24 (1867) 73-.
- Isomorphous bodies, conduction in. *Godard, L.* C. E. 102 (1886) 1233-.
- Lead, bismuth and Wood's alloy. *Kronauer, H.* Zür. Vjschr. 25 (1880) 257-.
- Magnesium carbonate as non-conductor. *Luttgen, E.* Am. I. Mn. E. T. 15 (1887) 614-.
- Marble and slate, conductance, temperature variation. *Pierce, B. O., & Willson, R. W.* Am. J. Sc. 50 (1895) 435-.
- Marbles. *Pierce, B. O., & Willson, R. W.* [1900] Am. Ac. P. 36 (1901) 11-.
- Mercury and other metals. *Berget, A.* Par. S. Ps. Sé. (1888) 335-.
- Metal bar. *Dumas, W.* A. Ps. C. 129 (1866) 272-, 393-.
- , conduction in. *Kleiner, A.* Arch. Sc. Ps. Nt. 23 (1892) 353-.
- — —, lecture apparatus. *Campbell, G.* Rm. R. Ac. Linc. Mm. 13 (1882) 124-.
- wires. *Poloni, G.* Mil. I. Lomb. Rd. 19 (1886) 654-.
- Metals. [*Péclel, non*] *Peilet, E.* C. R. 8 (1839) 627-; A. C. 2 (1841) 107-.
- *Franz, R., & Wiedemann, G. H.* Pogg. A. 89 (1853) 497-.
- *Mousson, A.* Sch. Gs. Vh. 50 (1866) 55-.
- *Brit. Ass. Comm.* B. A. Rp. 39 (1869) 175-.
- *Deny, É.* [1881] (xii) Metz Ac. Mm. 63 (1885) 379-.
- Metals. *Poloni, G.* Mil. I. Lomb. Rd. 15 (1882) 386-.
- *Chvolson, O. D.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 439-.
- *Berget, A.* C. R. 107 (1888) 227-.
- *Gezechus [Hesehus], N.* Rs. Ps.-C. S. J. 24 (Ps.) (1892) 153-; J. de Ps. 2 (1893) 528.
- *Gray, J. H.* [1894] Phil. Trans. (A) 186 (1896) 165-.
- *Edser, E.* Nt. 60 (1899) 244-.
- and alloys. *Johnson, R., & Crace-Calvert, F. C.* R. 47 (1858) 1069-; Phil. Trans. (1858) 349-.
- , conduction in. *Gore, G.* Ph. Mg. 6 (1853) 382-.
- , —, —. *Wiedemann, G.* Pogg. A. 95 (1855) 337-.
- , —, —. *Olivier, J.* (xii) Vauc. Ac. Mm. 1 (1882) 156-.
- and earthy substances. *Despretz, C.* A. C. 36 (1827) 422-.
- , effect of temperature on conductance. *Lenz, R.* [1869-70] St. Pét. Ac. Sc. Bl. 14 (1870) 54-; St. Pet. Ac. Sc. Mm. (Rs.) 16 (*1870) (App. No. 2) 63 pp.
- , especially platinum. *Fischer, N. W.* Pogg. A. 19 (1830) 507-.
- , thermal conductance, variation with temperature. *Lodge, O. J.* Ph. Mg. 7 (1879) 198-, 251-; 8 (1879) 510-; L. Ps. S. P. 3 (1880) 28-, 141-.
- , — and electric conductance. *Hansemann, G., & Kirchhoff, G.* A. Ps. C. 13 (1881) 406-.
- , —, —, —. *Lorenz, L.* [1881] Kjøb. Dn. Vd. Selsk. Skr. 2 (*1881-86) 35-; A. Ps. C. 13 (1881) 422-, 582-.
- , —, —, —. *Berget, A.* J. de Ps. 9 (1890) 135-.
- , —, —, —. *Straneo, P.* Rm. R. Ac. Linc. Rd. 7 (1898) (Sem. 1) 197-, 310-.
- , —, —, —. *Aubel, E. van.* D. Ps. Gs. Vh. (1900) 3-.
- , —, —, — (van Aubel). *Jäger, W., & Diesselhorst, H.* D. Ps. Gs. Vh. (1900) 39-.
- , —, —, — (Jäger and Diesselhorst). *Aubel, E. van.* D. Ps. Gs. Vh. (1900) 77-.
- , —, —, —. *Riecke, E.* A. Ps. 2 (1900) 835-; Gött. Nr. (1900) 250-.
- , —, —, —. *Grüneisen, E.* A. Ps. 3 (1900) 43-.
- , —, —, — on electron theory. *Reinganum, M.* A. Ps. 2 (1900) 398-.
- , —, —, —, heat capacity and thermo-electric power. *Jaeger, W., & Diesselhorst, H.* Berl. Ak. Sb. (1899) 719-; Berl. Ps. Reichsanst. Ab. 3 (1900) 269-.
- Minerals, etc., conductance, measurement. *Jannettaz, É.* Par. S. Ps. Sé. (1885) 6.
- , fibrous. *Jannettaz, É.* Par. S. Gl. Bil. 6 (1878) 203-.
- and rocks. *Thoulet, J.* A. C. 20 (1880) 362-; C. R. 94 (1882) 1047-; A. C. 26 (1882) 261-.
- Nickel. *Baillie, T. C.* Edinb. R. S. T. 39 (1900) 361-.

2020 *Specifica Solids*

- Non-isotropic bodies, conduction in, lecture experiment. *Sella, A. N. Cim.* 10 (1899) 186-.
- Organic substances, conduction in. *Greiss, C. B. A. Ps. C.* 139 (1870) 174-.
- Phosphor-copper and arsen-copper, thermal and electric conductivity. *Rietzsch, A. A. Ps.* 3 (1900) 403-.
- Plates, conduction in, from hot gases to water. *Halliday, G.* [1898] *Glasg. I. Eng. T.* 42 (1899) 41-.
- with variously arranged surfaces, conduction in. *Walker, W. G. Elect.* 35 (1895) 788-.
- Porous moist substances. *Andrée, S. A.* [1890] *Stockh. Ak. Hndl. Bh.* 16 (*Afd.* 1) [1891] *No. 7, 7 pp.*; *Fschr. Ps.* (1890) (*Ab.* 2) 381.
- Rocks. *Herschel, A. S. B. A. Rp.* 43 (1873) (*Sect.*) 40.
- (St. Gothard). *Weber, R. H. Neuch. S. Sc. Bll.* 12 (1880) 687-.
- *Prestwich, J.* [1885] *R. S. P.* 41 (1887) 1-.
- *Stadler, G. Zür. Vjschr.* 34 (1889) 12-.
- , conduction, temperature variation. *Forbes, J. D. B. A. Rp.* (1840) 434-.
- , —, —. *Kelvin, (Lord), & Murray, J. R. E. R. S. P.* 58 (1895) 162-.
- , —, —. *Weber, R. Nt.* 52 (1895) 458-.
- , —, —. *Peirce, B. O., & Willson, R. W.* [1895] *Nt.* 53 (1895-96) 4.
- (Campagna), external and internal conductance. *Morano, F. Rm. R. Ac. Linc. Rd.* 7 (1898) (*Sem.* 2) 61-, 83-, 357.
- and solids in general. *Jannetaz, É. C. R.* 78 (1874) 1202-.
- Salts. *Lees, C. H. Manch. Lt. Ph. S. Mm. & P.* 42 (1898) *No. 5, 4 pp.*
- Selenium, action of light. *Bellati, M., & Lussana, S. Ven. I. At.* (1886-87) 1117-.
- Snow. *Hjeltström, S. A. Stockh. Öfv.* (1889) 669-; *J. de Ps.* 10 (1891) 142-.
- Soils. *Forbes, J. D. Edinb. R. S. P.* 1 (1845) 343-.
- Steam-pipes, non-conducting coverings for. *Ordway, J. M. Franklin I. J.* 86 (1888) 411-.
- Steel, manganese-. *Mitchell, A. C. Edinb. R. S. T.* 35 (1890) 947-.
- , mild. *Hall, E. H. Am. Ac. P.* 31 (1896) 271-.
- , — and hard. *Kohlrausch, F. Würzb. Ps. Md. Sb.* (1887) 120-.
- plates, conduction in. *Blechynden, A. Nv. Archt. T.* 35 (1894) 70-.
- Stones. *Perry, J., & Ayrton, W. E. Ph. Mg.* 5 (1878) 241-.
- *Peirce, B. O., & Willson, R. W. Am. Ac. P.* 34 (1899) 1-.
- Tourmaline. *Senarmont, H. de. A. C.* 28 (1850) 279.
- *Stenger, F. A. Ps. C.* 22 (1884) 522-.
- Tube plates, conduction through. *Durston, A. J. Nv. Archt. T.* 34 (1893) 130-.
- Vulcanite. *Peirce, B. O. Am. Ac. P.* 35 (1900) 73-; *Ph. Mg.* 49 (1900) 15-.
- Walls, conduction in. *Ferrini, R. Mil. I. Lomb. Rd.* 31 (1898) 479-.

Heat Conductance of Liquids 2030

- Walls, conduction of solar heat in. *Provenzali, F. S. Rm. N. Linc. At.* 34 (1881) 143-.
- of cylinders of steam-engines, conduction in. *Henrotte, J., & Yssel de Schepper, J. H. A. Rv. Un. Mines* 6 (1899) 40-, 129-.
- safes, resistance to passage of heat. *Ruff, F. Dingler* 300 (1896) 173-.
- , —, —, —, —. *Russner, —. Dingler* 301 (1896) 95-.
- Wire heated equally at ends, steady state. *Hearn, G. W. Ph. Mg.* 29 (1846) 22-.
- Wood. *Hoh, T. (xii) Bamb. Nf. Gs. B.* (11) (1876) (*Pt. 1, No. 3*) 17 pp.
- , æolotropic conductance. *Decandolle, A., & De la Rive, A. Gen. Mm. S. Ps.* 4 (1828) 70-.
- , —. *Tyndall, J. B. A. Rp.* (1852) (*pt. 2*) 20.
- and stone. *Less, E.* [1877] *A. Ps. C. (Ergänz.)* 8 (1878) 517-.

2030 Liquids, Conductance of.

- Dalton, J.* [1799] *Manch. Ph. S. Mm.* 5 (1802) 373-.
- Nicholson, W. Nicholson J.* 5 (1802) 197-.
- Murray, (Dr.) J. Nicholson J.* 1 (1802) 165-, 241-.
- Traill, T. S. Nicholson J.* 12 (1805) 133-.
- Böckmann, C. W. Rot. N. Vh.* 6 (1827) 1-.
- Despretz, C. C. R.* 8 (1839) 879-.
- Guthrie, Fred.* [1868] *Phil. Trans.* 159 (1869) 637-.
- Paalzow, A. A. Ps. C.* 134 (1868) 618-.
- Despretz, C. C. R.* 72 (1871) 484-.
- Winkelmann, A. A. A. Ps. C.* 153 (1874) 481-.
- Beetz, W. Münch. Ak. Sb.* 9 (1879) 86-.
- Baumgartner, G. Carl Rpm.* 17 (1881) 586-.
- Gratz, L.* [1882-85] *A. Ps. C.* 18 (1883) 79-; 25 (1885) 337-.
- Weber, H. F. Berl. Ak. Sb.* (1885) 809-.
- Apparatus. Evans, W. P.* [1898] *N. Z. I. T.* 31 (1899) 555-.
- Conductance in solid and liquid states. *Sluginov, N. Rs. Ps.-C. S. J.* 23 (*Ps.*) (1891) 456-; *J. de Ps.* 1 (1892) 405-.

CONDUCTION IN LIQUIDS.

- Thomson, T. Nicholson J.* 4 (1801) 529-.
- Rumford, B. (Count). Nicholson J.* 14 (1806) 353-.
- Prevost, P. J. de Ps.* 72 (1811) 168-.
- Fourier, J. B. J.* [1820] *Par. Mm. Ac. Sc.* 12 (1833) 507-.
- Despretz, C. C. R.* 7 (1838) 933-; 8 (1839) 838-; *A. C.* 71 (1839) 206-.
- Guthrie, Fred. Ph. Mg.* 35 (1868) 283-.
- Paalzow, —. D. Nf. Tbl.* (*1868) 170-.
- Weber, H. F. Zür. Vjschr.* 24 (1879) 252-, 355-.
- (Weber.) *Winkelmann, A. A. A. Ps. C.* 10 (1880) 668-.
- (Winkelmann.) *Weber, H. F. A. Ps. C.* 11 (1880) 347-.
- (Weber.) *Winkelmann, A. A. A. Ps. C.* 11 (1880) 734-.
- Chree, C. R. S. P.* 43 (1888) 30-.

Kristensen, K. S. Ts. Ps. C. 31 (1892) 97-
with convection. *Oberbeck, A.* A. Ps. C.
7 (1879) 271-
in motion. *Duhamel, J. M. C.* C. R. 47 (1858)
5-, 129-, 175-
— —. *Šebuev, G.* Kazan S. Ps.-Mth. Bil.
1 (1891) 22-.

Mixtures and their constituents. *Lees, C. H.*
[1895-99] B. A. Rp. (1895) 628; L. Ps. S. P.
17 (1901) 73-; Ph. Mg. 49 (1900) 286-
Temperature variation. *Lees, C. H.* [1897]
Phil. Trans. (A) 191 (1898) 399-.

SPECIFIED LIQUIDS.

Mercury. *Gripou, É.* [1866] C. R. 63 (1866)
51-; (xn) Lille S. Mm. 3 (1867) 179-
— *Herwig, H.* [1873-80] A. Ps. C. 151
(1874) 177-; 10 (1880) 662-
— (Herwig). *Weber, H. F.* A. Ps. C. 11
(1880) 345-
— *Berget, A.* C. R. 105 (1887) 224-; 106
(1888) 1152-; 107 (1888) 171-; Par. S. Ps.
Sé. (1888) 335-
— and amalgams. *Johnson, R., & Crace-
Calvert, F.* Phil. Trans. (1859) 831-
Organic liquids. *Heen, P. de.* Brux. Ac. Bil.
18 (1889) 192-
Saline solutions. *Jüger, G.* Wien Ak. Sb.
99 (1891) (Ab. 2a) 245-
Water. *Bottomley, J. T.* [1879] Phil. Trans.
172 (1881) 537-
— *Milner, S. R., & Chattock, A. P.* [1898]
Ph. Mg. 48 (1899) 46-
— and alcohol mixtures. *Henneberg, H.* A.
Ps. C. 36 (1889) 146-
—, conductance, and conduction in system of
cylinders. *Lorberg, H.* A. Ps. C. 14 (1881)
291-, 426-
— heated at the top in stone boiler. *Horn-
blower, J. C.* Nicholson J. 8 (1804) 169-
— as non-conductor. *Mather, W. W.* Silliman
J. 13 (1828) 368-
—, warming in tubes. *Forchheimer, P.* Hann.
Arch. -Vr. Z. 34 (1888) 175-; 35 (1889) 609-.

2035 Gases, Conductance of.

Mohr, C. F. Bonn SB. Niedr. Gs. (1869) 196;
Z. Mth. Ps. 15 (1870) 269-
(Mohr.) *Clausius, R.* D. C. Gs. B. 4 (1871)
269-
Ronkar, E. Brux. Ac. Bil. 8 (1884) 204-
Smoluchowski, M. Prace Mt.-Fiz. 10 (1899-
1900) 33-
Apparatus. *Kundt, A.* A. Ps. C. 2 (1877) 384-
— *Wood, R. W.* Ps. Rv. 6 (1898) 165-
Conductance at low temperatures. *Eckertlein,
P. A.* A. Ps. 3 (1900) 120-.

CONDUCTION IN GASES.

Fourier, J. B. J. [1820] Par. Mm. Ac. Sc.
12 (1833) 507-
Magnus, G. Berl. Mb. (1860) 465-
Clausius, R. Pogg. A. 115 (1862) 1-.

Stefan, J. [1872-75] Wien Sb. 65 (1872)
(Ab. 2) 45-; 72 (1876) (Ab. 2) 69-
Boltzmann, L. [1875] Wien Ak. Sb. 72 (Ab.
2) (1876) 458-
Winkelmann, A. A. A. Ps. C. 156 (1875) 497-;
157 (1876) 497-
Schliermacher, A. A. Ps. C. 34 (1888) 623-
Winkelmann, A. A. Ps. C. 44 (1891) 177-,
429-
Graetz, L. A. Ps. C. 45 (1892) 298-
(Graetz.) *Winkelmann, A.* A. Ps. C. 46 (1892)
323-
Weber, L. [1894] Schl.-Holst. Nt. Vr. Schr.
10 (1895) 313.
effect of density. *Winkelmann, A. A.* A. Ps.
C. 11 (1880) 474-
— — temperature. *Winkelmann, A. A.* A.
Ps. C. 19 (1883) 649-; 29 (1886) 68-
— —. *Eichhorn, W.* A. Ps. C. 40 (1890)
697-
at high temperatures. *Winkelmann, A. D.*
Nf. Tbl. (*1879) 181.
rarefied. *Smoluchowski, M. (Ritter) von Smolan.*
A. Ps. C. 64 (1898) 101-; Ph. Mg. 46 (1898)
192-
— *Gehrcke, E.* A. Ps. 2 (1900) 102-
—, and friction. *Kundt, A., & Warburg, E.*
A. Ps. C. 155 (1875) 337-, 525-; 156 (1875)
177-
and vapours. *Winkelmann, A. A.* A. Ps. C.
159 (1876) 177-.

Mixtures. *Plank, J.* [1875] Wien Ak. Sb.
72 (1876) (Ab. 2) 269-
Temperature variation. *Graetz, L.* A. Ps. C.
14 (1881) 232-
— (Graetz). *Winkelmann, A. A.* A. Ps. C.
14 (1881) 534-
— (Winkelmann). *Graetz, L.* A. Ps. C.
14 (1881) 541-
Vapours, temperature and pressure variations.
Magnamini, G., & Zunino, V. Mod. Ac. Sc.
Mm. 2 (1900) 87-.

SPECIFIED GASES.

Air (rarefied). *Crookes, W.* [1880] R. S. P.
31 (1881) 239-
— *Winkelmann, A.* A. Ps. C. 48 (1893)
180-
— *Müller, E.* A. Ps. C. 60 (1897) 82-
— and hydrogen. *Buff, H.* A. Ps. C. 158
(1876) 177-; Berl. Ak. Mb. (1876) 89; Arch.
Sc. Ps. Nt. 57 (1876) 293-
— —, temperature coefficient. *Winkelmann,
A. A.* A. Ps. C. 1 (1877) 63-
—, temperature variation. *Müller, E.* [1900]
Ps. Z. 2 (1901) 161-
—, use as bad conductor. *Bodde, B.* Hermb-
städt Bil. 9 (1811) 161-
Mercury vapour. *Schliermacher, A.* A. Ps.
C. 36 (1889) 346-
Nitrogen, nitric oxide, ammonia and illumina-
ting gas. *Plank, J.* [1876] Wien Ak. Sb.
74 (1877) (Ab. 2) 215-.

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- (-.) *Parrot, G. F.* Gilbert A. 17 (1804) 257-, 369-; 22 (1806) 148-.
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- - - - - *Murgue, D.* [1893-94] Fed. I. Mn. E. T. 6 (1894) 135-, 418-; 7 (1894) 211-.
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- - tubular boilers. *Brillié, H.* Gén. Civ. 32 (1897-98) 75-, 95-, 114-, 264-, 282, 297-, 313-; 34 (1898-99) 134-, 147-, 165-, 181-, 195-; 35 (1899) 342-, 357-, 378-, 388-, 405-.
- - vertical glass tubes. *Dutrochet, H.* A. C. 48 (1831) 268-.
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- Belpaire, T.* *Brux. Ac. Bll.* 34 (1872) 509-.
- Kurz, A.* *Carl Rpm.* 8 (1872) 161-.
- Nichols, R. C.* *Ph. Mg.* 1 (1876) 369-.
- Wood, De V.* *Franklin I. J.* 85 (1883) 347-.
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- Webb, J. B.* *Am. As. P.* (1885) 143-.
- Boltzmann, L.* *Wien Alm.* 36 (1886) 225-.
- Pirogov, N. N.* *Ra. Ps.-C. S. J.* 18 (*Ps.*) (1886) 307-; *Fschr. Ps.* (1886) (*Ab.* 2) 238-.
- Pictet, R.* *D. Nf. Thl.* (1887) 231-.
- Wald, F. Z. Ps. C.* 1 (1887) 408-; 2 (1888) 523-.
- Wood, De V.* *Franklin I. J.* 123 (1887) 128-, 196-, 298-.
- Farkas, G.* *Orv.-Termt. Éts. (Termt. Szak)* (1888) 241-, 279-.
- Natanson, W.* *Kosmos (Lw.)* 13 (1888) 256-.
- Wiedemann, E.* *A. Ps. C.* 36 (1889) 485-.
- Brit. Ass. Comm. (Bryan, G. H.) B. A. Rp.* (1891) 85-.
- Burbury, S. H.* [1893] *Nt.* 49 (1893-94) 150-.
- Bryan, G. H.* [1893] *Nt.* 49 (1893-94) 197-.
- Tiurin, V. A.* *Ra. Ps.-C. S. J.* 25 (*Ps.*) (1893) 112-.
- Burbury, S. H.* *Nt.* 49 (1893-94) 246-; *Ph. Mg.* 37 (1894) 574-.

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- Pünning*, —. [1894] Westf. Vr. Jbr. (1894-95) 237-.
- Vliet, P. P. van der.* Rs. Ps.-C. S. J. 26 (Ps.) (1894) 78-.
- Lodge, O. J.* Elect. 35 (1895) 80-.
- Casalunga, D. A.* As. Fr. C. R. (1898) (Pt. 1) 114.
- Schiller, N.* Rs. Ps.-C. S. J. 30 (Ps.) (1898) 31-; J. de Ps. 7 (1898) 674.
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- and kinetic theory of gases. *Burbury, S. H.* Ph. Mg. 1 (1876) 61-.
- — — — (Maxwell's demons). [1900] *Lippmann, G.* Sc. Abs. 4 (1901) 381.
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- Stationary motion, theory. *Oppenheim, S.* A. Ps. C. 15 (1882) 495-.
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- — — —, temperature effects on solids exposed. *Joule, J. P., & Thomson, W.* R. S. P. 8 (1856-57) 41-, 178-, 556-; Phil. Trans. (1860) 325-.
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- *Millington, J.* QJ. Sc. 5 (1818) 177-.
- , Narbonne. *Pavesi, A.* Polli A. 26 (1858) 178-.
- , thermo-lamp for. *Lampadius, W. A.* Schweigger J. 8 (1813) 38-.
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- by lime light, apparatus. *Drummond, T.* Edinb. J. Sc. 5 (1826) 319-.
- , — (Drummond). *Schweigger, J. S. C.* Schweigger J. 48 (= *Jb.* 18) (1826) 431-.
- , —, application to public and private lighting. *Gaudin, A. C. R.* 6 (1838) 861-.
- , —, of lighthouses in Black Sea. *Barlow, W. H.* Ph. Mg. 8 (1836) 238-.
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- — —. *Schlömilch, O.* Schlömilch Z. 3 (1858) 321-.
- — —. *Bazala, J.* Arch. Mth. Ps. 5 (1887) 113-.
- — —. *Waelsch, E.* Wien Ak. Sb. 101 (1892) (*Ab.* 2a) 79-.
- — —, on algebraic ruled surface. *Burali-Forti, C.* Palermo Cir. Mt. Rd. 4 (1890) 57-.
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- , due to 1 or 2 point-sources. *Weinberg, J.* Mosc. Bil. S. Nt. 38 (*pt.* 2) (1865) 435-.
- measurement. *Mascart, —.* [1885] Tel. E. J. 17 (1889) 642-.
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- , as distinct from photometry. *Nerville, — de.* Elect. 25 (1890) 402-.
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- of mines. *Lemielle, T.* Brux. Mm. Cour. 8° 1 (1840) 387-.
- by petroleum. *Wehrle, A.* Wien Jb. Pol. I. 5 (1824) 1-.
- — phosphorescent sulphides. *Montigny, C.* Brux. Ac. Bil. 49 (1880) 320-.
- by mixture of alcohol and turpentine. *Lancellotti, F.* [1843] Nap. At. I. Inc. 7 (1847) 135-.
- new system for steam boats to prevent running foul. *Charpy, —.* Rv. Mar. et Col. 82 (1884) 126-.
- from non-spherical surfaces in different positions. *Krüß, H.* Czgt. Opt. 8 (1887) 85-.
- phenomena. *Lallemand, A.* C. R. 77 (1873) 1216-.
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- — —. *Godfray, H.* Camb. (M.) Mth. M. 3 (1860) 38-.
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- — — ellipsoid by luminous point. *Kiel, A.* Arch. Mth. Ps. 67 (1882) 131-.
- surfaces of equal illumination. *Hoppe, R.* [1867] Ups. N. Acta S. Sc. 6 (1868) 4 pp. of theatres. *Ainger, Alf.* R. I. J. 2 (1831) 45-, 214-.
- theory. *Ebert, H.* D. Nf. Tbl. (1889) 200-.

- Photographic study of sources of light. *Crova*, A. C. R. 116 (1893) 1343-.
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- Pigments, brightness, by oblique vision. *Whitman*, F. P. Science 9 (1899) 734-.
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- Surface brightness, photographic measurement. *Hartmann*, J. Z. Instk. 19 (1899) 97-.
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- , of luminous bodies. *Trannin*, H. C. R. 77 (1873) 1495-.
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- , *Weber*, L. A. Ps. C. 20 (1883) 326-.
- application of coloured media, theory. *Krüss*, H. Cztg. Opt. 6 (1885) 196-, 244-.
- — diverging lenses. *Voller*, C. A. [1882] Hamb. Nt. Vr. Ab. 7 (Ab. 2) (1883) 40-.
- — Dove's prism. *Grosse*, W. Cztg. Opt. 8 (1887) 157-.
- — irradiation. *Lissagaray*, H. Mon. Sc. 10 (1868) 299-.
- — the potential. *Houllevigue*, L. J. de Ps. 10 (1891) 126-.
- — ten-candle lamps. *Harcourt*, A. V. B. A. Rp. (1894) 582-.
- of artificial means of illumination. *Porter*, C. H., & *Silliman*, B. Silliman J. 23 (1857) 315-.
- bright lights. *Hammerl*, H. (xii) Elekttech. Z. 4 (1883) 262-.
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- and brightness of solar disc. *Fontana*, G. Verona S. It. Mm. 1 (1782) 111-.
- of coloured flames. *Gouy*, A. C. R. 83 (1876) 269-; 85 (1877) 70-; A. C. R. 18 (1879) 5-; J. de Ps. 9 (1880) 19-.
- — light. *Cavalleri*, G. M. Mil. G. I. Lomb. 9 (1856) 83-.
- — —. *Vierordt*, K. A. Ps. C. 137 (1869) 200-.
- — —. *Grönberg*, T. [1881] Riga Cor.-Bl. 25 (1882) 40-.
- — —. *Whitman*, F. P. [1895] Ps. Rv. 3 (1896) 241-.
- — rays, and measurement of chemical intensity of daylight and coloured lights. *Vogel*, H. W. Berl. Ps. Gs. Vh. (1891) 35-.
- — sources of light. *Zahn*, W. von. [1874] Leip. Nf. Gs. Sb. 1 (1875) 25-.
- — —. *Rood*, O. N. [1877] Am. J. Sc. 15 (1878) 81-.
- — —. *Crova*, A. C. R. 93 (1881) 512-.
- — —. *Nicati*, W., & *Macé de Lépinay*, J. As. Fr. C. R. (1882) 223-.
- — —. *Macé de Lépinay*, J. C. R. 97 (1883) 1428-.
- — —. *Weber*, L. Elekttech. Z. 5 (1884) 166-.
- — colours. *Charpentier*, A. C. R. 88 (1879) 299-.
- — (in the spectrum). *Abney*, (Capt.) W. de W., & *Festing*, (Maj.-Gen.) E. R. [1886] Phil. Trans. 177 (1887) 423-.
- — (reflected). *Abney*, (Capt.) W. de W., & *Festing*, (Maj.-Gen.) E. R. [1888] Phil. Trans. (A) 179 (1889) 547-.
- — —. *Abney*, (Capt.) W. de W. C. S. P. 7 (1891) 150-.

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- Anon.* (vi 299) Cattaneo G. Farm. 18 (1833) 303-.
- Talbot*, W. H. F. Ph. Mg. 5 (1834) 321-.
- Arago*, D. F. J. Bb. Un. 59 (1845) 396-; C. R. 30 (1850) 305-, 365-, 425-, 617-.
- Zöllner*, F. Pogg. A. 100 (1857) 381-, 474-, 651-; 109 (1860) 244-; Basel Vh. 2 (1860) 287-.
- Pohl*, J. J. Dingler 161 (1861) 450-.
- Wild*, H. Pogg. A. 118 (1863) 192-.
- Foster*, W. C. N. 24 (1871) 124-.
- Provenzali*, F. S. Rm. At. N. Linc. 24 (1871) 138-.
- Bohn*, C. [1872] Pogg. A. (Ergänz.) 6 (1874) 386-.
- Wolf*, C. J. de Ps. 1 (1872) 81-.
- Cornu*, A. Par. S. Ps. Sé. (1881) 50-; Lum. Elect. 5 (1881) 221-, 232-.
- Ketteler*, E., & *Pulfrich*, C. [1881] A. Ps. C. 15 (1882) 337-.
- Crova*, A. Rv. Sc. 3 (1882) 225-, 752-.
- Weber*, L. Cztg. Opt. 4 (*1883) 181-, 194-.
- Möller*, W. Elekttech. Z. 5 (1884) 370-, 405-.
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- Karsten*, G. [1886] Schl.-Holst. Nt. Vr. Schr. 7 (Heft 1) (1888) 29-.
- Mascart*, —. Par. S. Ps. Sé. (1886) 147-.
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- Lummer*, O., & *Brodhun*, E. Z. Instk. 9 (1889) 41-, 461-; 10 (1890) 119-; 12 (1892) 41-, 132-; 16 (1896) 299-.
- Lummer*, O. D. Nf. Vh. (1890) (Th. 2) 92-.
- Methven*, J. Cztg. Opt. 11 (1890) 134-.
- Thompson*, S. P. L. Ps. S. P. 12 (1894) 361-; Ph. Mg. 36 (1893) 120-.

- of colours. *Abney, (Capt.) W. de W., & Festing, (Maj.-Gen.) E. R.* Phil. Trans. (A) 183 (1893) 531-.
- — — *Lovibond, J. W.* Mer. S. J. (1893) 275-.
- — — *Mayer, A. M.* Am. J. Sc. 46 (1893) 1-.
- by comparison, instrument. *Potter, R.* Ph. Mg. 1 (1832) 174-.
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- of curved light-surfaces. *Saltzmann, W.* Elekttech. Z. 8 (1887) 430-.
- diffuse reflection. *Lommel, E.* [1887] Münch. Ak. Sb. 17 (1888) 95-.
- — — *Seeliger, H.* [1888] Münch. Ak. Sb. 18 (1889) 201-.
- — —, Lambert's law. *Seeliger, H.* Leip. As. Gs. Vjschr. 20 (1885) 267-.
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- Masson, A.* A. C. 14 (1845) 129-; C. R. 18 (1844) 289-; 19 (1844) 925-; A. C. 30 (1850) 5-; C. R. 30 (1850) 627-; 31 (1850) 887-; 32 (1851) 127-; A. C. 31 (1851) 295-; 45 (1855) 385-.
- Fizeau, H. L., & Foucault, L.* C. R. 18 (1844) 746-.
- Géraldy, F.* Lum. Élect. 1 (*1879) 64-.
- Sabine, R.* B. A. Rp. (1882) 667-.
- Genung, N. H.* Elect. Rv. 31 (1892) 722-.
- arc, continuous current, as standard light. *Blondel, A.* [1893] Elect. 32 (1894) 117-, 145-, 169-.
- , enclosed alternating. *Mathews, C. P., Thompson, W. H., & Hibbich, J. E.* [1898] Sc. Abs. 2 (1899) 422.
- and glow lamps. *Voit, E., & Krüss, —.* Lum. Élect. 7 (*1882) 402-.
- — — *Krüss, H.* Elekttech. Z. 8 (1887) 356-.
- — — (Krüss). *Heim, C.* Elekttech. Z. 8 (1887) 414.
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- — — *Mathews, C. P.* Sc. Abs. 3 (1900) 928-.
- — — with various currents. *Lucas, F. C. R.* 100 (1885) 1454-.
- — —, secondary standard. *Guilbert, F.* Lum. Élect. 47 (1893) 573-.
- candle power. *Higgs, R. W. H. P.* I. CE. P. 68 (1882) 117-.
- — — (mean horizontal). *Mathews, C. P.* Ps. Rv. 6 (1898) 55-.
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- — — *Crova, A.* As. Fr. C. R. (1889) (Pt. 2) 336-.
- — — *Liebethal, E.* Z. Instk. 19 (1899) 193-, 225-.
- — — *Rowland, A. J.* Franklin I. J. 148 (1899) 376-.
- incandescent lamps and Auer's gas lamps. *Abt, A.* Orv.-Termt. Éts. (Termt. Szak) (1894) 294-, 347-.
- — — their efficiency. *Thomson, (Sir) W., & Bottomley, J. T.* B. A. Rp. (1881) 559-.
- — — electrical measurements. *Preece, W. H.* B. A. Rp. (1884) 654-.
- — — — — *Strecker, —.* Elekttech. Z. 8 (1887) 76-.
- — — hydrocarbon flames, colour. *Heise, R.* Berl. Gsndhamt. Arb. 17 (1900) 207-.
- — —, stand for. *Sharp, C. H.* Ps. Rv. 11 (1900) 181-.
- — —, technical photometry. *Strecker, —.* Elekttech. Z. 7 (1886) 146-.
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- — — *Boutan, A.* Rouen Tr. Ac. (1851-52) 101-.
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- improvements. *Krüss, H.* [1884] Hamb. Mth. Gs. Mt. 1 (1889) 105-.
- of incandescent gas mantles. *Medley, E. A.* Elect. Rv. 41 (1897) 824-.
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- — — tourmaline plates. *Schwebel, P. H.* (xii) Z. Kr. 7 (1883) 153-.
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— *Henry*, *C.* As. Fr. C. R. (1895) (Pt. 1) 227-.

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Palaz, *A.* Lum. Élect. 31 (1889) 267-.

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accuracy for measurements of photographic density, and sector photometer. *Abney*, (*Capt.*) *W. de W.* S. C. In. J. 9 (1890) 722-.

— — — — — (Abney). *Hurter*, *F.*, & *Driffield*, *V. C.* S. C. In. J. 9 (1890) 725.

— — — — — (Hurter & Driffield).

Abney, (*Capt.*) *W. de W.* S. C. In. J. 10 (1891) 18-.

— — — — — (Abney). *Hurter*, *F.*, & *Driffield*, *V. C.* S. C. In. J. 10 (1891) 20-, 98-.

improvements. *Gezechus* [*Hesehus*], *N. A.* Rs. Ps.-C. S. J. 20 (Ps.) (1888) 107-; J. de Ps. 8 (1889) 539.

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 — —, — fluid lenses. *Pil'chikov, N. D. (xii) Rs. Ps.-C. S. J. 13* (Ps.) (1881) [(Pt. 1)] 393-.
 — — and glass plates. *Wiedemann, E. E. G. A. Ps. C. 158* (1876) 375-.
 — —, simple method. *Bodyński, J. Carl Rpm. 18* (1882) 502-.
 — —, by telescope and scale method. *Ruoss, H. A. Ps. C. 48* (1893) 531-.
 — —, use of hollow prisms. *Pařizek, A. P., & Šulc, O. Prag České Ak. Fr. Jos. Rz. (Třída 2) 3* (1894) *Art. 1*, 30 pp.
 without measurement of angles. *Zenger, C. V. C. R. 99* (1884) 377-.
 and measurement of curvature. *Boys, C. V. Ph. Mg. 14* (1882) 30-.
 by microscope. *Kayser, E.* [1888] *Danzig Schr. 7* (1888-91) (*Heft 2*) xi-.
 — —, of glass. *Royston-Pigott, G. W. QJ. Mer. Sc. 12* (1872) 273-.
 — —, — liquids. *Harting, P. J. Mer. Sc. 6* (1858) 107-.
 — —, ——. *Sorby, H. C. C. S. J. 33* (1878) 487-.
 — —, ——. *Thompson, G. Nt. 34* (1886) 157-.
 — —, — — and transparent plates. *Bertin, A. A. C. 26* (1849) 288-; *C. R. 28* (1849) 447-.
 of microscopic objects. *Israel, O. Z. Ws. Mkr. 16* (1899) 349-.
 — minerals, by total reflection. *Thoulet, M. J. O. (xii) Fr. S. Mn. Bll. 6* (1883) 184-.
 — mixed alcohols. *Blaserna, P. Gz. C. It. 2* (1872) 69-.
 — mounting media, method. *Nelson, E. M. Mer. S. J.* (1892) 141-; (1894) 655-.
 — opaque bodies. *Malus, E. L.* [1807] *Par. Mm. Sav. Étr. 2* (1811) 509-.
 — parallel faced bodies. *Croullebois, M. C. R. 68* (1869) 1209-.

by photography. *Lumière, A., & Lumière, L.* C. R. 124 (1897) 1438-.

— Poggendorff's method. *Bieroviet, — van.* Brux. S. Sc. A. 12 (1888) (Pt. 1) 74-.

of prism. *Geranzi, B. T.* Rv. Sc.-Ind. 23 (1891) 221-.

by prism and by total reflection. *Dufet, H.* Par. S. Ps. Sé. (1891) 212-.

of quartz. *Esselbach, E.* Pogg. A. 98 (1856) 541-.

rapid. *Cominotto, E.* Rv. Sc.-Ind. 32 (1900) 49-.

by sextant. *Swan, W.* [1843] Edinb. N. Ph. J. 36 (1844) 102-.

of small crystals. *Sorby, H. C.* Mn. Mg. 1 (1877) 97-.

— solids. *Feussner, K. N.* Jb. Mn. (1883) (Bd. 2) 89-.

— strong solution of cyanin. *Lang, V. von.* [1881] Wien Ak. Sb. 84 (1882) (Ab. 2) 361-.

— — — — (Lang). *Pulfrich, C.* A. Ps. C. 16 (1882) 335-.

— sugar solutions. *Obermayer, A. von.* Wien Sb. 61 (1870) (Ab. 2) 797-.

by total reflection. *Kohlrausch, F.* [1877-78] Würzb. Ps. Md. Vh. 12 (1878) 103-; A. Ps. C. 4 (1878) 1-.

— — — *Quincke, G. H.* Halle Nf. Gs. Festschr. (1879) 321-.

— — — *Meyer, O. E.* Bresl. Schl. Gs. Jbr. (1889) 111.

Wollaston's method, modification. *Kohlrausch, F.* A. Ps. C. 16 (1882) 603-.

REFRACTIVE INDICES OF
VARIOUS SUBSTANCES.

acids. *Willigen, V. S. M.* van der. Harl. Arch. Ms. Teyl. 2 (1869) 238-.

air. *Chappuis, J., & Rivière, C.* C. R. 102 (1886) 1461-.

alcohol and aniline. *Johst, W.* A. Ps. C. 20 (1883) 47-.

— glycerin solutions. *Willigen, V. S. M.* van der. Harl. Arch. Ms. Teyl. 2 (1869) 199-.

alcoholic solution of fuchsine. *Christiansen, C.* A. Ps. C. 141 (1870) 479-.

alums (for various wave-lengths). *Soret, C.* C. R. 99 (1884) 867-, 1000; 101 (1885) 156-.

aniline red. *Christiansen, C.* Kjøb. Ov. (1871) 5-.

aqueous solutions. *Damien, B. C.* C. R. 91 (1880) 323-.

argon and helium. *Rayleigh, (Lord).* Nt. 52 (1895) 533; R. S. P. 59 (1896) 198-.

benzene. *Willigen, V. S. M.* van der. Harl. Arch. Ms. Teyl. 2 (1869) 218-.

— *Vostokov, I. A.* Vars. S. Nt. Tr. (1891-92) (C. R., Ps. C.) No. 8, 13-.

— *Bernackij, V.* [1891-92] Vars. S. Nt. Tr. (Mm.) 2 (1892) No. 5, 58 pp.; Fschr. Ps. (1891) (Ab. 2) 53; Vars. S. Nt. Tr. (1892-93) (C. R., Ps. C.) No. 1, 15-.

bismuth nitrate solution. *Ditscheiner, L.* Wien Sb. 49 (1864) (Ab. 2) 326-.

bodies gaseous at ordinary temperatures only. *Leroux, F. P.* A. C. 61 (1861) 385-.

bromine. *Rivière, C.* C. R. 131 (1900) 671-.

cadmium salt-solutions. *Muyneck, R. de.* A. Ps. C. 53 (1894) 559-.

calcium chloride solutions. *Bremer, G. J. W.* Arch. Néerl. 5 (1900) 202-.

compound ethers. *Long, J. H.* Am. J. Sc. 21 (1881) 279-.

cyanogen. *Chappuis, J., & Rivière, C.* C. R. 104 (1887) 1433-.

for D line of dry air from astronomical observations. *Comstock, G. C.* Washburn Obs. P. 9 (1896) 202.

ebonite. *Perry, J., & Ayrton, W. E.* L. Ps. S. P. 4 (1881) 345-; Ph. Mg. 12 (1881) 196-.

ethyl ether. *Oudemans, A. C. (jun.)* Amst. Ak. Vs. M. 1 (1885) 426-; Delft Éc. Pol. A. 3 (1887) 1-.

— near critical point. *Golicyn, (Prince) B., & Wilip, J.* St. Pét. Ac. Sc. Bil. 11 (1900) 117-.

fluorite, in infra-red. *Paschen, F.* A. Ps. C. 56 (1895) 762-.

fused salts. *Arons, L.* A. Ps. C. 53 (1894) 95-.

gases (liquefied). *Bleekrode, L.* A. Ps. C. 8 (1879) 400-; R. S. P. 37 (1884) 339-.

— *Rivière, C., & Chappuis, J.* Par. S. Ps. Sé. (1886) 188.

— (liquefied). *Chappuis, J.* C. R. 114 (1892) 286-.

—, Arago's interference apparatus. *Cornu, A.* (ix) Par. S. Phlm. Bil. 4 (1867) 2-.

— under high pressure. *Chappuis, J., & Rivière, C.* C. R. 96 (1883) 699-; Par. S. Ps. Sé. (1883) 193-.

— and vapours. *Mascart, É. É. N.* C. R. 86 (1878) 321-.

glass, influence of temperature. *Pulfrich, C.* A. Ps. C. 45 (1892) 609-.

— and quartz. *Quincke, G. H.* Edinb. R. S. P. 9 (1878) 567-.

glycerin solutions. *Strohmer, F.* Wien Az. 20 (1883) 237-.

hydrophane saturated with liquids. *Ščekaljev, J.* A. Ps. C. 64 (1898) 325-; 65 (1898) 745.

ice. *Meyer, G.* A. Ps. C. 31 (1887) 321-.

Iceland spar. *Dufet, —.* Par. S. Ps. Sé. (1894) 95-.

liquid nitrogen and air. *Living, G. D., & Dewar, J.* Ph. Mg. 36 (1893) 328-.

— oxygen, nitrous oxide and ethylene. *Living, G. D., & Dewar, J.* Ph. Mg. 34 (1892) 205-.

liquids. *Bequerel, E., & Cahours, A.* C. R. 11 (1840) 867-.

— *Damien, B. C.* Par. Éc. Norm. A. 10 (1881) 233-.

— (relations between compressibility and refractive indices). *Quincke, G.* A. Ps. C. 44 (1891) 774-.

— of feeble dispersion. *Willigen, V. S. M.* van der. [1867] Harl. Arch. Ms. Teyl. 1 (1868) 161-.

—, indices greater than 1.8. *Bertrand, É.* Fr. S. Mn. Bil. 11 (1888) 31.

metal chlorides in solution. *Willigen, V. S. M.* van der. Harl. Arch. Ms. Teyl. 2 (1869) 222-.

metals. *Quincke, G.* Pogg. A. 120 (1863) 599-.

- metals. *Kundt*, —. [1888] Gen. S. Ps. Mm. 30 (1888-90) lxxiii-.
- , *Aubel, E. van.* Brux. S. Sc. A. 24 (1900) (Pt. 1) 64-.
- mica and pennine. *Haidinger, W.* Wien Sb. 14 (1854) 330-.
- mineral waters. *Riegler, E.* Bucarest S. Sc. Bl. 9 (1900) 251-.
- native barium, strontium and lead sulphates, effect of heat. *Arzruni, A.* (xii) Z. Kr. 1 (1877) 165-.
- optical glass of several kinds. *Mascart, É.* A. C. 14 (1868) 144-.
- phosphorus dissolved in carbon disulphide. *Whitwell, C. T.* Nt. 11 (1875) 307.
- potassium nitrate and sodium chloride solutions. *Schmidt, W.* Pogg. A. 107 (1859) 539-.
- quartz (various kinds). *Dufet, H.* Par. S. Ps. Sé. (1890) 193.
- , *Macé de Lépinay, J.* Mars. Fac. Sc. A. 5 (1896) Fasc. 2, 14 pp.
- , effect of calcination. *Brun, A.* Arch. Sc. Ps. Nt. 2 (1896) 657-.
- rock-forming minerals (for sodium light). *Zimányi, K.* [1893] Mag. Tud. Ak. Étk. (Termt.) 23 (1894) No. 2, 72 pp.; Mth. Nt. B. Ung. 11 (1894) 189-.
- rock salt. *Langley, S. P.* Am. J. Sc. 30 (1885) 477-.
- , sylvin and fluorite (for very long wavelengths). *Rubens, H., & Snow, B. W.* A. Ps. C. 46 (1892) 529-.
- saline solutions. *Beer, A., & Kremers, P.* Pogg. A. 101 (1857) 133-.
- , *Bary, P. C. R.* 114 (1892) 827-.
- sea water. *Soret, J. L., & Sarasin, É.* Arch. Sc. Ps. Nt. 21 (1889) 509-.
- , *Manley, J. J.* [1900] Edinb. R. S. P. 23 (1902) 35-.
- sodium salt solutions. *Willigen, V. S. M. van der.* [1870] (xi) Haarl. Ms. Teyl. Arch. 3 (1874) 15-.
- several substances. *Powell, B. B. A.* Rp. (1850) (pt. 2) 14-.
- , table. *Brewster, (Sir) D.* QJ. Sc. 22 (1827) 355-.
- , *Herschel, (Sir) J. F. W.* Edinb. J. Sc. 10 (1829) 296-.
- substitution products of carbonic ether. *Wiedemann, E.* J. Fr. C. 114 (1873) 453-.
- water (distilled). *Willigen, V. S. M. van der.* A. Ps. C. 122 (1864) 191-; Amst. Vs. Ak. 16 (1864) 332-.
- , *Croullebois, M. C. R.* 70 (1870) 847-, 1022.
- (Croullebois). *Jamin, J. C. R.* 70 (1870) 966-.
- , *Brühl, J. W.* Berl. B. 24 (1891) 644-.
- , *Walter, B. A.* Ps. C. 46 (1892) 423-.
- , carbon disulphide, monobromonaphthalene, terebenthene, alcohol, quartz, fluorite, beryl. *Dufet, H.* Fr. S. Mn. Bl. 8 (1885) 171-.
- vapour. *Jamin, J. A. C.* 52 (1858) 171-.
- white light refracted without sensible dispersion. *Montigny, C.* Brux. Ac. Bl. 19 (1865) 177-.

REFRACTOMETERS.

- Royston-Pigott, G. W.* M. Mer. J. 5 (1871) 65-.
- Abbe, E.* Jena. Sb. (1879) 35-.
- Pulfrich, C. Z.* Instk. 8 (1888) 47-.
- Féry, C. C. R.* 113 (1891) 1028-; As. Fr. C. R. (1892) (Pt. 2) 245-.
- Pulfrich, C. Z.* Ps. C. 18 (1895) 294-; J. de Ps. 5 (1896) 73-.
- Abbe's Appel, J.* Ts. Ps. C. 27 (1888) 164-.
- , *Czapski, S. Z.* Instk. 10 (1890) 246-, 269-.
- , *Feussner, W.* Z. Instk. 14 (1894) 87-.
- , new arrangements. *Pulfrich, C.* Z. Instk. 18 (1898) 107-.
- for analysis of oils and butter. *Amagat, E. H., & Jean, F. C. R.* 109 (1889) 616-.
- Bertrand's. Hausser, W.* Gén. Civ. 9 (1886) 44-.
- for butter experiments. *Poleck, —.* Bresl. Schl. Gs. Jbr. (1894) (Ab. 2a) 111-.
- differential. *Trannin, H.* As. Fr. C. R. (1885) (Pt. 1) 105-.
- , *Doumer, E. J. de Ps.* 9 (1890) 191-.
- (Zeiss's). *Anon. Mcr. S. J.* (1900) 722-.
- , for liquids. *Hallwachs, W.* A. Ps. C. 50 (1893) 577-.
- educational (Zeiss's). *Anon. Mcr. S. J.* (1900) 636-.
- form. *Royston-Pigott, G. W.* M. Mer. J. 16 (1876) 294-.
- , new. *Hallwachs, W.* Dresden Isis Sb. (1893) (Ab.) 49-.
- with heating arrangement. *Leiss, C. Z.* Instk. 19 (1899) 65-.
- immersion- (Zeiss's). *Anon. Mcr. S. J.* (1900) 721-.
- lens-, for liquids. *Pilčikov, N.* Par. S. Ps. Sé. (1889) 61-.
- for liquids. *Soret, C.* Arch. Sc. Ps. Nt. 19 (1888) 264-.
- , *Sondén, —.* Nt. 44 (1891) 478.
- or gases (Dupré's). *Pellin, P.* Par. S. Ps. Sé. (1889) 85-.
- new. *Viola, C. Z.* Instk. 19 (1899) 276-.
- for solids. *Soret, C. C. R.* 95 (1882) 517-; Arch. Sc. Ps. Nt. 9 (1883) 5-.
- total reflection. *Kohlrausch, F.* A. Ps. C. 16 (1882) 609-.
- , *Pulfrich, C. A.* Ps. C. 30 (1887) 193-, 487-; 31 (1887) 724-; Z. Instk. 7 (1887) 16-, 55-, 392-; A. Ps. C. 36 (1889) 561-.
- for use with the microscope. *Starke, H. D.* Ps. Gs. Vh. (1899) 117-.
- using Newton's rings. *Royston-Pigott, G. W.* R. S. P. 24 (1876) 393-.
- with variable refracting angle. *Pulfrich, C.* Z. Instk. 19 (1899) 335-.
- for Wollaston's method. *Liebisch, T.* Z. Instk. 4 (1884) 185-; 5 (1885) 13-.
- Wollaston's, improvements. *Cooper, J. T. C.* S. Mm. 1 (1841-43) 234-.

Salt invisible in its mother liquor. *Tomlinson, C. Ph. Mg.* 40 (1870) 328-.

Shadows under water, effects due to. *Hutchinson, H. N.* [1875] *Rugby NH. S. Rp.* (1876) 22-.

Sphere, homogeneous, course of light-rays in. *Lippich, F.* *Wien Ak. Sb.* 79 (1879) (Ab. 2) 516-.

—, optical property. *Hermann, L.* *Zür. Vjschr.* 19 (1874) 413-, 428.

Strophoid, application in geometrical optics. *Loria, G.* *N. A. Mth.* 16 (1897) 262-.

Surface images. *Mannoury, G.* *N. Arch. Wisk.* 4 (1899) 112-.

Surfaces of 2nd degree, mechanical method of producing. *Plücker, J.* *Crelle J.* 34 (1847) 357-.

—, optical, production. *Brashear, J. A.* *Am. As. P.* (1884) 255-.

—, tests for planeness and parallelism. *Gibbs, W.* *Am. J. Sc.* 50 (1870) 53-.

Tracing paper for copying drawings. *Lasteyrie, —.* *Tilloch Ph. Mg.* 47 (1816) 132-.

Transmission of light through bent tubes. *Babinet, J. C. R.* 15 (1842) 802.

Transparent bodies, action on differently coloured rays. *Brewster, (Sir) D.* [1815] *Edinb. R. S. T.* 8 (1818) 1-.

— plates, interference apparatus for testing parallelism. *Czapski, S.* *Z. Instk.* 5 (1885) 149-.

Vision through glass plate. *Gergonne, J. D.* [1823] *Gergonne A. Mth.* 14 (1823-24) 1-.

Water, scenic effects due to. *Inman, T.* (x) *Lpool. Lt. Ph. S. P.* 27 (1873) 215-.

Window-glass, phenomenon with. *Tait, P. G.* *Edinb. R. S. P.* 11 (1882) 418-.

3030 Spectrometry. Dispersion.

(See also 3800; Chemistry 7310.)

Coloured light for dark rooms, measurement. *Abney, (Capt.) W. de W.* *Phot. J.* 10 (1886) 114-, 138-.

Colours, experiments. *Pownall, —.* *Tilloch Ph. Mg.* 12 (1802) 42-, 107-.

—, Newton's seven. *Mollweide, C. Gehlen J.* 1 (1806) 651-.

—, physical investigations. *Venturi, G.* *Mod. S. It. Mm.* 8 (1799) 699-.

—, prismatic. *Tenney, S.* [1792] *Bost. Mm. Am. Ac.* 2 (1793) 37-.

—, —. *Mons, J. B. van.* (vi *Adds.*) *V. Mons J. C.* 6 (1804) 106-, 242-.

Dispersionometer, construction. *Mousson, A.* *Sch. Gs. Vh.* 55 (1872) 183-.

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Rudberg, F. *Pogg. A.* 9 (1827) 483-.

Amici, G. B. *Pogg. A.* 35 (1835) 609-.

Hunt, E. B. *Silliman J.* 7 (1849) 364-.

Christoffel, E. B. *Berl. Mb.* (1861) 906-.

Briot, C. *C. R.* 57 (1863) 866-.

Mathieu, É. *C. R.* 59 (1864) 885-; *Liouv. J. Mth.* 11 (1866) 49-.

Ricour, T. *C. R.* 69 (1869) 1231-; 70 (1870) 115-.

Willigen, V. S. M. van der. *Harl. Arch. Ms. Teyl.* 2 (1869) 308-.

(Lommel, Glazebrook and Mathieu.) *Ketteler, E.* *A. Ps. C.* 15 (1882) 613-.

Klercker, C. E. de. [1882-83] *Stockh. Ak. Hndl. Bh.* 7 (1882-83) No. 1, 54 pp.; *C. R.* 95 (1882) 588-; *Stockh. Ak. Hndl. Bh.* 8 (*1883-84) No. 10, 36 pp.; *C. R.* 97 (1883) 707-.

of air. *Runge, C.* *As. & Asps.* 12 (1893) 426-.

—, new method of determining. *Rydberg, J. R.* *Stockh. Öfv.* (1893) 693-; *Fachr. Ps.* (1893) (Ab. 2) 46.

chromatic. *Petruševskij, T.* *Rs. Ps.-C. S. J.* 28 (Pa.) (1896) 91-; *Fachr. Ps.* (1896) (Ab. 2) 38.

—, laws. *Ponton, M.* [1859] *Ph. Mg.* 19 (1860) 165-, 263-, 364-.

—, — (Ponton). *Stewart, B.* *Ph. Mg.* 20 (1860) 143-.

—, —. *Ponton, M.* *Ph. Mg.* 20 (1860) 253-.

of colourless transparent media. *Wüllner, F. H. A. A.* *A. Ps. C.* 17 (1882) 580-.

determination with very small prisms. *Babinet, J. C. R.* 21 (1845) 513-.

and deviation, mode of increasing. *Kohlrausch, F. A.* *Ps. C.* 143 (1871) 147-.

of diamond. *Schrauf, A.* *A. Ps. C.* 22 (1884) 424-; 26 (1885) 644.

— fluorite. *Langley, S. P.* *Smiths. I. Asps. Obs. A.* 1 (1900) 219-.

formulæ. *Powell, B.* *Ph. Mg.* 9 (1836) 116-.

—, *Mascart, É.* *Par. Éc. Norm. A.* 1 (1864) 263-.

—, *Carvalho, E.* [1900] *Sc. Abs.* 4 (1901) 488.

— with only 2 constants. *Lommel, E. C. J.* *Erlang. Ps. Md. S. Sb.* 11 (1879) 191-.

—, experimental proofs. *Brühl, J. W.* *Lieb. A.* 236 (1886) 233-.

of gases. *Ketteler, E.* *Berl. Mb.* (1864) 630-.

—, —. *Croullebois, M.* *C. R.* 68 (1869) 778-.

—, —. *Mascart, É. É. N. C. R.* 78 (1874) 679-.

— glass. *Barlow, P.* *Phil. Trans.* (1827) 231-.

—, simple and accurate method for ratio. *Stokes, G. G.* *R. S. P.* 27 (1878) 485-.

— glycerin. *Listing, J. B.* *Gött. Nr.* (1869) 203-.

— gypsum. *König, W.* *A. Ps. C.* 69 (1899) 1-.

— Iceland spar. *Carvalho, E.* *J. de Ps.* 9 (1900) 465-.

laws. *Ketteler, E.* *A. Ps. C.* 7 (1879) 658-.

—, *Mouton, L.* *C. R.* 88 (1879) 1189-.

—, *Hesse, O.* *A. Ps. C.* 11 (1880) 871-.

—, *Lommel, E. C. J.* *Erlang. Ps. Md. S. Sb.* 13 (1881) 24-.

—, of calorific rays, and measurement of their wave-lengths. *Mouton, L.* *A. C.* 18 (1879) 145-.

of liquid oxygen. *Olzewski, K., & Witkowski, A.* *Cre. Ac. Sc. Bll.* (1894) 245-.

— mercuric iodide solution. *Living, G. D.* [1879] *Camb. Ph. S. P.* 3 (1880) 258-.

- method of measuring in different parts of spectrum. *Mousson, A.* Arch. Sc. Ps. Nt. 45 (1872) 13.
- number of points in spectrum required for exact knowledge. *Willigen, V. S. M. van der.* Harl. Arch. Ms. Teyl. 1 (1868) 275-.
- phenomena (earthquake waves) analogous to. *Rudzki, M. P.* [1898] Krk. Ak. (Mt.-Prz.) Rz. 16 (1899) 115-; Cre. Ac. Sc. Bll. (1898) 166-.
- propagation of light-waves with reference to. *Gouy, A.* Liouv. J. Mth. 8 (1882) 335-.
- of ray of light refracted at any number of plane surfaces. *Pickering, E. C.* Am. Ac. P. 7 (1868) 478-.
- rock salt. *Ketteler, E.* A. Ps. C. 31 (1887) 322-.
- —. *Carvalho, E. J. de Ps.* 8 (1889) 179-.
- —. *Langley, S. P.* Smiths. I. Asps. Obs. A. 1 (1900) 219-, 253-.
- sylvine, and reflecting power of metals. *Troubridge, A.* A. Ps. C. 65 (1898) 595-.
- theory. *Renard, N. A. C. R.* 64 (1867) 357-.
- (Briot's). *Mees, R. A.* A. Ps. C. 134 (1868) 118-.
- *Shebuev, G. N.* (xii) Rs. Ps.-C. S. J. 11 (Ps.) (1879) [(Pt. 1)] 103-.
- (Shebuev's). *Stolyetov, A. G.* (xii) Rs. Ps.-C. S. J. 11 (Ps.) (1879) [(Pt. 1)] 134.
- *Lorenz, L.* [1883] Kjøb. Dn. Vd. Selsk. Skr. 2 (*1881-86) 165-; A. Ps. C. 20 (1883) 1-.
- (Voigt's). *Gruzincev, A. P.* Kharkov Mth. S. Com. (1886) 17-.
- , mathematical. *Gercken, W.* A. Ps. C. Beibl. 2 (1878) 407-.
- of ultra-violet light. *Simon, H. T.* A. Ps. C. 53 (1894) 542-.
-
- Dispersive power of air. *Montigny, C.* Brux. Ac. Bll. 24 (1867) 523-.
- — gases and vapours. *Croullebois, M.* C. R. 67 (1868) 692-.
- —, high, of liquids. *Gibbs, W.* Am. J. Sc. 50 (1870) 50-.
- — —, use in spectroscopy. *Zenger, C. V.* C. R. 100 (1885) 731-.
- — —, oil of Cassia, cause. *Herschel, (Sir) J. F. W.* Edinb. J. Sc. 10 (1829) 308-.
- —, measurement. *Herschel, (Sir) J. F. W.* [1822] Edinb. R. S. T. 9 (1823) 445-.
- — of organic liquids. *Barbier, P., & Roux, L.* C. R. 108 (1889) 1249-.
- — — saline solutions. *Barbier, P., & Roux, L.* C. R. 110 (1890) 457-.
- — —, effect of molecular weight of salt. *Barbier, P., & Roux, L.* C. R. 110 (1890) 527-.
- Light. *Brougham & Vaux, H. (Lord).* Phil. Trans. (1797) 352-.
- , composition. *Bompas, C. C.* Tilloch Ph. Mg. 50 (1817) 366-.
- , corpuscular theory, spectrum, phosphorescence, fluorescence. *Cuadrado, G. A.* Habana Ac. A. 33 (1896) 253-.
- Light never decomposed into the prismatic colours. *Reade, J.* Thomson A. Ph. 3 (1814) 276-.
- , decomposition. *Prieur, C. A.* A. C. 59 (1806) 227-.
- , experiments. *Gourdin, —.* [1787] Rouen Tr. Ac. 5 (1781-93) 202.
- , white. *Almeida Lima, J. M. d'.* Lisb. J. Sc. Mth. 3 (1895) 209-.
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- — — — —, simple. *Varley, S. Tilloch Ph. Mg.* 4 (1799) 87-.
- — — — —, *Jacquin, J. von. Baumgartner Z.* 2 (1833) 101-.
- — — — — and field of view. *Lubimoff, N. [1872] Mosc. Bil. S. Nt.* 45 (pt. 2) (1873) 1-.
- — — — — (Lubimoff). *Bredichin, T. Mosc. Bil. S. Nt.* 45 (pt. 2) (1873) 380-; 46 (pt. 1) (1873) 460-; (xii) *Rec. Mth. (Moscou)* 6 (1872-73) (Pt. 1) 303-.
- — — — — (Bredichin). *Lubimoff, N. Mosc. Bil. S. Nt.* 46 (pt. 1) (1873) 165-.
- — — — — (Lubimoff). *Bredichin, T. Carl Rpm.* 10 (1874) 54-.
- — — — — — — — — — and brightness. *Bohn, C. Z. Mth. Ps.* 29 (1884) 25-, 74-.
- — — — — — — — — —, simple determination. *Waltenhofen, A. von. [1871] Prag Ab. 5* (1872) 15 pp.
- — — — —, theorem. *Robinson, T. R. [1852] Ir. Ac. P.* 5 (1850-53) 249-.
- — — — —, useful. *Strehl, K. Czgt. Opt.* 18 (1897) 171.
- — — — — and visual angle, instrument for measuring. *Cavalleri, G. M. (vi Add.) Majocchi A. Fis. C.* 27 (1847) 281-.
- marine. *Steinheil, C. A. von. Münch. Sb.* 1 (1863) 468-.
- method of weakening sun's light at focus. *Foucault, [J. B.] L. C. R.* 63 (1866) 413-.
- micrometeradjustments, illumination. *Förster, W. (xii) Z. Instk.* 1 (1881) 7-, 119-.
- micrometers for. *Cavani, F. Mod. Ac. Sc. Mm.* 12 (1896) lxxxv-.
- mirror readings, form for. *Hartmann, E. Würzb. Ps. Md. Sb.* (1881) 45-.
- monochromatic, with application to photometry. *Rayleigh, (Lord). L. Ps. S. P.* 7 (1886) 90-; *Ph. Mg.* 19 (1885) 446-.
- non-magnifying. *Bohn, K. (xii) Z. Instk.* 2 (1882) 7-.
- notation for lenses. *Gariel, C. M. J. de Ps.* 7 (1878) 127-.
- OBJECTIVES.**
- Moser, C. Z. Instk.* 7 (1887) 225-4, 308-.
- Fowler, A. Nt.* 45 (1892) 204-.
- with aperture in form of scalene triangle, appearance of luminous point through. *Müller, W. H. Ph. Mg.* 15 (1839) 459-.
- aplanatic, 4 surfaces. *M'Laren, (Lord). Edinb. R. S. P.* 15 (1889) 355-.
- astronomical, calculation. *Harting, H. Z. Instk.* 19 (1899) 104-.
- auto-collimation. *Martin, Ad. C. R.* 91 (1880) 219-.
- distribution of light in non-central images. *Steinheil, A. Leip. As. Gs. Vjschr.* 24 (1889) 239, 254-; *Münch. Ak. Sb.* 19 (1890) 413-.

double achromatic. *Harkness, W.* [1893-1900] *Am. J. Sc.* 9 (1900) 287-.

— cemented, theory. *Harting, H.* *Z. Instk.* 18 (1898) 357-.

— —, —. *Höegh, E. von.* *Z. Instk.* 19 (1899) 37-.

with flint glass lenses. *Kapustin, P. I.* *Mosc. S. Sc. Bll.* 65 (No. 1) (1890) 90-; *Fschr. Ps.* (1890) (Ab. 2) 208.

— improved colour correction. *Wolf, M.* *Z. Instk.* 19 (1899) 1-.

influence of want of sphericity on angular measurements. *Krüß, H.* *Z. Instk.* 12 (1892) 199-.

large, testing. *Grubb, (Sir) H. B. A. Rp.* (1876) (Sect.) 36-.

and mirrors, preparation and testing. *Grubb, (Sir) H.* [1886] *R. I. P.* 11 (1887) 413-.

new support for. *Steinheil, R.* *Z. Instk.* 14 (1894) 170-.

of several separated lenses. *Ferraris, G.* *Tor. Ac. Sc. At.* 16 (1890) 45-.

for spectroscopic use. *Hastings, C. S.* *Am. J. Sc.* 7 (1899) 267-.

theory. *Seidel, L.* *As. Nr.* 35 (1853) 301-.

of zenith telescope, combination for. *Zahn, W. von.* [1880] *Leip. Nf. Gs. Sb.* 7 (1881) 24-.

optical axis, determination. *Rozé, C. C. R.* 104 (1887) 1260-.

— effects of large and small. *André, C.* *As. Fr. C. R.* (1889) (Pt. 1) 254.

— illusion. *Lisleferme, H.* *J. de Ps.* 6 (1877) 339-.

— theory. *Jadanza, N.* *Tor. Ac. Sc. At.* 17 (1881) 714-; 19 (*1883) 769-.

pancratic. *Donders, F. C.* *Donders Ndl. Gast. Oogl. Vs.* 18 (1877) 51-; *Arch. Néerl.* 13 (1878) 99-; *Donders Ndl. Gast. Oogl. Vs.* 18 (1877) 87-.

panorthic, with wide field. *Zschokke, P.* *Cztg. Opt.* 7 (1886) 1-.

possibilities. *Biggs, A. B.* *Tasm. R. S. P.* (1891) 18-.

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Brewster, (Sir) D. *Edinb. Ph. J.* 7 (1822) 323-; 8 (1823) 326-.

Barfuss, F. W. *As. Nr.* 15 (1838) 285-; 18 (1841) 197-.

Cassegrain, with glass mirror, theory. *Groeben, — von den.* *Cztg. Opt.* 6 (1885) 147-.

— and Gregory, theory. *Macé de Lépinay, J. N. A. Mth.* 18 (1879) 256-.

collimator for completing adjustments. *Stoney, G. J. B. A. Rp.* (1856) (pt. 2) 30-.

improved equatorial. *Calver, G.* *Cztg. Opt.* 16 (1895) 121-, 133-.

metallic alloys for. *Šafařík, A.* *Prag Sb.* (1893) (*Mth.-Nt.*) No. 34, 14 pp.; *Cztg. Opt.* 15 (1894) 207-, 217-, 229-, 241-, 253-, 265-.

and mirrors. *Schröder, H.* *Cztg. Opt.* 19 (1898) 2-, 13-, 23-, 42-, 52-, 62-, 71-, 83-.

mirrors, construction. *Schröder, H.* *Cztg. Opt.* 16 (1895) 37-, 50-; 17 (1896) 101-.

and observatory, Bowdon. *Okell, S.* *Manch. Lt. Ph. S. Mm. & P.* 3 (1890) 212-.

and refracting telescopes. *Herschel, (Sir) J. F. W.* [1825] *QJ. Sc.* 20 (1826) 288-.

— — —, large. *Lockyer, W. J. S.* [1897] *Nt.* 57 (1897-98) 200-.

shortening, method. *Burckhardt, J. C.* [1807] *Con. des Temps* (*1809) 401-.

— — —, Burckhardt's. *Brewster, (Sir) D.* *Tilloch Ph. Mg.* 33 (1809) 290-.

specula, annealing. *MacCulloch, J.* *QJ. Sc.* (1828) (Pt. 1) 255-.

—, casting. *Potter, R.* *Ph. Mg.* 36 (1850) 13-.

—, — and working, improvements. *Potter, R.* [1830] *Edinb. J. Sc.* 4 (1831) 13-.

—, composition and figuring. *Sollitt, J. D.* *B. A. Rp.* (1853) (pt. 2) 10.

—, effects of heat. *Fagnoli, G.* *Bologna Mm. Ac. Sc.* 2 (1850) 439-.

—, polishing. *Rosse, L. Parsons (Earl of).* *B. A. Rp.* (1884) 637-.

use of metallic mirrors. *Schröder, H.* *Cztg. Opt.* 18 (1897) 71-, 82-, 92-, 104-, 112-, 124-, 132-.

REFRACTING TELESCOPES.

Brewster, (Sir) D. *Tilloch Ph. Mg.* 33 (1809) 290-.

Cazalet, —. *J. de Ps.* 79 (1814) 233-.

Hinks, A. R. *Nt.* 62 (1900) 565.

erecting or inverting at will. *Oppel, J. J.* (XII) *Frk. a. M. Ps. V. Jbr.* (1863-64) 69-.

history. *Voretzsch, M.* *Mt. Ostld.* 4 (1888) 117-.

improved lens for large. *Schröder, H.* *Z. Instk.* 6 (1886) 41-.

Lick Observatory, colour aberrations. *Strehl, K.* *Cztg. Opt.* 17 (1896) 3-, 14.

and micrometric telescope. *Chevalier, C.* [1841] *As. S. M. Not.* 5 (1839-43) 111-.

reticule illumination. *Czapski, S.* *Z. Instk.* 5 (1885) 347-.

rock-crystal. *Cauchoir, —.* *Pogg. A.* 15 (1829) 244-.

for sextants. *Plummer, W. E.* [1899] *Nt.* 61 (1899-1900) 54.

shortened. *Jadanza, N.* *Tor. Ac. Sc. At.* 19 (*1883) 769-.

—, *Steinheil, R.* *Z. Instk.* 12 (1892) 374-, 418-.

—, measurement of distance with. *Jadanza, N.* *Tor. Ac. Sc. At.* 30 (1895) 713-.

shortening, method. *Jadanza, N.* *Tor. Ac. Sc. At.* 21 (1885) 118-.

siderospectrographic. *Konkoly, N. von.* *Cztg. Opt.* 9 (1888) 25-.

spectroscopic. *Zöllner, F.* *Leip. B.* 24 (1872) 129-.

for stellar photography. *Grubb, (Sir) H.* *Nt.* 40 (1889) 441-, 645-.

telescope combination for gun sighting. *Schröder, H.* *Z. Instk.* 10 (1890) 133-.

theory. *Piola, G.* *Mil. Effm. As.* (1822) 13-.

—, new. *Reade, J.* *Tilloch Ph. Mg.* 63 (1824) 20-.

use on dark nights. *Rayleigh, (Lord).* [1882] *Camb. Ph. S. P.* 4 (1883) 197-.

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- use of Porro prisms. *Bordé*, —. Par. S. Ps. Sé. (1898) 68*.
— of right-angled prism. *Steinheil*, A. Leip. As. Gs. Vjschr. 18 (1888) 255-.
with variable magnification. *Fritsch*, K. Cz. Opt. 18 (1897) 1-, 11-, 21-, 163-.
— — — *Kaempfer*, D. Braunsch. Vr. Nt. Jbr. (10) (1897) 229-.
water-, for seeing mountains. *Adie*, J. Edinb. N. Ph. J. 49 (1850) 117-.
zenith-, photographic. *Marcuse*, A. Berl. Strnw. Beob.-Ergebn. No. 7 (1897) 6-.

FIELD-GLASSES.

- adjustable to eyes of unequal focal lengths. *Malcolm*, (Col.) —. L. Ps. S. P. 7 (1886) 80-; Ph. Mg. 19 (1885) 461-.
astronomical, with large objectives. *Olivi*, R. Rv. Sc. Ind. 29 (1897) 132-.
capabilities. *Thompson*, R. E. [U. S.] Chief Sig. Off. A. Rp. (1889) (Pt. 1) 48-.
inventor. *Govi*, G. C. R. 91 (1880) 547-.
Krauss-Zeiss. *Coupé*, (Vabbé) —. Brux. S. Sc. A. 22 (1898) (Pt. 1) 17-.
marine, *Merz's*. *Perty*, M. Bern Mt. (1865) 139-.
Zeiss. *Nelson*, E. M. [1894] M. S. J. (1895) 360-.
— *Hermann*, —. Königsb. Schr. 36 (1895) [4]-.
— *Mack*, —. [1895] Würtb. Jh. 52 (1896) lxxxii-.
— *Schiff*, J. Bresl. Schl. Gs. Jbr. (1896) (Ab. 2a) 15-.

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- Koch*, —. (vr Adds.) Halle Jbr. Nf. Gs. (1824-25) 3-.
Jacquín, J. von. Baumgartner Z. 5 (1829) 131-.
Carpenter, T. Gill Tech. Mer. Rep. 6 (1830) 129-, 194-, 321-; 7 (1830) 1-.
Barfuss, F. W. As. Nr. 20 (1843) 17-, 39-.
Grüel, C. A. Pogg. A. 61 (1844) 220-.
Barfuss, F. W. Pogg. A. 68 (1846) 88-.
Mercklin, C. E. von. Riga Arb. Nf. Vr. 1 (1848) 83-.
Gaudin, A. C. R. 30 (1850) 141-.
Burnett, W. J. Silliman J. 12 (1851) 56-.
Alquen, F. d'. Rheinl. Westphal. Vh. (1856) 87-.
Gibbons, W. S. J. M. Sc. 4 (1856) 299-.
Reinicke, F. Al. D. Nt. Ztg. 2 (1856) 470-.
Thury, [J. M. A.] Bb. Un. Arch. 8 (1860) 283-.
Perty, M. Bern Mt. (1862) 83-.
Porro, I. Mil. I. Lomb. Rd. 3 (1866) 285-.
Díppel, L. Arch. Mkr. An. 5 (1869) 281-; 9 (1873) 801-.
Abbe, E. M. M. Sc. J. 14 (1875) 191-, 245-.
Crisp, F. M. S. J. 1 (1878) 121-.

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- Anon*. M. S. J. 4 (1884) 281-.
Díppel, L. Humb. 4 (1885) 273-, 306-, 356-.
Dallinger, (Rev.) W. H. M. S. J. (1887) 185-.
Polí, A. Rv. Sc.-Ind. 20 (1888) 137-, 169-, 190-; 21 (1889) 217-.
Darwin, C. M. S. J. (1889) 454-.
Lamb, J. M. Am. S. M. P. 13 (1891) 13-.
Dallinger, (Rev.) W. H. [1893] Quek. M. Cl. J. 5 (1894) 210-.
Nelson, E. M. [1894-96] Quek. M. Cl. J. 5 (1894) 348-; 6 (1897) 14-, 191-.
Michael, A. D. M. S. J. (1897) 97-.
Tatham, J. F. W. [1899-1900] Quek. M. Cl. J. 7 (1900) 180-, 299-.
Nelson, E. M. M. S. J. (1900) 153-.

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- Edwards*, A. M. M. S. J. 5 (1857) 110-.
Sorby, H. C. M. S. J. 1 (1878) 1-.
Malassez, L. Par. S. Bl. Mm. 41 (1889) (C. R.) 321-.
Anti-vibration turntray. *Bridgman*, W. K. [1876] Quek. M. Cl. J. 4 (1874-77) 209-.
Aplanatic searcher. *Royston-Pigott*, G. W. Phil. Trans. 160 (1870) 591-; Q. J. M. Sc. 10 (1870) 393-; M. M. S. J. 11 (1874) 153-.

Camera Lucida.

- Nachet*, —. J. M. Sc. 8 (1860) 156-.
Crisp, F. [1878] M. S. J. 2 (1879) 21-.
Russell, J. C. [1878] M. S. J. 2 (1879) 25-.
Schröder, H. M. S. J. 3 (1883) 813-.
Anthony, J. M. S. J. 4 (1884) 697-.
Franco, P. [1884] Brux. S. Blg. M. S. J. 10 (1885) 77-.
Thoma, R. Z. Ws. Mkr. 5 (1888) 297-.
Abbe's improvements. *Giltay*, E. (xii) Bt. Ch. 12 (1882) 419-.
—, —. *Heinsius*, H. W. Z. Ws. Mkr. 6 (1889) 36-.
—, —. *Anon*. M. S. J. (1899) 93.
Ashe's. *Scourfield*, D. J. Quek. M. Cl. J. 7 (1900) 413-.
binocular. *Edwards*, A. M. Am. M. S. J. 18 (1897) 256-.
of Doyère and Milne-Edwards, improvement. *Malassez*, L. Par. S. Bl. Mm. 36 (1884) (C. R.) 510-.
Dumaige's. *Anon*. M. S. J. (1888) 487-.
erecting. *Nelson*, E. M. [1894] M. S. J. (1895) 21-.
Hofmann's. *Hewrick*, H. van. [1878] Brux. S. Blg. M. S. J. 5 (*1879) lxvi-.
improved. *Ives*, F. E. M. S. J. (1898) 495.
— method of making measurements with. *Sendall*, (Sir) W. M. S. J. (1891) 705-.
and microscope, combination. *Wetckert*, —. Gilbert A. 41 (1812) 110-.
Nachet's. *Anon*. M. S. J. 6 (1886) 1057.
— *Anon*. M. S. J. (1893) 99-.
theory and improvement. *Giltay*, E. [1883-84] Ndl. Kruidk. Arch. 4 (*1886) 106-; Z. Ws. Mkr. 1 (1884) 1-.

- use. *Pettigrew, J. B.* Manch. Mer. S. T. (1888) 80-.
- of microscope as. *Fayel, —.* Par. S. Bl. Mm. 38 (1886) (C. R.) 405-.
- in microscopic drawing. *Goethart, J. W. C.* [1892] Ndl. Kruidk. Arch. 6 (1895) 161-; Z. Ws. Mkr. 10 (1893) 466-.
- with variable angle. *Malassez, L.* Par. S. Bl. Mm. 37 (1885) (C. R.) 277-; Par. Lb. Hl. Tr. (1886-87) 7-.
- Zeiss's. Sykes, M. L.* Manch. Mer. S. T. (1889) 106-.
- Centering glass, *Ross's. Anon.* Mer. S. J. 6 (1886) 681-.
- Compressor. *Hislop, W.* [1856] Mer. S. T. 5 (1857) 159-.
- , *Clark, S. M.* Silliman J. 29 (1860) 448.
- , *Monticelli, F. S.* Z. Ws. Mkr. 11 (1894) 454-.
- , *Ziegler, H. E.* Z. Ws. Mkr. 14 (1897) 145-.
- , reversible, *Davis's ebonite. Anon.* Mer. S. J. (1899) 337-.
- , —, *Macer's. Anon.* Mer. S. J. (1893) 691-.
- Cover-glass gauge, *Beck's. Anon.* Mer. S. J. (1900) 516.
- Cover-glasses, thin. *Jackson, G. J.* Mer. Sc. 1 (1853) 141-.
- Diaphragms, dispersing. *Unna, P. G.* Z. Ws. Mkr. 3 (1886) 230.
- , graduated. *Coulier, —.* Mm. Md. Mil. 20 (1868) 328-.
- , iris, *Zeiss's. Zimmermann, A.* Z. Ws. Mkr. 4 (1887) 343-.
- , *Klönne and Müller's. Anon.* Mer. S. J. 6 (1886) 680-.
- and mechanical finger. *Griffith, E. H.* Am. S. Mer. P. (1885) 112-.
- , new ocular. *Lighton, W.* [1890] Mer. S. J. (1891) 255-.
- , substage, *Griffith's. Anon.* Mer. S. J. 6 (1886) 130.
- Diatomscope. *Osborne, (Lord) S. G.* Mer. S. J. 4 (1884) 802-, 961.
- , *Osborne's. F., W.* [1884] Mer. S. J. 5 (1885) 128-.
- , —, *Heurck, H. van.* [1884] Mer. S. J. 5 (1885) 129.
- Drawing apparatus. *Bernhard, W.* Z. Ws. Mkr. 9 (1892) 439-.
- , —, *Smith, A. H.* Mer. S. J. (1892) 277-.
- , —, *Abbe's, modification. Bernhard, W.* Z. Ws. Mkr. 8 (1891) 291-.
- , —, construction and new model. *Czapski, S.* Z. Ws. Mkr. 11 (1894) 289-.
- , —, for low powers. *Edinger, L.* Z. Ws. Mkr. 8 (1891) 179-.
- , —, —, —, *Kaiser, O.* Z. Ws. Mkr. 13 (1896) 163-.
- , —, —, —, improved form of *Edinger's. Nelson, E. M.* Mer. S. J. (1893) 101-.
- , —, micropantograph. *Roberts, I. M.* Mer. J. 8 (1872) 1-.
- , —, microscopic geometric. *Hilgendorf, F. M.* (XII) Z. Instk. 2 (1882) 459-.
- , —, prism. *Anon.* Mer. S. J. (1887) 650.
- Drawing apparatus, prism. *Piffard, H. G.* Mer. S. J. (1892) 874-.
- , —, *Reichert's. Brauer, F.* Z. Ws. Mkr. 8 (1891) 451-.
- , —, *Winkel's. Henking, H.* Z. Ws. Mkr. 8 (1891) 295-.
- and dissection of objects, new arrangement for. *Brooke, C. B. A. Rp.* (1851) (pt. 2) 7.
- easel. *Giesenhagen, —.* Z. Ws. Mkr. 7 (1890) 169-.
- and measuring objects, apparatus. *Fick, A.* Henle u. Pfeufer Z. 3 (1853) 273-.
- , projection and photomicrography, *Reichert's* combined apparatus. *Anon.* Mer. S. J. (1900) 122.
- Electric action, improved arrangement for observation. *Ströbel, O.* (XII) Z. Instk. 2 (1882) 274-.
- Eye-shade. *Ward, R. H.* Am. Mer. J. 5 (1884) 82-.
- , *Hall, L. B.* Science 22 (1893) 94-.
- Finder. *Maltwood, T.* Mer. S. T. 6 (1858) 59-.
- , *Janson, H. U. J.* Mer. Sc. 8 (1860) 199-.
- , *Powell, T.* Dubl. QJ. Md. Sc. 38 (1864) 286-.
- , *Flesch, M. H. J.* Arch. Mkr. An. 20 (1882) 502-.
- (“microstat” or “microtopograph”). *Smirnow, A.* Arch. Mkr. An. 29 (1887) 384-.
- , *Valenti, A.* Z. Ws. Mkr. 10 (1893) 454-.
- , *Stiles, J. H.* [1896] Sc. Mer. S. P. & T. 2 (1900) 96.
- , geometrical. *Vescovi, P. de.* Z. Az. 15 (1892) 203-.
- , nose-piece. *Janson, H. U.* Mer. J. 8 (1860) 269-.
- Finders. *Edwards, A. M.* Mer. J. 5 (1857) 200-.
- and indicators. *Amyot, T. E.* QJ. Mer. Sc. 4 (1856) 151-.
- , use. *Fabre-Domergue, P.* Toul. S. H. Nt. Bil. (1884) 148-.

Illuminators.

(See also Illumination.)

- Abbe, E.* Arch. Mkr. An. 9 (1873) 469-; M. Mer. J. 13 (1875) 77-.
- Christy, T.* S. C. In. J. 7 (1888) 719.
- Reichert, —.* Mer. S. J. (1893) 381-.
- Abbe's. Dippel, L.* Flora 56 (1873) 497-.
- , and apochromatic lenses. *Thanhoffer, L.* Term. Közl. 20 (1888) (Suppl.) 174-.
- , improved form. *Reichert, C.* Czgt. Opt. 18 (1897) 141-.
- , *Koristka's* modification. *Martinotti, G.* Z. Ws. Mkr. 2 (1885) 500-.
- , mechanical construction. *Behrens, W.* Z. Ws. Mkr. 1 (1884) 409-.
- achromatic light-filter for high powers. *Eisen, G.* Z. Ws. Mkr. 14 (1897) 444-.
- black shadow. *Royston-Pigott, G. W. M.* Mer. J. 11 (1874) 246-.
- cell. *Jacobs, F. O.* Mer. S. J. (1890) 795.
- concave mirror. *Ewell, M. D.* Am. Mer. S. P. 14 (1892) 43.

3082 *Illuminators**Illuminators: Condensers* 3082

- dark ground. *Nachet*, —. *J. Mer. Sc.* 8 (1860) 207-.
- , *Lighton, W.* [1878] (xii) *Am. Mer. J.* 1 [(1878-79)] 42-.
- , *Mayer, A. M.* *Mer. S. J.* 6 (1886) 514-.
- , *Nachet*, —. *Mer. S. J.* (1887) 463.
- direct, *Sorby's. Anon.* *Mer. S. J.* 6 (1886) 130-.
- glass-rod. *Maddox*, —. *Mer. S. J.* (1890) 101-.
- immersion-. *Mayall, J.* *Mer. S. J.* 2 (1879) 27-.
- , catadioptric. *Stephenson, J. W.* *Mer. S. J.* 5 (1885) 207-.
- , —, *Stephenson's. Anon.* *Mer. S. J.* 5 (1885) 523.
- , catoptric. *Stephenson, J. W.* *Mer. S. J.* 2 (1879) 36-.
- , paraboloid. *Edmunds, J.* [1877] *Quek. Mer. Cl. J.* 5 (1878-79) 17-.
- , stage. *Mayall, J.* *Mer. S. J.* 2 (1879) 837-.
- iris. *Ward, R. H.* *Am. S. Mer. P.* (1884) 160-.
- method of adjusting. *Zimmermann, A. Z.* *Ws. Mkr.* 8 (1891) 454-.
- monochromatic. *Nelson, E. M.* [1891] *Mer. S. J.* (1891) 443-; (1892) 1-.
- , *Zeiss's. Anon.* *Mer. S. J.* 6 (1886) 515.
- paraboloid. *Edmunds, J. M.* *Mer. J.* 18 (1877) 78-.
- , *Wenham, F. H.* (xii) *Am. Mer. J.* 1 [(1878-79)] 186-; 1 (1880) 101-.
- , *Moore, A. J.* *Mer. S. J.* 4 (1884) 453-.
- , *Anon.* *Mer. S. J.* 4 (1884) 454.
- prism, achromatic. *Edwards, A. M.* *N. Y. Lyceum P.* 1 (1873) 299-.
- , binocular, improved form of *Stephenson's. Ahrens, C. D.* *Mer. S. J.* 5 (1885) 959.
- , diatom, and true form of diatom markings. *Reade, J. B.* *M. Mer. J.* 2 (1869) 5-.
- , doubly reflecting. *Gray, P.* *Mer. J.* 1 (1861) 273-.
- , erecting. *Nachet*, —. *J. Mer. Sc.* 8 (1860) 206-.
- , *Nachet's. Shadbolt, G.* [1850] *Mer. S. T.* 3 (1852) 74-.
- , revolver immersion. *Edmunds, J.* *Mer. S. J.* 2 (1879) 32-.
- reflex, for high powers. *Wenham, F. H.* *M. Mer. J.* 7 (1872) 237-.
- simple. *Edwards, A. M.* *Mer. S. J.* (1893) 286-.
- (Edwards). *Maddox, R. L.* *Mer. S. J.* (1893) 423.
- superstage. *Goodwin, W.* [1889] *Quek. Mer. Cl. J.* 4 (1892) 70-.
- theory. *Fripp, H. E.* *Mer. S. J.* 2 (1879) 503-; 3 (1880) 742-.
- on total reflection principle. *Kochs, W.* *Arch. Mkr. An.* 32 (1888) 683-.
- for transparent objects. *Harting, P.* *Ndl. Lancet* 6 (1850-51) 457-.
- traverse-lens. *Tolles, R. B.* *Mer. S. J.* 2 (1879) 388-.
- universal reflecting. *Bridgman, W. K.* [1876] *Quek. Mer. Cl. J.* 4 (1874-77) 214-.
- vertical. *Stephenson, J. W.* *Mer. S. J.* 2 (1879) 266-.
- , *Forgan, W.* [1896] *Sc. Mer. S. P. & T.* 2 (1900) 56-.
- , diaphragm for *Beck's. Anon.* *Mer. S. J.* 5 (1885) 522-.
- Wenham* half-disk. *Dayton, R.* (xii) *Am. S. Mer. P.* (1882) 161-.

Illuminators: Condensers.

- Bausch, E.* *Mer. S. J.* 4 (1884) 623.
- Wallich, G. C.* [1884] *Mer. S. J.* 5 (1885) 127-.
- Nelson, E. M.* *Mer. S. J.* 5 (1885) 327.
- achromatic. *Curties, C. L.* *Mer. S. J.* (1900) 532.
- , *Baker's. Anon.* *Mer. S. J.* (1900) 512-.
- , *Beck's. Anon.* *Mer. S. J.* (1899) 338-.
- , and new method of illuminating opaque objects. *Riddell, J. L.* *Silliman J.* 15 (1853) 69.
- annular. *Shadbolt, G.* [1850] *Mer. S. T.* 3 (1852) 132-.
- apochromatic. *Mayall, J. (jun.)* *Mer. S. J.* (1889) 609.
- , *Powell and Lealand's. Anon.* *Mer. S. J.* (1889) 125-.
- , substage, with collar-correction. *Nelson, E. M.* *Mer. S. J.* (1895) 229-.
- Bausch and Lomb's. Anon.* *Mer. S. J.* (1887) 648.
- bull's eye. *Nelson, E. M.* *Mer. S. J.* (1891) 309-.
- , doublet, new form. *Nelson, E. M.* *Mer. S. J.* (1896) 365-.
- cone and immersion paraboloid. *Swift, J.* *Mer. S. J.* 5 (1885) 126-.
- "desideratum." *Miles, J. L. W.* *Manch. Mer. S. T.* (1886) 31-.
- with 2 diaphragm plates, *Beck's. Anon.* *Mer. S. J.* 4 (1884) 124.
- homogeneous objective. *Lighton, W.* *Am. Mer. J.* 15 (1894) 59-.
- improved. *Bridgman, W. K.* *Quek. Mer. Cl. J.* 4 (1874-77) 311-.
- oil immersion, *Beck's* new wide-angle. *Anon.* *Mer. S. J.* (1900) 254.
- , equalising thickness of slips with. *Nelson, E. M.* [1885] *Mer. S. J.* 6 (1886) 131.
- old Gillett, with collar adjustment. *Nelson, E. M.* *Mer. S. J.* (1899) 679.
- Reichert's. Moeller, J. Z.* *Ws. Mkr.* 2 (1885) 339-.
- substage. *Leach, W.* *Manch. Mer. S. T.* (1888) 76-.
- , *Maddox, R. L.* [1889] *Mer. S. J.* (1890) 99-.
- , *Nelson, E. M.* [1890] *Quek. Mer. Cl. J.* 4 (1892) 116-.
- , *Hyatt*, —. *Mer. S. J.* (1891) 256-.
- and substage, *Bausch and Lomb's. Anon.* *Mer. S. J.* (1887) 809.
- substage and diaphragm. *Czapski, S. Z.* *Ws. Mkr.* 11 (1894) 433-.
- , *Kellner* eye-piece as. *Maddox, R. L.* *Mer. S. J.* 4 (1884) 801-.

- substage, Swift's. *Anon.* *Mer. S. J.* (1900) 718-.
- , Watson's. *Anon.* *Mer. S. J.* (1900) 119-.
- Wallich's. *Anon.* *Mer. S. J.* 4 (1884) 962-.
- Illuminators: Lamps.*
- Drosten, R.* *Brux. S. Blg. Mer. Bl.* 14 (1888) 171-.
- acme. *Queen, J. W.* *Mer. S. J.* 6 (1886) 1053-.
- arc-, projection, Zeiss's. *Anon.* *Mer. S. J.* (1900) 381-.
- Baker's. *Anon.* *Mer. S. J.* 6 (1886) 688.
- Beck's complete. *Anon.* *Mer. S. J.* 4 (1884) 628-.
- chimney for. *Nelson, E. M.* *Mer. S. J.* (1894) 108-.
- electric. *Flesch, M.* *Z. Ws. Mkr.* 1 (1884) 561-.
- , *Poulsen, V. A.* [1884] *Kjøb. Bt. F. Mdd.* 1 (1882-86) 144-.
- (Poulsen's). *Anon.* *Bt. Not.* (1885) 106-.
- , *Barnard, J. E.* [1899] *Mer. S. J.* (1900) 118.
- , *Rousset, C. F.* *Mer. S. J.* (1900) 741-.
- incandescent. *Stearn, C. H.* *Mer. S. J.* 3 (1883) 29-.
- —, *Stein, T.* *Z. Ws. Mkr.* 1 (1884) 161-.
- — (Stein). *Heurck, H. van.* *Z. Ws. Mkr.* 1 (1884) 419-.
- —, *Anon.* *Mer. S. J.* 6 (1886) 1053.
- , Trouvé-Helot. *Mayall, J. (jun.)* *Mer. S. J.* 5 (1885) 1121-.
- Goodwin's. *Nelson, E. M.* *Mer. S. J.* (1897) 90.
- incandescent, Auer. *Bürkner, K.* *Z. Ws. Mkr.* 4 (1887) 35-.
- , burning carburetted air. *Regnard, P.* *Par. S. Bl. Mm.* 34 (*1882) (*C. R.*) 177-.
- Koch-Wolz. *Schiefferdecker, P.* *Z. Ws. Mkr.* 7 (1890) 450-; 8 (1891) 53.
- monochromatic. *Brewster, (Sir) D.* [1822] *Edinb. R. S. T.* 9 (1823) 433-.
- Nelson's. *Anon.* *Mer. S. J.* 4 (1884) 125.
- , improved form. *Swift, J.* *Mer. S. J.* (1895) 393.
- Nelson-Mayall. *Mayall, J. (jun.)* *Mer. S. J.* 4 (1884) 286-.
- reflector. *Koch, W., & Wolz, M.* [1887] *Mer. S. J.* (1888) 1025-.
- Rühe's. *Fricke, A. C.* *Ztg.* 9 (1885) 1338.
- Schieck's. *Anon.* *Mer. S. J.* (1888) 490-.
- shade. *Quimby, B. F.* *Mer. S. J.* (1887) 463.
- Immersion heating apparatus. *Julien, A. A.* [1885] *Mer. S. J.* (1887) 466.
- Inclining a preparation, instrument for. *Jagger, T. A. (jun.)* *Am. J. Sc.* 3 (1897) 129-.
- Indicator. *Bailey, J. W.* *Silliman J.* 20 (1855) 58-.
- , *Schmidt, Ad.* *Halle Z. Nw.* 33 (1869) 465-.
- for small objects. *Ballé, v.* *Rouen S. Sc. Bl.* (1894) 216-.
- Indicators. *Pantocsek, J.* *Z. Ws. Mkr.* 5 (1888) 39-.
- , focus-. *Griffith, E. H.* *Am. S. Mer. P.* 13 (1891) 47-.
- Lens- and slide-holder, Hippisley's. *Anon.* *Mer. S. J.* 6 (1886) 129-.
- Lieberkühn stops. *Giles, G. W. M.* *Mer. S. J.* 6 (1886) 681.
- Measuring apparatus. *Lindau, G.* [1889] *Mer. S. J.* (1891) 252-.
- — for small inequalities. *Sandberger, G.* *Pogg. A.* 85 (1852) 97-.
- Mechanical finger. *Smith, H. L.* *Am. J. Sc.* 41 (1866) 331-.
- Micromegascope. *Matthews, J.* *Quek. Mer. Cl. J.* 5 (1878-79) 167-.
- Micrometers and Micrometry.*
- Harting, P.* *Hoeven en Vriese Ts.* 7 (1840) 165-.
- Jackson, G.* [1847] *Mer. S. T.* 2 (1849) 134-.
- Robertson, W.* *Edinb. M. J. Md. Sc.* 12 (1851) 329-.
- Jackson, G.* *J. Mer. Sc.* 4 (1856) 241-.
- Petruschefsky, F.* *Pogg. A.* 107 (1859) 633-.
- Burch, G. J.* [1878] *Quek. Mer. Cl. J.* 5 (1878-79) 45-.
- Baumann, T.* *Z. Instk.* 4 (1884) 149-.
- Love, E. G.* [1895] *Mer. S. J.* (1896) 245-.
- Berger, H.* *Z. Ws. Mkr.* 15 (1898) 303-.
- adjustment. *Förster, W.* (xii) *Z. Instk.* 1 (1881) 7-, 119-.
- best form. *Jackson, G.* *J. Mer. Sc.* 2 (1854) 129-.
- comparison and regulation. *Ettingshausen, A. von.* *Baumgartner Z.* 5 (1829) 316-.
- dynameter-, useful form (kratometer). *Roy-ston-Pigott, G. W.* *M. Mer. J.* 5 (1871) 79-.
- measurements. *Ewell, M. D.* *Mer. S. J.* (1889) 447.
- , variation due to curvature of cover-glass. *Ewell, M. D.* *Am. S. Mer. P.* 12 (1890) 79-.
- — — focusing. *Hirsch, A.* *Par. Poids et Mes. PV.* (*1877) 255-.
- — — —, *Bosscha, J.* *Delft Éc. Pol.* A. 2 (1886) 89-.
- — — — and inclination. *Foerster, W.* *Par. Poids et Mes. PV.* (*1877) 269-.
- — — — different illumination. *Fasoldt, C.* *Mer. S. J.* (1888) 814.
- new method. *Gibbons, W. S.* [1858] *Mer. S. T.* 7 (1859) 31-.
- —, *Matthews, J.* *Quek. Mer. Cl. J.* 1 (1868-69) 231-.
- Petruschewsky's Knorr, E.* *Pogg. A.* 111 (1860) 125-.
- screw, differential. *Betz, G. W.* *Cztg. Opt.* 19 (1898) 181-.
- , and glass micrometer eye-piece combined. *Koch, A.* *Z. Ws. Mkr.* 6 (1889) 33-.
- , new arrangement. *Mohl, H. von.* *Arch. Mkr. An.* 1 (1865) 79-.
- , — model. *Schiefferdecker, P.* *Z. Ws. Mkr.* 3 (1886) 1-.
- stage-, aerial. *Royston-Pigott, G. W.* [1872] *M. Mer. J.* 9 (1873) 2-, 51-.
- , *Fasoldt, Mendenhall, T. C.* (xii) *Am. S. Mer. P.* (1882) 201-.
- , 2 new forms. *Ewell, M. D.* *Am. S. Mer. P.* 12 (1890) 76-.

- Moist gas chambers, history. *Kühne, W. J.* Pr. C. 17 (1878) 240, 288.
- Nose piece adapter, Dumaige's. *Anon.* Mcr. S. J. (1888) 488.
- , Jung's. *Anon.* Mcr. S. J. 6 (1886) 132-.
- adapters. *Anon.* Mcr. S. J. 4 (1884) 284.
- , —. *Thury, M.* Mcr. S. J. 4 (1884) 445.
- , centering and focusing. *Frazer, A.* [1886] Sc. S. Arts T. 11 (1887) 345-.
- , Fasoldt's. *Anon.* Mcr. S. J. 4 (1884) 959.
- and objective, standard screw thread for. *Beck, C.* Mcr. S. J. (1896) 389-.
- , revolving. *Henneguy, —.* Par. S. Bl. Mm. 37 (1885) (C. R.) 700.
- , sliding, improved form. *Turnbull, J. M.* [1886] Sc. S. Arts T. 11 (1887) 352-.
- Object pusher, simple. *Mayer, P. Z. Ws.* Mkr. 17 (1900) 7-.
- Objects, apparatus for marking. *Schiefferdecker, P. Z. Ws.* Mkr. 3 (1886) 461-.
- Oxyhydrogen apparatus. *Stratingh, S. Mulder* Arch. 5 (1837) 161-.
- Polarising apparatus. *Thompson, S. P.* Mcr. S. J. (1889) 617-.
- , *Ebner, V. von.* Z. Ws. Mkr. 9 (1892) 161-.
- , Amici's. *Madan, H. G.* Mcr. S. J. 6 (1886) 682-.
- , distinctness of vision. *Brewster, (Sir) D.* Ph. Mg. 32 (1848) 161-.
- Prism, analysing, and goniometer, Boecker's holder for. *Anon.* Mcr. S. J. 5 (1885) 705.
- Ruling machine, Nobert's. *Mayall, J. (jun.)* Mcr. S. J. 5 (1885) 377-, 530.
- Scale and pointer. *Bridgman, W. K. J.* Mcr. Sc. 5 (1857) 206-.
- Screen. *Wray, L. (jun.)* Mcr. S. J. 4 (1884) 956-.
- , *Schiefferdecker, P. Z. Ws.* Mkr. 9 (1892) 180-.
- , breath. *Schiemenz, P. Z. Ws.* Mkr. 6 (1889) 37-.
- , use. *Schmidt, Ad.* Hedw. 8 (1869) 130.
- Slide, aluminium. *Heidenhain, M. Z. Ws.* Mkr. 13 (1896) 166-.
- , current-. *Parsons, P. B.* Mcr. S. J. 4 (1884) 121-.
- holder. *Fabre-Domergue, —.* A. Mergr. 6 (1894) 84-.
- with movable capillary tube. *Chabry, L.* Par. S. Bl. Mm. 38 (1886) (C. R.) 322-.
- , pambolised gas-. *Edmunds, J.* Mcr. S. J. 3 (1880) 585-.
- , short, as safety slide. *Shimer, H.* [1891] Mcr. S. J. (1892) 567-.
- , simple means for distinguishing details in. *Bolsius, (le rév. père) —.* Brux. S. Sc. A. 19 (1895) (Pt. 1) 80-.
- Slides, canary glass for. *Brücke, E.* Wien SB. 21 (1856) 430-.
- , glass for. *Donders, F. C.* Ndl. Lancet 5 (1849-50) 309-.
- for opaque objects with removable cover. *Scott, D. B.* [1899] Quek. Mcr. Cl. J. 7 (1900) 167-.
- Slides with pillars for micro-chemical reactions. *Nunn, R. J.* [1883] Mcr. S. J. 4 (1884) 123-.
- Spark apparatus, Stokes's. *Anon.* Mcr. S. J. 4 (1884) 964-.
- , Stokes-Watson electric. *Anon.* Mcr. S. J. 5 (1885) 1069-.
- Spot-lens mounting, Queen's. *Anon.* Mcr. S. J. 4 (1884) 452-.
- Substage apparatus, Beck's combined. *Anon.* Mcr. S. J. 5 (1885) 115-.
- Turntable, improved. *Dunning, C. G.* [1880] Quek. Mcr. Cl. J. 6 (1879-81) 81-.
- Turntables, 3. *Griffith, E. H.* Am. S. Mcr. P. (1885) 112-.
- Universal accessory, Bausch and Lomb's, to replace substage. *Anon.* Mcr. S. J. 5 (1885) 713.
- carrier. *Bolsius, (le rév. père) H.* Brux. S. Sc. A. 15 (1891) (Pt. 1) 42-; 21 (1897) (Pt. 2) 87-.
- Zeiss's new apparatus. *Drosten, R.* Brux. S. Blg. Mcr. Bll. 21 (1894) 52-.
- Achromatic combination for use with blue light. *Stoney, G. J.* QJ. Mcr. Sc. 11 (1871) 212-.
- Achromatism. *Airy, G. B.* [1824] Camb. Ph. S. T. 2 (1827) 227-.
- Adaptations. *Rood, O. N.* Silliman J. 21 (1856) 106-.
- Aplanatic power; and new double-star and image tests. *Royston-Pigott, G. W. M.* Mcr. J. 4 (1870) 254-.
- Binocular vision. *Wenham, F. H.* [1853] Mcr. S. T. 2 (1854) 1-.
- , *Smith, H. L.* Am. J. Sc. 38 (1864) 111-.
- , *Carpenter, —.* Mcr. S. J. 4 (1884) 486-.
- Choice of microscope. *Mohl, H. von.* Bt. Ztg. 1 (1843) 305-.
- , —. *Schleiden, M. J.* Froriep Not. 4 (1847) 1-.
- , —. *Nave, J.* Brünn Jh. Nw. Sect. (1859) (Sb.) xv-.
- , —. *Areschoug, J. E.* Bt. Not. (1867) 25-.
- Coarse adjustment, application of Mayall's stepped diagonal rackwork. *Anon.* Mcr. S. J. 4 (1884) 958-.
- , rackwork. *Nelson, E. M.* Mcr. S. J. (1899) 256-.
- Colour contrast between object and background, optically produced. *Rheinberg, J.* Mcr. S. J. (1896) 373-.
- effects on boundaries of colourless objects. *Ambrohn, H.* Leip. Mth. Ps. B. 48 (1896) 134-.
- studies. *Stack, H. J.* Pop. Sc. Rv. 14 (1875) 126-.
- Cover glass thickness, correction. *Bausch, E.* Am. S. Mcr. P. 12 (1890) 43-.
- , —, estimation. *Royston-Pigott, G. W.* M. Mcr. J. 8 (1872) 269-.
- , — and tube length, correction. *Gage, S. H.* Am. S. Mcr. P. (1887) 168-.
- , —, —, —. *Poli, A.* Rv. Sc.-Ind. 21 (1889) 65-.

- Dispersion. *Nelson, E. M.* *Mer. S. J.* (1899) 121-.
- Elevations and depressions, discrimination. *Welcker, H.* *Henle u. Pfeufer Z.* 7 (1859) 63-.
- Evolution of microscope. *Smolik, J.* *Živa* 9 (1861) 299-.
- — —. *Blackham, G. E.* (xn) *Am. S. Mer. P.* (1882) 25-.
- — —. *Lamb, J. M.* *Am. Mer. J.* 12 (1891) 273-.
- — —. *Nelson, E. M.* [1897-98] *Quek. Mer. Cl. J.* 6 (1897) 349-; 7 (1900) 98-.
- — —, origin and uses. *Clinch, J. W.* [1896] *Yn Lioar Manninagh* 3 (1902) 49-.
- Field of view, large, to obtain. *Forgan, W.* [1900] *Sc. Mer. S. P. & T.* 3 (1904) 32-.
- FINE ADJUSTMENT.*
- Czapski, S.* *Z. Ws. Mkr.* 3 (1886) 207-.
- Anon.* *Mer. S. J.* 6 (1886) 686-.
- Griffith, E. H.* *Am. S. Mer. P.* 10 (1888) 161-.
- (Watson's.) *Anon.* *Mer. S. J.* (1893) 93-.
- Marpmann, G.* *Z. Angew. Mkr.* 4 (1899) 86-.
- Stringer, E. B.* *Mer. S. J.* (1900) 419-.
- cam. *Cutter, E.* *Mer. S. J.* 6 (1886) 1041-.
- Campbell's. Nelson, E. M.* *Mer. S. J.* 6 (1886) 324-.
- and coarse, Ross's screw and pinion. *Anon.* *Mer. S. J.* (1889) 691-.
- differential screw, Schröder's. *Anon.* *Mer. S. J.* 6 (1886) 685-.
- double action, Anderson's. *Anon.* *Mer. S. J.* 6 (1886) 325.
- evolution. *Nelson, E. M.* *Mer. S. J.* (1899) 366-.
- hydrostatic. *Nelson, E. M.* [1884] *Quek. Mer. Cl. J.* 2 (1886) 57-.
- "jewelled." *Mayall, J. (jun.)* *Mer. S. J.* (1890) 507-.
- lever and parallel spring, Swift's. *Anon.* *Mer. S. J.* (1887) 808.
- for substage. *Karop, G. C.* *Mer. S. J.* (1892) 421-.
- tangent screw, Hilger's. *Anon.* *Mer. S. J.* (1887) 461.
- Focus, means of changing. *Govi, G.* *C. R.* 84 (1877) 341-.
- — — —. *Anon.* *Mer. S. J.* 5 (1885) 1057.
- — — —. *Neuhauss, R.* *Mer. S. J.* (1888) 809.
- — — —. *Lucas, K.* *Mer. S. J.* (1899) 139-.
- Focusing up or down too much, effect. *Maskell, W. M.* [1888] *Mer. S. J.* (1889) 134-.
- Gavino's modification. *Trouessart, —, & Duplouch, —.* *Par. S. Bl. Mm.* 48 (1896) (C. R.) 1088-.
- Glass, action of bleaching agents. *Whelpley, H. M.* *Mer. S. J.* (1889) 314.
- , cut lines in, optical appearance. *Slack, H. J.* *M. Mer. J.* 5 (1871) 213-.
- scales. *Nobert, F. A.* *As. Nr.* (1849) (*Er-gänz. Heft*) 93-.
- Hairs, visibility, etc. *Slack, H. J.* *Mer. S. J.* 1 (1878) 318-.
- Heat-measurements. *Engelmann, T. W.* *Ndl. Arch. Ntk.* 3 (1868) 506-; *Arch. Mkr. An.* 4 (1868) 334-.
- ILLUMINATION.*
- (See also *Illuminators under Accessories.*)
- Brewster, (Sir) D.* [1831-40] *Edinb. J. Sc.* 6 (1832) 83-; *B. A. Rp.* (1840) (*pt.* 2) 9-.
- Bergin, T. F.* *Ir. Ac. P.* 5 (1853) 313-.
- Wenham, F. H.* *J. Mer. Sc.* 2 (1854) 145-.
- Higgins, J. F.* [1869] *QJ. Mer. Sc.* 10 (1870) 150-.
- Barker, J.* [1870] *Ir. Ac. P.* 1 (1873-74) 7-.
- Nelson, E. M.* [1884] *Mer. S. J.* 5 (1885) 713-.
- Tatham, J.* *Manch. Mer. S. T.* (1886) 78-.
- by air-bubbles. *Brevoort, H. L.* [1885] *Mer. S. J.* 6 (1886) 324.
- alco-carbon. *Malassez, L.* *Par. Lb. Hl. Tr.* (1886-87) 28-.
- and aplatic definition. *Royston-Pigott, G. W.* *M. Mer. J.* 4 (1870) 296-.
- by artificial light. *Griffith, J. W.* *A. NH.* 12 (1843) 481.
- — —. *Rainey, G.* [1853] *Mer. S. T.* 2 (1854) 23-.
- — —. *Flesch, M. H. J.* *Würzb. Ps. Md.* *Sb.* (1882) 37-.
- — — and daylight. *Nelson, E. M.* *Mer. S. J.* 4 (1884) 621-.
- — —, with low powers. *Karop, G. C.* [1896] *Quek. Mer. Cl. J.* 6 (1897) 278-.
- "canalisation" of electric light. *Tchikoleff, W.* *Lum. Élect.* 3 (*1881) 132-, 151-, 184-.
- centering the illuminating beam. *Queen, J. W.* *Mer. S. J.* 5 (1885) 524-.
- central versus oblique light. *Nelson, E. M.* *Mer. S. J.* 6 (1886) 322-.
- colour-. *Edwards, A. M.* *Am. Mer. J.* 16 (1895) 183-.
- *Rheinberg, J.* [1896-1900] *Quek. Mer. Cl. J.* 6 (1897) 346-, 438; *Mer. S. J.* (1899) 142-; *Am. Mer. J.* 21 (1900) 1-.
- , for stained preparations. *Flesch, M. Z.* *Ws. Mkr.* 3 (1886) 52.
- dark-field. *Gebhardt, W.* *Z. Ws. Mkr.* 15 (1898) 289-.
- by direct light. *Holmes, O. W.* *Am. Ac. P.* 2 (1848-52) 326-.
- — —. *Selle, —.* *Fsehr. Md.* 8 (1890) 775-, 814-.
- direction, measurement. *Stuart, A.* [1870] *St. Pé. Ac. Sc. Bll.* 15 (1871) 517-.
- by electric light. *Flesch, M.* *Z. Ws. Mkr.* 1 (1884) 175-.
- under high powers. *Smith, Jas.* *Mer. S. J.* 3 (1880) 398-.
- improvement. *Grubb, T.* *Ir. Ac. P.* 5 (1853) 296-.
- by incandescent gas. *Arsonval, A. d'.* *Par. S. Bl. Mm.* 40 (1888) (C. R.) 170-.
- lime light, portable form. *McIntosh, L. D.* *Am. S. Mer. P.* 13 (1891) 41-.
- by monochromatic light. *Goring, C. R.* *Edinb. J. Sc.* 5 (1831) 52-.

- by monochromatic light (Goring). *Brewster*, (Sir) D. Edinb. J. Sc. 5 (1831) 143-.
- — — *Castracane degli Antelminelli*, F. Rm. At. 24 (1871) 106-.
- — — *Mayall*, —. Mcr. S. J. (1891) 439.
- new method. *Castracane degli Antelminelli*, F. QJ. Mcr. Sc. 5 (1865) 249-.
- oblique. *Reade*, J. B. Sturgeon A. Electr. 4 (1839-40) 407-.
- *Nachet*, —. C. R. 24 (1847) 976-.
- *Oberhaeuser*, G. C. R. 24 (1847) 1052-.
- *Middeldorpf*, A. Bresl. Schl. Gs. Übs. (1848) 37-.
- *Zeiss*, C. Pogg. A. 103 (1858) 654-.
- *Hislop*, W. [1868] Quek. Mcr. Cl. J. 1 (1868-69) 64-.
- *Woodward*, J. J. (xii) Am. Mcr. J. 1 ([1878-79]) 268-.
- *Gundlach*, E. (xii) Am. Mcr. J. 3 (1882) 85-.
- *Nelson*, E. M. [1884] Mcr. S. J. 5 (1885) 129, 131-.
- "F. R. M. S." [1884] Mcr. S. J. 5 (1885) 130-, 132-.
- lateral displacement with. *Heschl*, —. Pogg. A. 105 (1858) 295-.
- — — *Place*, F. Pogg. A. 106 (1859) 641-; 107 (1859) 657-.
- and new sphæro-annular condenser. *Shadbolt*, G. [1851] Mcr. S. T. 3 (1852) 154-.
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- , — and *Cary.* *Anon.* Mer. S. J. (1898) 473-.
- , *Pistor and Schiek's.* *Ehrenberg, C. G.* Pogg. A. 24 (1832) 188-.

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- old, Plössl. *Nelson, E. M.* Mer. S. J. (1900) 269.
- , Powell, Ross and Smith. *Nelson, E. M.* Mer. S. J. (1900) 282-, 425-, 550-.
- , presented by Linnaeus to Bernard Jussieu in 1738. *Henrici, J. F.* Am. S. Mer. P. (1887) 214-.
- , Ross, 1842-43. *Anon.* Mer. S. J. (1899) 214-.
- for opaque objects. *Hall, R.* Thomson A. Ph. 14 (1819) 107-.
- , —, *Frenont, C. C. R.* 121 (1895) 321-.
- , —, *Le Chatelier's. Pellin, P.* As. Fr. C. R. (1897) (Pt. 1) 197.
- , —, —, *Anon.* [1898] Mer. S. J. (1901) 81-.
- , —, *Reichert's. Rejtö, A.* Z. Ws. Mkr. 14 (1897) 1-.
- oxyhydrogen-. *Göppert, H. R., & Purkinje.* —, *Froriep* Not. 6 (1838) 149-.
- , *Hughes, W. C.* Mer. S. J. (1889) 115-.
- , improvements. *Mason, R. G.* [1890] Mer. S. J. (1891) 89-.
- , *Swift's. Anon.* Mer. S. J. 4 (1884) 799-.
- pancratic. *Fischer, A.* Mose. S. Nt. Bl. (1841) 125-.
- "paragon," *Swift-Wale. Anon.* Mer. S. J. 6 (1886) 1043-.
- patent. *Fasoldt, C.* Mer. S. J. (1889) 109-.
- periscopic. *Wollaston, W. H.* Phil. Trans. (1812) 370-.
- (*Wollaston*). *Jones, W.* Nicholson J. 34 (1813) 100-.
- perspective. *Burch, G. J.* R. S. P. 42 (1887) 49-.
- "plantation." *Baker, C.* Mer. S. J. (1900) 410.
- , *Baker's. Anon.* Mer. S. J. (1900) 511-.
- polarising. *Nodot, —.* Par. S. Ps. Sé. (1877) 69-.
- , *Dufet, H.* Par. S. Ps. Sé. (1886) 139-.
- , arrangement for investigation of organic substances. *Möhl, H. von.* Pogg. A. 108 (1859) 178-.
- , in crystallography. *Des Cloizeaux, A.* A. Mines 6 (1864) 557-.
- , improvement. *Brewster, (Sir) D. B. A.* Rp. (1840) (pt. 2) 10.
- , *Reichert's. Anon.* Mer. S. J. 4 (1884) 440.
- , new. *Anon.* Mer. S. J. (1899) 432.
- polymicroscope. *Lenhossék, J. von.* Virch. Arch. 70 (1877) 268-; Mer. S. J. (1888) 104-.

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- Amici, G. B.* Il Tempo 1 (1858) 161-.
- Anon.* Mer. S. J. 4 (1884) 437.
- Anon.* Mer. S. J. 5 (1885) 700-.
- Hennequy, —.* Par. S. Bl. Mm. 39 (1887) (C. R.) 103.
- Sticker, G.* Z. Ws. Mkr. 14 (1897) 433-.
- aluminium. *Swift, J. M.* Mer. S. J. (1895) 711.
- and brass. *Smith, R.* Mer. S. J. (1895) 711.
- Beck's. Anon.* Mer. S. J. 5 (1885) 115.
- Chevalier's. Anon.* Mer. S. J. 6 (1886) 122, 124.

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- field. *Anon.* Mer. S. J. (1900) 379.
- hand. *Sedlacek, J.* Wien Jb. Gl. 7 (1856) 97-.
- , *Marpmann, G.* Z. Angew. Mkr. 3 (1898) 44-.
- , *Nachet's. Anon.* Mer. S. J. (1893) 97.
- , *Reichert's. Anon.* Mer. S. J. (1893) 381.
- , 3 small. *Nelson, E. M.* Mer. S. J. (1899) 643-.
- Harris's. Anon.* Mer. S. J. 4 (1884) 611-.
- improvements. *Warington, R.* Mer. S. T. 7 (1859) 58-.
- Leitz's. Curties, C. L.* Mer. S. J. (1899) 678.
- , *Anon.* Mer. S. J. (1900) 108.
- Nachet's. Francotte, —.* Brux. S. Blg. Mer. Bl. 12 (1885) 60-.
- , *Hill, E. E.* Mer. S. J. (1895) 359-.
- Nelson's. Anon.* Mer. S. J. (1887) 1013-.
- pocket. *Klein, L.* Z. Ws. Mkr. 5 (1888) 196-.
- , *Adams's compendious. Anon.* Mer. S. J. (1899) 532-.
- , *Klönne and Müller's. Anon.* Mer. S. J. 5 (1885) 309.
- , *Watson's. Anon.* Mer. S. J. 6 (1886) 311.
- Swift's. Nelson, E. M.* [1895] Mer. S. J. (1896) 135.
- , *Siddons, (Lt.-Col.) H. G. F.* Mer. S. J. (1896) 486-.
- , *Anon.* Mer. S. J. (1900) 379-.
- Zentmayer's. Nelson, E. M.* Mer. S. J. (1895) 26-.

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- Rutot, A.* Brux. S. Blg. Mer. A. 3 (*1877) 17-.
- Wright, L.* [1884] Mer. S. J. 5 (1885) 196-.
- Duboscq, T., & Duboscq, A.* C. R. 101 (1885) 476-.
- Fayel, —.* Par. S. Bl. Mm. 38 (1886) (C. R.) 405-.
- Quinn, E. P.* Manch. Mer. S. T. (1887) 26-.
- Leach, W.* Manch. Mer. S. T. (1887) 52-.
- Heger, R.* Dresden Isis Sb. (1888) 27-.
- Hughes, W. C.* Mer. S. J. (1889) 116-.
- Nelson, E. M.* Mer. S. J. (1891) 439-.
- Furnivel, J. A.* [1891] Mer. S. J. (1892) 105-.
- Fletcher, T.* [1891] Mer. S. J. (1892) 106-.
- Salomons, (Sir) D. L.* Mer. S. J. (1893) 424-.
- Greenwood, W.* Manch. Mer. S. T. (1894) 9-.
- Adams's. Mayall, J. (jun.)* Mer. S. J. (1888) 525.
- attachment for oblique illumination or opaque objects. *McIntosh, L. D.* Am. S. Mer. P. 10 (1888) 155-.
- Edinger's, Leitz's objectives for. Anon.* Mer. S. J. (1900) 251-.
- and electrical regulator for microscopic objects. *Behrens, W.* Z. Ws. Mkr. 16 (1899) 183-.
- improved. *Wright, L.* Mer. S. J. (1899) 247-.
- Leach's. Anon.* Mer. S. J. (1889) 803-.
- reflector with. *Buckton, G. B.* [1892] Nt. 47 (1892-93) 54-.
- Reichert's. Anon.* Mer. S. J. (1900) 120-.
- , *Anon.* Mer. S. J. (1900) 252-.
- , *Anon.* Mer. S. J. (1900) 253-.
- Watson's. Anon.* Mer. S. J. 5 (1885) 1064-.
- Zeiss's. Anon.* Mer. S. J. (1900) 383-.

- radial, Swift's. *Mayall, J. (jun.)* Mcr. S. J. 6 (1886) 555-.
- reading- (Geneva Co.'s). *Anon.* Mcr. S. J. (1887) 643.
- (Cambridge Scientific Instrument Co.'s). *Anon.* Mcr. S. J. (1887) 643.
- , simplified. *Bohn, C. Z. Instk.* 4 (1884) 87-.
- reflecting. *Brewster, (Sir) D.* Edinb. Ph. J. 8 (1823) 326-.
- , *Guthrie, A.* Edinb. N. Ph. J. 20 (1836) 326-.
- , Amici's. *Cavalleri, G. M. (vi Add.)* Majocchi A. Fis. C. 8 (1842) 297-.
- , —, improvements. *Goring, C. R. QJ. Sc.* 21 (1826) 34-.
- , Brewster's, compared with Amici's catadioptric engyscope. *Goring, C. R.* Edinb. N. Ph. J. 27 (1839) 31-.
- , improvements. *Doppler, C.* Böhm. Gs. Ab. 4 (1845-46) 91-.
- , refracting, and single, comparative merits. *Goring, C. R. QJ. Sc.* (1828) (Pt. 1) 107-.
- Reichert's No. VII b. *Anon.* Mcr. S. J. (1893) 380-.
- with revolving foot, MeLaren's. *Anon.* Mcr. S. J. 4 (1884) 111-.
- — stage. *Anon.* Mcr. S. J. 5 (1885) 699-.
- revolving, with swinging tail-piece, Aylward's. *Anon.* Mcr. S. J. 4 (1884) 110-.
- with screw stage micrometer, Schieck's. *Anon.* Mcr. S. J. 5 (1885) 861.
- simple, and mechanical stage. *Wenham, F. H.* Am. Mcr. J. 17 (1896) 143-.
- , Zeiss's. *Schacht, H.* Bt. Ztg. 10 (1852) 698-.
- with single lens, of diamond. *Pritchard, A.* QJ. Sc. (1827) (Pt. 2) 15-.
- — — — or sapphire. *Pritchard, A.* Edinb. J. Sc. 10 (1829) 327-.
- single, new construction. *Brewster, (Sir) D.* Edinb. Ph. J. 3 (1820) 74-.
- sliding, Leitz-Nebelthau. *Anon.* Mcr. S. J. (1900) 109-.
- solar. *Deschamps, A. C. R.* 130 (1900) 1175-.
- , aplanatic. *Carpenter, —.* QJ. Sc. (1828) (Pt. 2) 194-.
- , experiment. *Watson, Jas.* Thomson A. Ph. 14 (1819) 428-.
- and oxyhydrogen, production of achromatic light in. *Reade, (Rev.) J. B. (vi Add.)* Ph. Mg. 10 (1837) 184-.
- "star", Beck's. *Anon.* Mcr. S. J. 5 (1885) 512-.
- , —. *Anon.* Mcr. S. J. (1891) 806.
- stereoscopic. *Seibert, W.* [1876] Giessen Oberh. Gs. B. 16 (1877) 38-.
- dissection. *Schulze, F. E.* Berl. Nf. Fr. Sb. (1887) 146-.
- , Greenough's. *Czapski, S. Z. Ws. Mkr.* 14 (1897) 289-.
- , —. *Harting, H.* Z. Ws. Mkr. 15 (1898) 299-.
- , —, accessories. *Gebhardt, W.* Z. Ws. Mkr. 14 (1897) 304-.
- student's. *Nelson, E. M.* Mcr. S. J. (1887) 292-.
- student's. *Seaman, W. H.* Am. S. Mcr. P. 12 (1890) 67-.
- , Baker's. *Nelson, E. M.* Mcr. S. J. (1891) 298.
- , Bausch and Lomb's. *Anon.* Mcr. S. J. 6 (1886) 1037-.
- , Bulloch's. *Anon.* Mcr. S. J. (1887) 140-.
- , instructions for making. *Swift, J.* Mcr. S. J. (1894) 620-.
- , Swift's improved. *Karop, G. C.* Mcr. S. J. (1891) 87-.
- , Watson's. *Anon.* Mcr. S. J. (1899) 649-.
- , — Edinburgh. *Nelson, E. M.* [1892] Mcr. S. J. (1893) 95-.
- submersion. *Dudgeon, R. E.* QJ. Mcr. Sc. 11 (1871) 239-.
- Swift-Wale. *Anon.* Mcr. S. J. 5 (1885) 119-.
- swinging substage, Watson's. *Anon.* Mcr. S. J. 5 (1885) 1062-.
- table. *Grubb, T.* [1858] *Dubl. R. S. J.* 3 (1860-62) 85-.
- triocular, Ahrens's. *Anon.* Mcr. S. J. (1887) 799-.
- universal. *Zenger, K. V.* Prag. Sb. (1874) 131-.
- , *Braham, P.* Mcr. S. J. (1890) 501-.
- , Russwurm's. *Anon.* Mcr. S. J. (1899) 529-.
- Watson-Draper. *Anon.* Mcr. S. J. (1887) 458-.
- Watson-Wale. *Anon.* Mcr. S. J. 5 (1885) 860-.
- Winkel's. *Listing, J. B. A. Ps. C.* 142 (1871) 479-.
- Zeiss's X. *Anon.* Mcr. S. J. 4 (1884) 954-.
- II a. *Anon.* Mcr. S. J. (1888) 636-, 794.
- VI a. *Johne, —.* D. Z. Thmd. 20 (1894) 418-.
- , and 300 years history. *Martenson, J.* [1889] *Phm. Z. Russl.* 29 (1890) 145-, 161-, 177-, 193-, 224.
- Microscopic forms, investigation by means of images they furnish of external objects. *Rood, O. N.* Silliman J. 33 (1862) 65-.
- granules, motion. *Stodder, C. M.* Mcr. J. 5 (1871) 81-.
- images with high powers, interpretation. *Nelson, E. M.* Quek. Mcr. Cl. J. 2 (1886) 255-.
- , interpretation. *Cox, J. D.* Mcr. S. J. (1891) 657-.
- , true and false. *Smith, T. F.* [1888] *Quek. Mcr. Cl. J.* 3 (1889) 267-.
- , unusual. *Sohncke, L.* Münch. Ak. Sb. 23 (1894) 223-.
- objects, apparatus for exhibiting. *Flint, J. M.* Am. S. Mcr. P. 13 (1891) 54-.
- optics, progress. *Duncan, P. M.* Mcr. S. J. 2 (1882) 145-.
- physiology and physics, correlation. *Browning, J. M.* Mcr. J. 2 (1869) 15-.
- Microspectrometer. *Engelmann, T. W.* [1888] *Utr. Oz.* 11 (1889) 39-; *Z. Ws. Mkr.* 5 (1888) 289-.
- Microspectrophotometer. *Engelmann, T. W.* [1883] (xii) *Amst. Ak. Wet. P.* (1883-84) (No. 5) 3-.

Microspectroscope. *Browning, J.* M. Mer. J. 2 (1869) 65-.

—, *Merz, S.* Carl Rpm. 5 (1869) 390.

—, *Abbe, (Dr.) E.* Jena. Z. 5 (1870) 459-.

—, *Kraus, G.* Erlang. Sb. Ps. Md. S. 3 (1871)

62-.

—, *Gayer, E. J.* [1872] M. Mer. J. 9 (1873)

1-.

—, *Sorby, H. C.* M. Mer. J. 13 (1875) 198-.

—, *Abbe's. Anon.* Mer. S. J. 4 (1884) 957-.

—, improvements. *Ward, F. H.* Mer. S. J. 1

(1878) 326-.

—, mapping with bright-line micrometer.

Bridge, H. C. M. Mer. J. 6 (1871) 224-.

—, polarising. *Rollett, A.* (xii) Z. Instk. 1

(1881) 366-.

— with telescope, and prism spectroscope.

Marymann, G. Z. Angew. Mkr. 5 (1900) 309-.

Microspectroscopy. *Church, A. H.* Intell. Obs.

9 (1866) 291-.

—, *Hogg, J.* M. Mer. J. 2 (1869) 121-.

Microstereoscopic vision. *Babo, C. H. L. von.*

[1860] Freiburg B. 2 (1862) 312-.

—, *Moitessier, A.* [1865] Mntp. Mm. Ac.

Sect. Sc. 6 (1864-66) (PV.) 43-.

—, *Abbe, E.* Carl Rpm. 17 (1881) 197-;

Mer. S. J. 1 (1881) 680-.

Microstereoscopic and new stereoscopic en-

larging camera. *Drüner, L.* Z. Ws. Mkr.

17 (1900) 281-.

Miniatured images. *Abbe, E.* Mer. S. J. 2 (1882)

693-.

Misinterpretations. *Michels, J.* M. Mer. J. 14

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Multiple images formed by eyes of insects.

Ersser, T. D. [1895] Mer. S. J. (1896)

140.

— in mirrors. *Stokes, W. B.* [1896] Quek.

Mer. Cl. J. 6 (1897) 322-.

Notations, optical. *Raugé, P.* J. Mergr. 16

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OBJECTIVES.

Johnson, A. S. Silliman J. 13 (1852) 31-.

Blackham, G. E. Mer. S. J. 3 (1880) 515-.

Anon. Mer. S. J. 6 (1886) 316-.

Burrill, T. J. Am. S. Mer. P. 12 (1890) 35-.

Castracane, (Conte) F. Rm. N. Linc. At. 43

(1890) 215-.

achromatic and apochromatic, Leitz's. *Anon.*

Mer. S. J. (1900) 250-.

—, construction. *Marzoli, A.* Brescia Cm.

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—, for engyscopes. *Goring, C. R.* Edinb. J.

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—, history. *Casati, G.* Brescia At. Cm. (1891)

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—, —. *Mayall, —.* Brescia At. Cm. (1891)

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—, nomenclature. *Woodward, J. J.* Am. J.

Sc. 3 (1872) 406-.

—, properties. *Lister, J. J.* Phil. Trans.

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actinic and visual foci, difference. *Johnson,*

G. J. Manch. Mer. S. T. (1889) 108-.

— — — —. *Turner, E. H.* Manch. Mer.

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Wenham, F. H. J. Mer. Sc. 2 (1854) 209-;

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(Wenham.) *Bailey, J. W.* J. Mer. Sc. 4

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Wenham, F. H. M. Mer. J. 8 (1872) 231-.

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Fripp, H. E. (xii) Bristol Nt. S. P. 1 (1876)

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angular. *Hendry, W.* J. Mer. Sc. 8 (1860) 61-.

—, *Tolles, R. B.* M. Mer. J. 6 (1871) 36-.

— (Tolles). *Wenham, F. H.* M. Mer. J. 6

(1871) 84-.

—, *Tolles, R. B.* M. Mer. J. 10 (1873) 58-.

—, *Wenham, F. H.* M. Mer. J. 11 (1874)

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—, *Deby, J.* [1881] Brux. S. Blg. Mer. Bl.

7 (*1883) xc- or lxxxix-.

—, *Cox, J. D.* Am. S. Mer. P. (1884) 5-.

—, of immersion objectives. *Tolles, R. B. M.*

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—, — — —, determination. *Gundlach, E.*

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—, large. *North, E. D.* Silliman J. 17 (1854)

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—, —, effect of cover-glass thickness on per-

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437.

—, —, vision by. *Abbe, E.* [1882] Mer. S. J.

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—, measurement. *Robinson, T. R.* Ir. Ac. P.

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—, —, *Gillett, W. S.* [1854] R. S. P. 7

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—, —, *Stephenson, J. W.* M. Mer. J. 14

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—, —, *Hogg, J.* M. Mer. J. 15 (1876) 266-.

—, —, *Wenham, F. H.* M. Mer. J. 16 (1876)

285-; 18 (1877) 187-, 212-; 1 (1878) 321-;

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—, — (Wenham). *Keith, R.* Mer. S. J. 2 (1879)

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—, — by apertometer. *Woodward, J. J.* (xii)

Am. Mer. J. 1 [(1878-79)] 272-.

—, — — —. *Abbe, E.* Mer. S. J. 3 (1880) 20-.

—, — — —, *Abbe's. Zeiss, C.* [1877] Mer.

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—, — — —, —. *Nelson, E. M.* Mer. S. J.

(1896) 592-.

—, — — — slit. *Tolles, R. B.* [1874] M. Mer.

J. 13 (1875) 21-.

—, — — —. *Keith, R.* M. Mer. J. 14 (1875)

284-.

—, and optical angle of crystals. *Lane, A. C.*

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—, relation to penetrating power and to oblique

light. *Griffith, J. W.* [1854] R. S. P. 7

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- angular, relation to penetrating power and to oblique light (Griffith). *Alquen, F. d'*. J. Mer. Sc. 3 (1855) 43-.
- , — surface markings, etc. *Slack, H. J.* M. Mer. J. 13 (1875) 233-.
- , and universal apertometer. *Smith, H. L.* (xii) Am. Mer. J. 1 [(1878-79)] 194-.
- , — (Smith). *Mayall, J. (jun.)* (xii) Am. Mer. J. 1 [(1878-79)] 283-.
- , — working distance of objectives, measurement. *Blackham, G. E.* Am. S. Mer. P. 11 (1889) 146-.
- comparison. *Rawlings, R. B. L.* Am. Mer. J. 18 (1897) 3-.
- estimation. *Abbe, E.* Mer. S. J. 1 (1881) 388-.
- , *Hockin, C. (jun.)* [1882] Mer. S. J. 4 (*1884) 337-.
- excessive, invisibility of small objects due to. *Royston-Pigott, G. W.* M. Mer. J. 13 (1875) 55-.
- as factor in microscopic vision, experimental study. *Mercer, A. C.* Am. Mer. S. T. 18 (1896) 321-.
- and focal length and working distance. *Gundlach, E.* (xii) Am. Mer. J. 2 (1881) 32-.
- of immersion objectives, measurement. *Wenham, F. H.* M. Mer. J. 10 (1873) 10-.
- large, efficacy. *Govi, G.* [1865] Tor. Mm. Ac. 23 (1866) 285-.
- measurement. *Wenham, F. H.* J. Mer. Sc. 2 (1854) 134-.
- , *Robinson, T. R.* J. Mer. Sc. 3 (1855) 163-.
- and microscopic vision. *Crisp, F.* Mer. S. J. 1 (1881) 303-.
- numerical. *Stephenson, J. W.* Mer. S. J. 1 (1878) 51-.
- , *Mayall, J.* Mer. S. J. 2 (1879) 842-.
- , *Ewell, M. D.* Am. Mer. S. P. 14 (1892) 44-.
- , and apertometers. *Kayser, E.* [1888] Danzig Schr. 7 (1888-91) (Heft 2) xiii-.
- , formula. *Dippel, L.* Z. Ws. Mkr. 1 (1884) 23-.
- , method of increasing. *Pifard, —.* Mer. S. J. (1894) 518-.
- , in relation to air, water and balsam, tables. *Detmers, H. J.* Am. S. Mer. P. (1885) 199-.
- , table. *Stephenson, J. W.* Mer. S. J. 2 (1879) 839-.
- and power, relation. *Abbe, E.* Mer. S. J. 2 (1882) 300-, 460-; 3 (1883) 790-.
- , —, *Blackham, G. E.* (xii) Am. S. Mer. P. (1883) 33-.
- reduced. *Brakey, S. L.* M. Mer. J. 9 (1873) 108-.
- in relation to objects in Canada balsam. *Wenham, F. H.* J. Mer. Sc. 3 (1855) 302-.
- and resolution, relations. *Wright, L.* Mer. S. J. 4 (1884) 289-.
- significant angle. *Van Dyck, F. C.* (xii) Am. Mer. J. 3 (1882) 154-.
- small, calculation. *Harting, H.* Wien Ak. Sb. 107 (1898) (Ab. 2a) 624-; Z. Instk. 18 (1898) 331-.
- theoretical limit. *Stokes, G. G.* Mer. S. J. 1 (1878) 139-.
- aplanatic, for diverging rays. *Goring, C. R.* Q. J. Sc. 22 (1827) 265-; (1827) (Pt. 2) 248-.
- , — (Goring). *Chevalier, C.* Edinb. J. Sc. 5 (1831) 223-.
- , — (Chevalier). *Goring, C. R.* Edinb. J. Sc. 5 (1831) 238-.
- apochromatic. *Gundlach, E.* [1887] Mer. S. J. (1888) 285-.
- , *Heurck, H. van.* Brux. S. Blg. Mer. A. 23 (1898) 41-.
- , and compensation eye-pieces, *Koristka's.* *Poli, A.* Riv. Sc.-Ind. 20 (1888) 274-.
- , —, *Reichert's.* *Dippel, L.* Z. Ws. Mkr. 5 (1888) 148-.
- , —, *Zeiss's.* *Dippel, L.* Z. Ws. Mkr. 3 (1886) 303-.
- , —, —, *Czapski, S.* Z. Ws. Mkr. 5 (1888) 150-.
- , early form. *Mayall, J. (jun.)* Mer. S. J. (1890) 420-.
- , fluorite in. *Nelson, E. M.* [1892] Quek. Mer. Cl. J. 5 (1894) 122.
- , without fluorite. *Jourdain, P. E. B.* Mer. S. J. (1898) 395-.
- , new. *Cox, J. D.* [1890] Mer. S. J. (1891) 248-.
- , *Reichert's.* *Heurck, H. van.* Brux. S. Blg. Mer. Bl. 14 (1888) 156-.
- , *Zeiss's.* *Ewell, M. D.* Mer. S. J. (1887) 462.
- , —, *Heurck, H. van.* Brux. S. Blg. Mer. A. 13 (1890) 123-.
- , — $\frac{1}{2}$ in., and method of detecting spurious diffraction images. *Nelson, E. M.* [1889] Quek. Mer. Cl. J. 4 (1892) 55-.
- apparatus for quickly changing. *Schoch, G.* Zür. Vjschr. 13 (1868) 395-.
- , —, —, *Zeiss's.* *Czapski, S.* Z. Ws. Mkr. 4 (1887) 293-.
- , —, —, *Anon.* Mer. S. J. (1887) 646-.
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- centering. *Brewster, (Sir) D.* B. A. Rp. (1857) (pt. 2) 4-.
- , *Leroy, C. J. A.* C. R. 113 (1891) 639-.
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- correction. *Wenham, F. H.* Quek. Mer. Cl. J. 2 (1871) 21-.
- , primitive form. *Anon.* Mer. S. J. (1899) 436-.
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- , —. *Franklin, W. S.* *Ps. Rv.* 1 (1894) 142-.
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- , —, *Arachnoidiscus* as test. *Smith, T. F.* [1888] *Quek. Mer. Cl. J.* 3 (1889) 247-.

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- , of Zeiss, compared with Spencer's objectives. *Smith, H. L.* [1878] (xii) *Am. Mer. J.* 1 [(1878-79)] 28-.
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- , —, —, — (Woodward). *Bicknell, E.* *M. Mer. J.* 6 (1871) 225-.

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- , —. *Tolman, H. L.* *Am. Mer. J.* 13 (1892) 93-.
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- , —, standard of comparison. *Ingpen, J. E.* [1872] *M. Mer. J.* 8 (1872) 253-; *Quek. Mer. Cl. J.* 3 (1873) 97-.
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 —. *Nelson, E. M.* Mer. S. J. (1896) 681.
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 —. *Keith, R.* Mer. S. J. 1 (1878) 142-; 2 (1879) 269.
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 — — — attachable. *Anon.* Mer. S. J. (1899) 334-.
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 —. *Zimmermann, A.* Z. Ws. Mkr. 12 (1895) 433-.
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Winkel's. *Behrens, W.* Z. Ws. Mkr. 9 (1892) 433-.

- Winkel's, for circular stages. *Behrens, W.* Z. Ws. Mkr. 10 (1893) 297-.
- for Zeiss stands. *Czapski, S.* Z. Ws. Mkr. 11 (1894) 301-.
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- polarising. *Smith, James. J.* *Mer. Sc.* 8 (1860) 203-.
- revolving. *Taylor, T.* *Am. S. Mer. P.* 13 (1891) 189-.
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- secondary. *Hislop, W.* *Mer. S. T.* 6 (1858) 94-.
- selenite analysing. *Hislop, W.* *Quek. Mer. Cl. J.* 1 (1868-69) 225-.
- stage-plate, glass, with rectangular movements. *Cunningham, K. M.* *Am. Mer. J.* 19 (1898) 33-, 230.
- , Millar's multiple. *Anon.* *Mer. S. J.* 4 (1884) 120.
- , Stewart's safety-. *Anon.* *Mer. S. J.* 4 (1884) 120-.
- substage. *Nelson, E. M.* [1890] *Mer. S. J.* (1891) 257.
- , Bausch and Lomb's complete. *Anon.* *Mer. S. J.* (1899) 219-.
- , — — duplex. *Bausch, E.* [1900] *Mer. S. J.* (1901) 83-.
- fittings, standard sizes. *Nelson, E. M.* [1899] *Mer. S. J.* (1900) 141.
- , necessity. *Mayall, J. (jun.)* *Mer. S. J.* (1888) 1024-.
- table-. *Anon.* *Mer. S. J.* (1899) 355.
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- and cold. *Dewitz, H.* *Arch. Mkr. An.* 30 (1887) 666-.
- — —. *Anon.* *Mer. S. J.* (1887) 299-.

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- Coutant, R. B.* *Mer. S. J.* (1894) 736-.
- Bausch, E.* [1898] *Mer. S. J.* (1899) 81-.
- with concentric movements. *Cox, J. D.* (xii) *Am. S. Mer. P.* (1888) 147-.
- continental form, development. *Dallinger, —.* *Mer. S. J.* (1893) 573-.
- — —. *Nias, J. B.* *Mer. S. J.* (1893) 596-.
- dissecting-, and lens-carrier. *Siddons, (Lt.-Col.) H. G. F.* *Mer. S. J.* (1896) 679-.
- , Meyer's improved. *Anon.* *Mer. S. J.* (1899) 218-.
- graphological, small. *Exell, M. D.* *Am. S. Mer. P.* 13 (1891) 69-.
- Günther's. *Benda, C.* [1899] *Arch. An. Pl. (Pl. Ab.)* (1900) 179-.
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- and optical apparatus. ?*Marpmann, G.* Z. *Angew. Mkr.* 2 (1897) 290-, 321-, 351-.

- Reichert's model large No. Ia. *Dippel, L.* Z. Ws. Mkr. 5 (1888) 145-.
- , with new stage and iris-diaphragm. *Anon.* *Mer. S. J.* 6 (1886) 307-.
- non-inclining. *Anon.* *Mer. S. J.* (1899) 217, 647-.
- U-shaped. *Beall, W. J.* [1899] *Mer. S. J.* (1900) 114-.
- and tubes, etc. *Hildebrand, H. E.* Z. Ws. Mkr. 12 (1895) 145-.
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- *Anon.* *Mer. S. J.* (1895) 225-.
- Zeiss-Babuchin. *Czapski, S.* Z. Ws. Mkr. 4 (1887) 290-.
- Zentmayer's American - Continental. *Anon.* *Am. Mer. S. P.* 14 (1892) 48-.

- Tercentenary of microscope. *Mancini, E.* *N. Antol. Sc.* 114 (1890) 506-.
- — —. *Rutherford, W.* [1890] *Sc. Mer. S. P. & T.* 1 (1895) iv-.

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- Amici's test. *Karop, G. C.* [1895] *Quek. Mer. Cl. J.* 6 (1897) 79-.
- Colour test. *Royston-Pigott, G. W.* *M. Mer. J.* 10 (1873) 61-.
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- — —. *Nobert, F. A.* *N.-Vorp. Mt.* 13 (1882) 92-.

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- Woodward, J. J.* *M. Mer. J.* 6 (1871) 26-.
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- , *Barnard, F. A. P.* *M. Mer. J.* 6 (1871) 194-.
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- , and its observers. *Stodder, C.* *M. Mer. J.* 5 (1871) 118-; 6 (1871) 201-.
- , resolution. *Stodder, C.* *M. Mer. J.* 3 (1870) 257-.
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- and diatoms in measuring power. *Castracane degli Antelminelli, F.* *Rm. At.* 22 (1869) 111-, 170-.
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— —, — by central light. *Detmers, H. J.* [1883] Mer. S. J. 4 (*1884) 143.

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— —, —, and a violet copper-iodine light filter. *Zetnow, —.* [1893] Quek. Mer. Cl. J. 5 (1894) 286-.

— — and *Surirella gemma.* *Woodward, J. J.* Am. J. Sc. 1 (1871) 345-.

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— —, etc., structure. *Wenham, F. H.* M. Mer. J. 2 (1869) 25-, 158-.

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— — and Lendl's microscope. *Apáthy, S.* Z. Ws. Mkr. 8 (1891) 433-.

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— and practice. *Davis, G. E.* Manch. Mer. S. Rp. (*1883-84) 60-.

— — —. *Hitchcock, R.* Am. As. P. (1884) 566-.

— — —. *Gilly, H.* Nim. S. Sc. Bil. (1895) xxxii-.

— — —. *Marsson, T.* Z. Angew. Mkr. 1 (1896) 33-, 65-.

— —, progress. *Poli, A.* Rv. Sc.-Ind. 19 (1887) 89-, 109-, 137-.

— —, simplified. *Pelletan, J.* J. Mergr. 10 (1886) 279-.

Tremor, prevention. *Ross, A.* Mer. J. 1 (1841) 23-.

Tube length, optical. *Crisp, F.* Mer. S. J. 3 (1883) 816-.

— —, —, determination. *Ashe, A.* [1892-93] Quek. Mer. Cl. J. 5 (1894) 152-, 289-.

— — and resolving power. *Jameson, H. G.* Mer. S. J. (1892) 272-.

— —, standard. *Gage, S. H., Mercer, A. C., & Barr, C. E.* Am. S. Mer. P. 12 (1890) 250-.

— —, —. *Beck, C.* Mer. S. J. (1893) 814.

Upper work, new. *Berger, M.* Z. Instk. 18 (1898) 129-.

Use. *Audouin, J. V.* A. Sc. Nt. 3 (1824) 354-.

— in agriculture. *Cobb, N. A.* Mer. S. J. (1897) 433-.

— for drawing. *Alton, E. d'.* D. Nf. B. (1847) 176-.

— of high powers. *Peragallo, H.* A. Mergr. 4 (1891-92) 585-.

— in horizontal position. *Slack, H. J.* Mer. S. J. 4 (1884) 455.

— of low powers, with deep eyepieces. *Slack, H. J.* Intell. Obs. 4 (1863) 169.

— for photography. *Neyreneuf, V. C.* R. 84 (1877) 344-; Caen S. L. Bil. 1 (1877) 131-; J. de Ps. 6 (1877) 124-.

— — physical and chemical investigations. *Lehmann, O.* Z. Instk. 6 (1886) 325-.

— —, practical. *Hepworth, J.* J. Mer. Sc. 4 (1856) 109-; 5 (1857) 1-.

— in workshop. *Rogers, W. A.* Mer. S. J. 6 (1886) 679-.

3084 Eye-pieces. (See also Astronomy, 2120.)

- achromatic. *Brewster, (Sir) D. Nicholson J.* 14 (1806) 388-.
- , *Ellis, R. L.* Camb. Mth. J. 1 (1839) 269-.
- , 2-lens (of Galileo). *Forti, A.* (vi *Adds.*) Firenze At. Ac. Georg. 1 (1854) 483-.
- , 4-lens. *Sang, E.* Edinb. R. S. P. 14 (1888) 153-.
- , single. *Reade, J. B.* R. S. P. 4 (1840) 195.
- , for telescopes. *Gilbert, L. W.* Gilbert A. 34 (1810) 292-.
- astigmatic. *Gundlach, E.* Mer. S. J. 6 (1886) 313, 509-.
- , *Stockwell, J. K.* Mer. S. J. 6 (1886) 313-.
- binoocular. *Tolles, R. B.* Am. J. Sc. 39 (1865) 212-.
- , for high powers. *Smith, H. L.* Am. J. Sc. 45 (1863) 42-.
- , stereoscopic, Tolles's. *Smith, H. L. M.* Mer. J. 6 (1871) 45-.
- cross wires. *Schröder, H.* Cztg. Opt. 18 (1897) 4-, 14-.
- , quartz fibres for. *Bleekrode, L.* Nt. 50 (1894) 174.
- , —, —, *Wadsworth, F. L. O.* [1897] Mer. S. J. (1898) 232-.
- , in telescope. *Stevens, J. S.* Nt. 59 (1898-99) 255-.
- , —, —, history. *Hammer, E.* Cztg. Opt. 17 (1896) 221-.
- , —, —, problem. *Littrow, J. J. von.* Oken Isis (1831) 1067-.
- , —, —, —, *Littrow's. Muncke, G. W.* Baumgartner Z. 2 (1833) 53-; 3 (1835) 49-.
- , —, —, self-luminous. *Bohn, K.* (xii) Z. Instk. 2 (1882) 12-.
- diagonal. *Forbes, G. B. A.* Rp. (1878) 449.
- drawing, *Leitz's. Schiemenz, P.* Z. Ws. Mkr. 12 (1895) 289-.
- Ehrlich's. *Anon.* Mer. S. J. (1900) 250.
- erecting, new. *Jadanza, N.* Tor. Ac. Sc. At. 22 (1886-87) 447-.
- fluorescent, modified form of *Soret's. Dewar, J., & Liveing, G. D.* Camb. Ph. S. P. 4 (1883) 342-.
- , new. *Martens, F. F.* Z. Instk. 18 (1898) 252-.
- focal length, apparatus to determine. *Brauer, G.* (xii) Rs. C. Ps. S. J. 7 (Ps.) (1875) [Pt. 1] 55-.
- "holoscopic," *Watson and Son's. Anon.* Mer. S. J. (1899) 651.
- Huygens's. *Listing, J. B.* Gött. Nr. (1871) 89-.
- , *Hunter, J.* [1896] Sc. Mer. S. P. & T. 2 (1900) 61-.
- , achromatism. *Höegh, E. von.* Cztg. Opt. 7 (1886) 37-, 84.
- , and applications. *Schröder, H.* Cztg. Opt. 19 (1898) 91-, 101-, 113.
- , Ramsden's, achromatism. *Mittenzwey, M.* Cztg. Opt. 7 (1886) 61.

- interchangeable diaphragms. *Malassez, L.* Arch. An. Mer. 3 (1900) 436-.
- magnifying power. *Abbe, —.* Mer. S. J. 4 (1884) 804.
- micrometer-. *Soleil, H.* A. C. 18 (1869) 385-.
- , *Djakonov, D.* Rs. Ps.-C. S. J. 18 (Ps.) (1886) 120-; J. de Ps. 7 (1888) 220.
- , *Krysiński, S.* Virch. Arch. 111 (1888) 373-.
- , *Ward, R. H.* J. Mergr. 13 (1889) 209-.
- , *Hartwich, C.* Z. Ws. Mkr. 17 (1900) 156-.
- , compensation-. *Zeiss, —.* Mer. S. J. (1888) 797-.
- , filar. *Rogers, W. A.* Am. Mer. S. P. 14 (1892) 132.
- , for fixed stages. *Hartwich, C.* Z. Ws. Mkr. 17 (1900) 432-.
- , —, microscopes. *Fischer, A.* Mosc. S. Nt. Bll. 3 (1837) 21-.
- , —, —, *Coulier, —.* Brown-Séguard J. Pl. 2 (1859) 670-.
- , —, —, *Evell, M. D.* Mer. S. J. 6 (1886) 316.
- , —, —, *Jones, E. J.* Am. Mer. J. 11 (1890) 3-.
- , made by photography. *Levison, W. G.* N. Y. Ac. A. 11 (1898) 405-.
- , standard. *Findley, G. M.* Mer. J. 8 (1872) 264-.
- , *Winkel's. Behrens, W.* Z. Ws. Mkr. 2 (1885) 41-.
- , *Zeiss's. Anon.* Mer. S. J. 4 (1884) 118.
- for microphotography. *Neuhauss, R.* Z. Ws. Mkr. 5 (1888) 328-.
- , microscope. *Goodwin, W.* [1889-90] Quek. Mer. Cl. J. 4 (1892) 71-; Mer. S. J. (1890) 417.
- , —, *Azoulay, —, & Nageotte, —.* Par. S. Bl. Mm. 49 (1897) (C. R.) 641-.
- , with normal reflection. *Cornu, A.* As. Fr. C. R. (1893) (Pt. 1) 205.
- , —, widened field of vision and iris diaphragm. *Czapski, S.* Z. Ws. Mkr. 12 (1895) 437-.
- with moveable indicator, *Kuznitsky's. Wilde- man, É. de.* Brux. S. Blg. Mer. Bll. 22 (1897) 12-.
- multiple, *Griffith's. Anon.* Mer. S. J. 4 (1884) 443-.
- nadiral, interference fringes in. *Hurion, A.* J. de Ps. 1 (1892) 414-.
- new. *Krüß, A. H.* A. Ps. C. 153 (1874) 601-.
- , *Nelson, E. M.* [1887] Quek. Mer. Cl. J. 3 (1889) 173-; Mer. S. J. (1887) 928.
- , solid. *Reade, J. B. B. A.* Rp. (1850) (pt. 2) 15-.
- nomenclature. *Ward, R. H.* M. Mer. J. 8 (1872) 15-.
- , and sizes. *Ward, R. H., & others.* Am. S. Mer. P. (1884) 223-.
- orthoscopic. *Rabenhorst, L.* Bt. Ztg. 8 (1850) 526-; 9 (1851) 529-.
- polarising. *Cavalleri, G. M.* Mil. At. I. Lomb. 1 (1858) 283-; Mil. I. Lomb. Rd. 6 (1873) 477-.

- polarising, Abbe's. *Anon.* *Mer. S. J.* 4 (1884) 462.
- , Cavalleri's. *Cecchi, (padre) F.* (xii) *Rv. Sc.-Ind.* 5 (1873) 133-.
- , course of light in. *Sang, E.* *Edinb. R. S. P.* 18 (1892) 323-.
- , —, —, —. *Tait, —.* *Edinb. R. S. P.* 18 (1892) 337-.
- , improved, and new projection eye-piece. *Stringer, E. B.* *Mer. S. J.* (1900) 537-.
- with reflecting and polarising attachments. *Fuchs, F.* (xii) *Z. Instk.* 2 (1882) 305-.
- revolving, Leitz's. *Anon.* *Mer. S. J.* (1900) 249-.
- simple lenses as. *Breton [de Champ], Paul.* *C. R.* 50 (1860) 422-.
- starlit transit. *Royston-Pigott, G. W.* *As. S. M. Not.* 36 (1876) 250-.
- stereoscopic. *Abbe, E.* *Carl Rpm.* 17 (1881) 197-.
- and substage fittings, standard sizes. *Nelson, E. M.* [1899] *Mer. S. J.* (1900) 141.
- telescopic, measuring the power of. *Adamson, D. B.* [1887] *S. Aust. R. S. T.* 11 (1889) 112-.
- , variable magnification. *Goring, C. R.* *Edinb. N. Ph. J.* 25 (1838) 259-.
- terrestrial, formulae. *Gonnella, T. N.* *Cim.* 18 (1863) 306-.
- theory. *Moutier, J.* *Par. S. Phlm. Bl.* 1 (1877) 172-.
- Concave mirror, use for photography. *Smith, F. J.* [1892] *Nt.* 47 (1892-93) 10.
- Definition, photographic. *Mallock, A.* *Nt.* 44 (1891) 552-.
- Enlargement. *Wallon, É.* *A. Cons. Arts et Mét.* 1 (1899) 422-.
- , apparatus. *Monkhoven, (Dr.) — van.* *Les Mondes* 5 (1864) 125-.
- Exposers, determination of speed. *Pickering, W. H.* *Science* 4 (1884) 454; *Am. Ac. P.* 20 (1885) 478-.
- , principles of construction. *Pickering, W. H.* *Am. Ac. P.* 20 (1885) 483-.
- Focus of chemical, luminous and calorific rays, difference. *Borlinetto, L., & Zantedeschi, —.* *Wien SB.* 21 (1856) 521-.
- equaliser, self-acting. *Claudet, A. F. J.* *R. S. P.* 15 (1867) 456-.
- , photogenic, for daguerreotype. *Cavalleri, G. M.* (vii) *Bh. It.* 13 (1846) 229-.
- Focusing. *Pickering, W. H.* *Science* 1 (*1883) 160-.
- Image, curvature due to primary and secondary foci of oblique pencils of light. *Bow, R. H.* [1863] (vi *Adds.*) *Pht. S. J.* 8 (1864) 304-, 312-.
- formation by objectives, conditions. *Rohr, M. von.* *Z. Instk.* 17 (1897) 271-; 18 (1898) 4-.
- illumination in landscape photography, method of equalising. *Slight, G. H.* [1867] *Edinb. Sc. S. Arts T.* 7 (1868) 313-.
- Images, form, with large and small lenses. *Brewster, (Sir) D. B. A. Rp.* (1852) (pt. 2) 3-.
- , properties. *Vogel, H.* *A. Ps. C.* 140 (1870) 451-.
- , reflected, in optical combinations. *Dallmeyer, T. R.* *Phot. J.* 14 (1890) 155-.
- Instantaneous perigraph. *Mangin, (col.) A.* *As. Fr. C. R.* (1878) 339-.
- Intensification of photographic pictures, optical device for. *Rayleigh, (Lord).* *Ph. Mg.* 44 (1897) 282-.
- Oblique pencils. *Goddard, J. T.* *Pht. S. J.* 7 (1862) 349-; 8 (1864) 12-, 50-, 209-, 302-, 310-, 420-.
- Opera glasses, photographic. *Ferrand, H.* [1897] *Isère S. Bl.* 30 (1899) 129-.
- Optics, photographic. *Brewster, (Sir) D.* [1857] *Pht. S. J.* 4 (1858) 83-.
- , —. *Petzval, J.* *Wien SB.* 24 (1857) 50-, 92-, 129-; 26 (1857) 33-.
- , — (Petzval). *Pretsch, P.* [1857] *Pht. S. J.* 4 (1858) 102-.
- , —. *Symonds, P.* *Pht. Arch.* 1 (1860) 198-, 216-, 238-.
- , —. *Claudet, A. F. J.* *Ph. Mg.* 32 (1866) 212-.
- , —. *Hannot, A.* *Brux. Bil. Pht.* 19 (1880) 46-, 120-, 129-.
- , —. *Caplatzi, A.* *Mer. S. J.* (1891) 818-.
- , —. *Lummer, O.* *Z. Instk.* 17 (1897) 208-, 225-, 264-.
- , —. *Miethe, A. D. Nf. Vh.* (1897) (*Th.* 2, *Hälfte* 1) 132-.
- , —. *Schiffner, F.* *Wien Pht. Cor.* 37 (1900) 550-.
- Perspective photograph, visual point. *Streintz, H.* *Wien Pht. Cor.* 29 (1892) 559-.

3085 Photographic Lenses and Systems.

- Camera. *Voigtländer, P. W. F.* [1841] *Dingler* 83 (1842) 187-.
- (Voigtländer's). *Reindl, J.* *Dingler* 86 (1842) 128-.
- , *Pretsch, P.* [1858] *Pht. S. J.* 5 (1859) 39-, 61-.
- , "autograph," Walmsley's. *Fox, C. E.* *Mer. S. J.* (1896) 354.
- , binocular. *Brewster, (Sir) D. B. A. Rp.* (1849) (pt. 2) 5; *Edinb. T. Sc. S. Arts* 3 (1851) 259-.
- , improvements. *Brewster, (Sir) D. B. A. Rp.* (1849) (pt. 2) 5.
- , — suggested by Brewster. *Emerson, E.* *Silliman J.* 32 (1861) 227-.
- lucida applied to photography. *Carlini, F.* *Presse Sc.* 1 (1863) 350-.
- , photoelectric, Jaspars's. *Crahay, J. G.* (vi *Adds.*) *Rm. Cor. Sc.* 3 (1855) 53-.
- , relief of image on ground glass of. *Claudet, A.* *R. S. P.* 8 (1856-57) 569-.
- , solar, for enlarging. *Claudet, A. B. A. Rp.* (1860) (pt. 2) 62-.
- for travelling. *Hannot, A.* *Brux. Bil. Pht.* 20 (1881) 25-.
- , vertical, invention. *Goode, G. B.* *Science* 3 (1884) 672-.
- , —, —. *Gage, S. H.* *Science* 4 (1884) 5.
- , X-ray photography by. *Nipher, F. E.* *Science* 3 (1896) 783.

- Perspective, photographic. *Streintz, H.* Wien Pht. Cor. 29 (1892) 477-, 548-.
- , —. *Miethe, A.* Wien Pht. Cor. 31 (1894) 159-.
- , —, apparently incorrect. *Rothuelli, J.* [1860] Pht. S. J. 7 (1862) 24-.
- Photogrammetry. *Hübl, A. (Frhr.) von.* Wien Pht. Cor. 29 (1892) 269-.
- Photogrammetric instruments, new. *Doležal, E.* Wien Pht. Cor. 37 (1900) 81-.
- methods (with ordinary apparatus). *Schiffner, F.* Wien Pht. Cor. 26 (1889) 262-.
- reconstructions. *Doležal, E.* Wien Pht. Cor. 35 (1898) 345-, 408-.
- studies. *Schiffner, F.* Wien Pht. Cor. 27 (1890) 314-; 28 (1891) 165-.
- Photogrammetry. *Pizzighelli, —.* Wien Pht. Cor. 23 (1886) 119-, 199-, 251-, 404-.
- *Hafferl, F.* [1888] Wien Pht. Cor. 26 (1889) 95-.
- *Harris, C. H.* Aust. As. Rp. (1893) 595-.
- , geometrical theory. *Finsterwalder, S. D.* Mth. Vr. Jbr. 6 (1899) (Heft 2) 1-.

PHOTOGRAPHIC LENSES.

- Zettnow, E.* Wien Pht. Cor. 27 (1890) 161-.
- Sporžinskij, K. M.* Vars. S. Nt. Tr. (1893-94) (C. R., Ps. C.) Nos. 4 & 5, 10-.
- Miethe, A.* Wien Pht. Cor. 35 (1898) 452-.
- achromatic, calculation of numerical elements. *Teynard, F.* C. R. 64 (1867) 1013-.
- , determination. *Forti, A. N.* Cim. 14 (1861) 377-.
- anastigmatic. *Goerz, C. P.* Phot. J. 17 (1893) 253-.
- , astigmatism remaining in some. *Hoëgh, E. von.* [1893] Phot. J. 18 (1894) 34-, 92-.
- , Goerz's double, compared with Zeiss's. *Miethe, —, Neuhaus, —, & Stolze, —.* Wien Pht. Cor. 30 (1893) 457-.
- , Voigtländer's triple. *Kaempfer, —.* Wien Pht. Cor. 35 (1898) 173-.
- , —. *Eder, J. M.* Wien Pht. Cor. 35 (1898) 594-.
- , Zeiss's. *Eder, J. M.* Wien Pht. Cor. 28 (1891) 267-.
- , —. *Rudolph, P.* Wien Pht. Cor. 30 (1893) 512-.
- antiplanatic, Steinheil's new rapid. *Eder, J. M.* Wien Pht. Cor. 31 (1894) 168-.
- aplanatic, with adjustable distance of lenses, Steinheil's. *Eder, J. M.* Wien Pht. Cor. 22 (1885) 277-.
- , baryta-, Waechter's. *Eder, J. M.* Wien Pht. Cor. 29 (1892) 592-.
- , and pantoscope, Hartnack's new. *Eder, J. M.* Wien Pht. Cor. 27 (1890) 461-.
- , wide-angle, application of prism. *Husnik, J.* Wien Pht. Cor. 17 (1880) 13-.
- catadioptic, for celestial photography. *Zenger, C. V.* As. Fr. C. R. (1889) (Pt. 2) 378-; C. R. 109 (1889) 474-.
- chroscope, Goerz's. *Eder, J. M.* Wien Pht. Cor. 28 (1891) 223-.
- "collinear", Voigtländer's. *Kaempfer, D.* Wien Pht. Cor. 31 (1894) 455-.

- "collinear", Voigtländer's. *Eder, J. M.* Wien Pht. Cor. 32 (1895) 6-.
- , —. *Höegh, E. von.* Wien Pht. Cor. 32 (1895) 103-.
- , — (Höegh). *Kaempfer, D., & Scheffler, H.* Wien Pht. Cor. 32 (1895) 153-.
- combination. *Cundell, G. S.* (vi Adds.) Ph. Mg. 25 (1844) 173-.
- concentric. *Schröder, —.* Phot. J. 16 (1892) 276-.
- conjugate distances, simple method of obtaining. *Lambert, (Rev.) F. C.* Phot. J. 24 (1900) 307-.
- construction. *Hunt, R.* [1853] Pht. S. J. 1 (1854) 14-.
- *Aldis, H. L.* Phot. J. 24 (1900) 291-.
- , optical principles. *Grubb, T.* [1857] Pht. S. J. 4 (1858) 108-, 172-.
- daguerreotype, chemical and visual foci. *Lerebours, —.* C. R. 23 (1846) 634-.
- , —, —. *Lerebours, —, & Secretan, —.* C. R. 38 (1854) 789-.
- distance beyond which all objects will be in focus with given lens. *Salomons, (Sir) D.* Phot. J. 14 (1890) 47-.
- without distortion. *Sutton, T. B. A.* Rp. (1859) (pt. 2) 63-.
- double, new. *Listing, J. B.* Gött. Nr. (1865) 348-.
- equations, new form. *Jankó, P. von.* Wien Pht. Cor. 32 (1895) 488-.
- errors to be corrected. *Nelson, E. M.* Mer. S. J. (1898) 401-.
- euryscopic, perspective in photographs. *Oettingen, A. von.* Dorpat Sb. 8 (1889) 194-.
- , Voigtländer's. *Eder, J. M.* Wien Pht. Cor. 23 (1886) 12-.
- , —. *Angerer, V., et alii.* Wien Pht. Cor. 23 (1886) 359-.
- , —. *Eder, J. M.* Wien Pht. Cor. 26 (1889) 8-; 27 (1890) 553-.
- evolution. *Dallmeyer, T. R., & others.* Phot. J. 19 (1895) 221-.
- focal length, determination. *Porro, I. C. R.* 33 (1851) 50-.
- , —. *Schmidt, C. von.* Wien Pht. Cor. 25 (1888) 12-.
- , —. *Geršun, A. L.* Rs. Ps.-C. S. J. 25 (Ps.) (1893) 347; J. de Ps. 3 (1894) 573-.
- , —, from polar distance. *Müller, O.* Wien Pht. Cor. 29 (1892) 533-.
- focometer, use of Dallmeyer's. *Bolas, T.* [1899] Phot. J. 24 (1900) 107-.
- , — *Mergier's. Amet, —.* As. Fr. C. R. (1892) (Pt. 1) 174-.
- focometry of positive or negative systems. *Dallmeyer, T. R.* [1898] Phot. J. 23 (1899) 70-.
- focus, depth. *Salomons, (Sir) D.* Phot. J. 12 (1888) 160-.
- , —. *Cheyney, W. A.* Franklin I. J. 128 (1889) 356-; 129 (1890) 470-.
- , — and diffusion. *Dallmeyer, T. R.* Phot. J. 12 (1888) 86-.
- , variable, Français's. *Eder, J. M.* Wien Pht. Cor. 27 (1890) 555-.
- Fritsch's. *Eder, J. M.* Wien Pht. Cor. 26 (1889) 11-.

- Fritsch's long focus. *Eder, J. M.* Wien Pht. Cor. 30 (1893) 284-.
- globe, nature and advantages. *Sellers, C.* Silliman J. 35 (1863) 319-.
- , trial. *Hilgard, J. E.* (vi *Adds.*) U. S. Coast Sv. Rp. (1863) 206-.
- Goerz's. *Eder, J. M.* Wien Pht. Cor. 28 (1891) 5-, 72-.
- illumination in, de la Crouée's remedy for inequality. *Dallmeyer, T. R.* Phot. J. 19 (1895) 184-.
- focal plane. *Rohr, M. von.* Z. Instk. 18 (1898) 171-, 197-.
- microscope objectives. *Nelson, E. M.* Mcr. S. J. (1895) 498.
- new form proposed by Steinheil. *Porro, I.* Mil. I. Lomb. Rd. 3 (1866) 99-.
- optical centre. *Streintz, H.* Wien Pht. Cor. 29 (1892) 553-.
- "orthostigmat." *Anon.* Nt. 62 (1900) 188.
- , Steinheil's. *Eder, J. M.* Wien Pht. Cor. 34 (1897) 400-.
- panoramic, theory. *Sutton, T.* Pht. S. J. 6 (1860) 187-.
- paraplanatic, Goerz's rapid. *Eder, J. M.* Wien Pht. Cor. 28 (1891) 169-.
- for photographic and stereoscopic portraiture. *Brewster, (Sir) D.* Pht. S. J. 7 (1862) 130-.
- piano-convex. *Sutton, T.* Pht. S. J. 4 (1858) 252-.
- portrait, Petzval's first. *Eder, J. M.* Wien Pht. Cor. 36 (1899) 274-.
- , Voigtländer's. *Harting, H.* Wien Pht. Cor. 37 (1900) 279-.
- power. *Amann, J.* Laus. S. Vd. Bll. 35 (1899) xix-.
- , graphic method of representing. *Jankó, P. von.* Wien Pht. Cor. 33 (1896) 524-.
- for reproduction of maps, etc. *Hannot, A.* Brux. Bll. Pht. 18 (1879) 164-.
- simplified type. *Taylor, H. D.* [1894] Phot. J. 19 (1895) 64-.
- single, corrected for architecture. *Taylor, J. T.* Phot. J. 12 (1888) 98-.
- spectacle lenses as. *Eder, J. M.* Wien Pht. Cor. 30 (1893) 386-.
- spherical aberration, possible introduction. *Dallmeyer, T. R.* Phot. J. 13 (1889) 108-.
- standards of Phot. Soc., Dallmeyer's proposed alteration. *Cadett, J.* Phot. J. 11 (1887) 116-.
- for stellar photography. *Pickering, E. C.* Nt. 36 (1887) 562; 37 (1888) 558-.
- — —. *Grubb, H.* Nt. 37 (1888) 439.
- — —, with reduced secondary spectrum. *Harting, H.* Z. Instk. 19 (1899) 269-.
- stigmatic, and astigmatic corrector. *Dallmeyer, T. R.* Phot. J. 21 (1897) 167-.
- , — astigmatism. *Aldis, H. L.* Phot. J. 20 (1896) 117-.
- stops, iris diaphragms. *Boas, H.* Z. Instk. 15 (1895) 443-.
- and stops and perspective. *Baugh, J. H. A.* Phot. J. 24 (1900) 326-.
- stops, standard. *Addenbrooke, —.* Phot. J. 8 (1884) 52-.
- , system of measuring. *Rudolph, P.* [1893] Phot. J. 18 (1894) 79-.
- telephotographic. *Sachse, J. F.* Franklin I. J. 136 (1893) 214-.
- , *Longinescu, G. G.* Bucarest S. Sc. Bl. 4 (1895) 116-.
- , *Zschokke, W.* Wien Pht. Cor. 33 (1896) 160-.
- , Dallmeyer's new. *Brown, J.* Glasg. Ph. S. P. 23 (1892) 225-.
- , Fritsch's. *Eder, J. M.* Wien Pht. Cor. 29 (1892) 332-.
- , history and theory. *Jadanza, N.* [1899] Tor. Ac. Sc. Mm. 49 (1900) 153-.
- , Miethe's. *Eder, J. M.* Wien Pht. Cor. 28 (1891) 561-; 29 (1892) 123-.
- telescope objectives for astronomical photography. *Zschokke, P.* Wien Pht. Cor. 35 (1898) 585-.
- — — — —. *Steinheil, R.* Wien Pht. Cor. 36 (1899) 16-.
- testing. *Darwin, (Maj.) L.* [1892] R. S. P. 52 (1893) 403-; Phot. J. 17 (1893) 65-.
- , *Miethe, A.* [1893] Phot. J. 18 (1894) 76-.
- , *Zschokke, W.* Wien Pht. Cor. 33 (1896) 477-; 36 (1899) 131-.
- by adjustable lens. *Eder, J. M.* Wien Pht. Cor. 28 (1891) 361.
- and choice. *Steinheil, A.* Carl Rpm. 5 (1869) 193-.
- , Rudolph's method. *Baugh, J. H. A.* Phot. J. 20 (1896) 141-.
- tube with iris diaphragm, and combination set of lenses. *Addenbrooke, G. L.* Phot. J. 12 (1888) 122-.
- "universal." *Coupe, (l'abbé) —.* Brux. S. Sc. A. 20 (1896) (Pt. 1) 74-.
- view. *Sutton, T.* Pht. S. J. 5 (1859) 169-.
- , compound. *Grubb, T.* [1858] Dubl. R. S. J. 2 (1858-59) 27-.
- , Dallmeyer's new rectilinear. *Eder, J. M.* Wien Pht. Cor. 25 (1888) 189-.
- , single, form and application. *Dallmeyer, T. R.* Phot. J. 13 (1889) 95-.
- , and telescope. *Petzval, J.* Wien SB. 31 (1858) 213-.
- Voigtländer's, Steinheil's and Zeiss's. *Eder, J. M.* Wien Pht. Cor. 34 (1897) 133-.
- Zeiss's. *Eder, J. M.* Wien Pht. Cor. 27 (1890) 355-.
- , Goerz's and Steinheil's. *Eder, J. M.* Wien Pht. Cor. 31 (1894) 114-.

PHOTOMICROGRAPHY.

(See also *Biology 0400 and Anatomy, 0145.*)

- Carpenter, W. B.* B. A. Rp. (1847) (pt. 2) 48.
- Thomson, W. T. C.* B. A. Rp. (1850) (pt. 2) 126-.
- Kingsley, W. T.* [1852-54] (viii) Camb. Ph. S. P. 1 (1866) 117-; (m) Pht. S. J. 1 (1854) 93-.
- Pohl, J. J., & Weselsky, P.* Wien SB. 23 (1857) 317-.
- Shadbolt, G.* [1857] Pht. S. J. 4 (1858) 78-.
- Müller, (Dr.) J.* Freiburg B. 1 (1858) 508-.
- Rood, O. N.* Silliman J. 32 (1861) 186-.

- Vogel, H.* Pogg. A. 117 (1862) 629-.
- Maddox, R. L.* Mcr. J. 3 (1863) 9-.
- Moitessier, A.* [1865] Mntp. Mm. Ac. Sect. Sc. 6 (1864-66) (PV.) 38-.
- Arriaga, J. J.* [1869] (xii) Ntleza. 1 (1870) 27-.
- Erkmann, L.* [1871] Fresenius Z. 11 (1872) 37.
- Sanders, A.* M. Mer. J. 10 (1873) 250-.
- Gayer, E. J.* M. Mer. J. 15 (1876) 258-.
- Fayel, —.* C. R. 84 (1877) 343-.
- Evans, F. H., & Smith, G.* Mcr. S. J. 6 (1886) 557-.
- Smith, G.* [1886] Phot. J. 11 (1887) 22-.
- Evans, F. H.* [1886] Phot. J. 11 (1887) 25-.
- Marktanner-Turneretscher, G.* Wien Pht. Cor. 24 (1887) 237-.
- Rafter, G. W.* Am. S. Mer. P. (1887) 263-.
- Kibbler, —.* Mcr. S. J. (1888) 529-.
- Trambusti, A.* Z. Ws. Mkr. 5 (1888) 335-.
- Sudduth, W. X.* Mcr. S. J. (1889) 698-.
- Heurck, H. van.* Mcr. S. J. (1890) 104-.
- Piersol, G. A.* Mcr. S. J. (1890) 516-.
- Mayall, J. (jun.)* Mcr. S. J. (1891) 107-, 151-.
- Comber, T.* Mcr. S. J. (1891) 407-.
- Mercer, A. C.* Mcr. S. J. (1892) 305-.
- Molnár, N.* Termt. Kőzl. 24 (1892) (Suppl.) 169-.
- Duchesse, L.* A. Cons. Arts et Mét. 5 (1893) 61-.
- Marktanner-Turneretscher, G.* Z. Ws. Mkr. 10 (1893) 83-.
- Naumann, —.* [1893] Leip. Nf. Gs. Sb. 19-21 (1895) 67.
- Turner, E. H.* Manch. Mcr. S. T. (1895) 80-.
- Walmsley, W. H.* Am. Mer. S. T. 17 (1895) 340-.
- Walkhoff, O.* Braunsch. Vr. Nt. Jbr. (10) (1897) 98-.
- Monpillard, F.* A. Cons. Arts et Mét. 1 (1899) 363-.
- Spitta, —.* [1899] Mcr. S. J. (1900) 141-.
- Norman, A.* Mcr. S. J. (1900) 388-.
- of *Amphipleura pellucida*. *Bousfield, E. C.* Mcr. S. J. (1887) 357-.
- Apparatus.*
- Pumphrey, W.* Midl. Ntlist. 8 (1885) 113-.
- Viallanes, H.* Par. S. Bl. Mm. 37 (1885) (C. R.) 404-.
- Tursini, —.* Mcr. S. J. 6 (1886) 1060.
- Anon.* Mcr. S. J. (1887) 473-.
- Churchill, (Lord) E.* Mcr. S. J. (1888) 1061-.
- Czapski, S.* Z. Instk. 8 (1888) 301-.
- Ragazzoni, A.* Brescia At. Cm. (1889) 16-.
- Muras, T. H.* Mcr. S. J. (1892) 426-.
- Lavdowsky, M.* Z. Ws. Mkr. 11 (1894) 313-.
- Czaplewski, E.* Z. Ws. Mkr. 13 (1896) 147-.
- Giles, G. M.* Mcr. S. J. (1897) 164-.
- Golden, M. J.* Mcr. S. J. (1897) 582.
- Bitting, A. W.* [1897] Mcr. S. J. (1899) 440-.
- Barnard, J. E.* [1899] Mcr. S. J. (1900) 121-.
- Measures, J. W.* Mcr. S. J. (1900) 267-.
- for astronomical photography. *Mercer, A. C.* Am. Mcr. S. T. 18 (1896) 132-.
- Baker's Anon.* Mcr. S. J. (1891) 525-.
- camera. *Highley, S.* C. N. 8 (1863) 116-.
- *Neyreneuf, V.* Caen S. L. Bll. 1 (1877) 142-.
- *Mercer, F. W.* Mcr. S. J. 4 (1884) 625-.
- *Nelson, E. M.* Mcr. S. J. (1887) 1025-.
- *Griffith, E. H.* Mcr. S. J. (1888) 1031.
- *Kibbler, A.* Mcr. S. J. (1889) 127-.
- *Walmsley, W. H.* Am. S. Mer. P. 12 (1890) 69-.
- *Hardy, J. D.* [1893] Quek. Mcr. Cl. J. 5 (1894) 306-.
- *Leiss, C.* Z. Angew. Mkr. 1 (1896) 225-.
- and condensing system. *Stringer, E. B.* [1897] Mcr. S. J. (1898) 174-.
- — —, *Stringer's.* *Comber, T.* [1897] Mcr. S. J. (1898) 140.
- — —, — *Nelson, E. M.* [1897] Mcr. S. J. (1898) 140.
- , micro-stereoscopic, improved. *Baker, J. G.* Franklin I. J. 148 (1899) 145-.
- , miniature, *Robinson's.* *Roux, —.* Mcr. S. J. 5 (1885) 528-.
- , *Nachet's.* *Anon.* Mcr. S. J. (1893) 98-.
- , *Nelson's.* *Anon.* Mcr. S. J. (1887) 661-.
- , *Neuhaus's.* *Anon.* Mcr. S. J. (1888) 293-.
- for opaque objects. *Butterworth, J.* Mcr. S. J. (1896) 595-, 704.
- , *Stegemann's.* *Anon.* Mcr. S. J. (1888) 116-.
- , vertical, *Beck's.* *Anon.* Mcr. S. J. (1895) 236-.
- , — and horizontal combined, *Zeiss's.* *Anon.* Mcr. S. J. (1898) 351-.
- , —, *Pringle's.* *Anon.* Mcr. S. J. (1893) 695.
- chromo-copper light-filter. *Zeltnow, E.* Mcr. S. J. (1889) 700.
- cobalt blue glass. *Wallace, J.* [1899] Mcr. S. J. (1900) 255.
- colour screens. *Hubbard, J. G.* Bost. S. Md. Sc. J. 3 (1899) 297-.
- *Wright, J. H.* Bost. S. Md. Sc. J. 3 (1899) 302-.
- complete. *Oppio, L. dall'.* Rm. R. Ac. Linc. Rd. 5 (1896) (Sem. 2) 179-.
- *Gaylord, H. R.* Z. Ws. Mkr. 16 (1899) 289-.
- focusing screen. *Nelson, E. M.* Mcr. S. J. (1887) 1028.
- *Smith, G.* [1887] Mcr. S. J. (1888) 119.
- heliostat. *Woodward, J. J.* M. Mcr. J. 1 (1869) 29-.
- *Stratton, S. W., & Burrill, T. J.* Am. S. Mer. P. (1885) 103-.
- *Deck, L. S.* Am. S. Mer. P. 13 (1891) 49-.
- for instantaneous photomicrography. *Marktanner-Turneretscher, G.* Wien Pht. Cor. 25 (1888) 467-.
- — *Curties, C. L.* Mcr. S. J. (1894) 516-.

- for instantaneous photomicrography. *Scott, A. C.* *Mer. S. J.* (1900) 720-.
- — —, *Nachet's Anon.* *Mer. S. J.* 6 (1886) 842-.
- isochromatic plates. *Smith, T. F.* [1892] *Quek. Mer. Cl. J.* 5 (1894) 183-.
- lens, Cooke. *Jourdain, P. E. B.* *Mer. S. J.* (1898) 397-.
- , planar, for low powers. *Jourdain, P. E. B.* *Mer. S. J.* (1898) 399-.
- , Zeiss, for low powers. *Measures, —.* [1897] *Mer. S. J.* (1898) 139.
- lenses and eye-pieces. *Gage, S. H.* *Am. Mer. S. P.* 15 (1893) 25-.
- , suggested improvement in correction. *Piffard, H. G.* *Mer. S. J.* (1893) 786-.
- low power, Reichert's. *Anon.* *Mer. S. J.* (1899) 658-.
- Mawson and Swan's. *Anon.* *Mer. S. J.* (1889) 128.
- and methods. *Capranica, S.* *Z. Ws. Mkr.* 6 (1889) 1-.
- microscope. *Brewster, (Sir) D.* (vi *Adds.*) *Pht. S. J.* 8 (1864) 439-.
- , *Bourmans, —.* *Les Mondes* 20 (1869) 115-.
- , *Curties, C. L.* *Mer. S. J.* (1894) 417.
- , *Lemardeley, —.* *Mer. S. J.* (1894) 518.
- , *Measures, —.* *Mer. S. J.* (1899) 674.
- , Baker's. *Anon.* *Mer. S. J.* (1894) 517.
- , *Nachet's Anon.* *Mer. S. J.* 6 (1886) 840-.
- Nachet's Anon.* *Mer. S. J.* (1892) 870-.
- , *Anon.* *Mer. S. J.* (1893) 103.
- for photomicrography with strong objectives. *Israel, O.* *Virch. Arch.* 106 (1886) 502-.
- Pringle's.* *Mayall, J. (jun.)* *Mer. S. J.* (1890) 543-.
- small, Reichert's. *Anon.* *Mer. S. J.* (1900) 122-.
- stand, Zeiss's. *Anon.* *Mer. S. J.* (1900) 381.
- for systematic photomicrography. *Shearer, J. B.* *Am. Mer. S. T.* 18 (1896) 117-.
- use at night. *Edmonds, J.* *Midl. Ntlist.* 11 (1888) 23.
- Winkel's.* *Gaylord, H. R.* *Z. Ws. Mkr.* 14 (1897) 313-.
- application of acetylene gas. *Walmsley, W. H.* *Am. Mer. S. T.* 18 (1896) 136-.
- — — artificial illumination. *Shadbolt, G.* *J. Mer. Sc.* 1 (1853) 165-.
- — — divergent light. *F., S.* *Rv. Trim. Mergr.* 2 (1897) 177-.
- — — electric arc. *Barnard, J. E.* *Mer. S. J.* (1897) 600.
- — — —, *Barnard, J. E., & Carver, T. A. B.* [1897] *Mer. S. J.* (1898) 170-.
- — — light. *Heurck, H. van.* *Brux. S. Blg. Mer. Bl.* 8 (*1883) lix- or lxii-; 15 (1889) 24-.
- — — gaslight. *Sternberg, (Maj.) G. M.* *J. H. Un. Cir.* [9 (1889-90)] 72-; *Am. Mer. S. P.* 14 (1892) 85-.
- — — incandescent lamps. *Stein, T. Lum.* *Élect.* 14 (1884) 127-.
- — — lime light. *Woodward, J. J.* *Am. J. Sc.* 50 (1870) 366-.
- application of magnesium light. *Roux, E.* *Z. Ws. Mkr.* 5 (1888) 497-.
- — — —, *Neuhauss, R.* *Z. Ws. Mkr.* 8 (1891) 181-.
- — — —, *Rohmann, F., & Galewsky, E.* *Z. Ws. Mkr.* 9 (1892) 71.
- — — —, *Neuhauss, R.* *Z. Ws. Mkr.* 9 (1892) 72-.
- — — — and electric light. *Woodward, J. J.* *Am. J. Sc.* 49 (1870) 294-.
- — — — monochromatic light (yellow). *Smith, T. F.* *Mer. S. J.* (1893) 276-, 285-.
- — — —, *Pretzl, A. L.* [1897] *Mer. S. J.* (1898) 127-.
- — — —, influence of absorption pan. *Neuhauss, R.* *Z. Ws. Mkr.* 7 (1890) 20-.
- — — — orthochromatism. *Eder, J. M.* *Wien Pht. Cor.* 26 (1889) 7-.
- — — —, *Montillard, —.* [1893] *Mer. S. J.* (1894) 113-.
- — — — Siemens's regenerator burner. *Eder, J. M.* *Wien Pht. Cor.* 25 (1888) 488.
- chronophotography. *Weiss, G.* *Par. S. Bl. Mm.* 48 (1896) (C. R.) 645-.
- and coincidence of chemical and visual foci. *Wenham, F. H.* *Mer. S. T.* 3 (1855) 1-.
- of crystals of snow and ice. *Neuhauss, R.* *Z. Ws. Mkr.* 9 (1892) 324-.
- and drawing for scientific purposes. *Maaløe, C. U.* *Z. Ws. Mkr.* 12 (1895) 449-.
- fixation by means of oxyhydrogen microscope. *Gebauer, —.* [1839] *Flora* 23 (1840) 193-, 199-.
- of flagellæ of bacteria. *Zettnow, E.* *Z. Ws. Mkr.* 9 (1892) 74-.
- focusing. *Ellis, J.* *Mer. S. J.* (1887) 1028.
- , *Lignier, O.* *Caen S. L. Bil.* 5 (1891) 46-.
- , *Francotte, P.* *Mer. S. J.* (1892) 270.
- high power. *Woodward, J. J.* *Am. J. Sc.* 42 (1866) 189-.
- , *Barnard, J. E., & Carver, T. A. B.* *Nt.* 57 (1897-98) 448-.
- , actinic and visual foci. *Cox, J. D.* *Am. S. Mer. P.* (1885) 29-.
- , best technique. *Rafter, G. W.* *Am. S. Mer. P.* 11 (1889) 112-.
- , by lamplight. *Cox, J. D.* *Am. S. Mer. P.* (1884) 99-.
- , —, —, *Detmers, H. J.* *Am. S. Mer. P.* 10 (1888) 143-.
- illumination. *Köhler, A.* *Z. Ws. Mkr.* 10 (1893) 433-.
- , *Hunter, J.* *Sc. Mer. S. P. & T.* 1 (1895) 229-.
- instantaneous. *Holman, D. S.* *Mer. S. J.* 6 (1886) 333.
- , *Stenglein, M.* *Wien Pht. Cor.* 25 (1888) 192-.
- , *Marktanner-Turneretscher, G.* *Mer. S. J.* (1894) 110-.
- , *Stringer, E. B.* *Mer. S. J.* (1898) 282.
- and iso-photography and megaphotography. *Hunt, A. R.* *Nt.* 62 (1900) 79-.
- of large sections. *Nieser, O.* *Z. Ws. Mkr.* 11 (1894) 27.
- , —, *Forgan, W.* *Sc. Mer. S. P. & T.* 1 (1895) 221-.
- metals, Queen's. *Anon.* [1898] *Mer. S. J.* (1901) 207-.

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— *Neuhauß, R.* *Z. Ws. Mkr.* 5 (1888) 484-.

— *Piffard, —.* *Mer. S. J.* (1892) 868-.

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— — —, *Ives's process.* *Turner, —.* *Mer. S. J.* (1899) 676.

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— — —, *Walmsley, W. H.* *Am. Mer. S. T.* 20 (1899) 189-.

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— — — *formosum.* *Smith, T. F.* *Mer. S. J.* (1888) 1063-; (1889) 166.

— *Podura scales.* *Woodward, J. J.* *M. Mer. J.* 5 (1871) 149-, 245-.

— — —, *Vereker, (Hon.) J. G. P.* [1891] *Mer. S. J.* (1892) 425-.

— — —, *Wright, H. G. A.* *Mer. S. J.* (1892) 905-.

— — —, *Smith, T. F.* [1892] *Mer. S. J.* (1893) 105-.

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— spermatozoa from Triton. *Dowdeswell, —.* *Mer. S. J.* (1888) 1065-.

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— — —, *Bazilevskij, V. I.* *Rs. Ps.-C. S. J.* 21 (*Ps.*) (1889) 260-; *J. de Ps.* 9 (1890) 539.

— — —, *Rayleigh, (Lord).* *B. A. Rp.* (1889) 493-; *Ph. Mg.* 31 (1891) 87-.

— — —, *Colson, R.* *A. Cons. Arts et Mét.* 4 (1892) 173-.

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— and photography from balloons. *Meyer-Heine, —.* *A. Cons. Arts et Mét.* 1 (1899) 193-.

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Anorthoscopic figures. *Zöllner, F.* *Pogg. A.* 117 (1862) 477-.

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- dioptric. *Leyser, E. von.* Pogg. A. 56 (1842) 407-.
- Govi's, use in collimation and refractometry. *Lafay, A.* C. R. 130 (1900) 1122-.
- modified. *Lüdicke, M. A. F.* Gilbert A. 42 (1812) 338-.
- prism, new property. *Bauernfeind, C. M.* Münch. Sb. (1868) (1) 491-.
- steel. *Chladni, E. F. F.* Gilbert A. 61 (1819) 98-.
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- silvered glass. *Terquem, A.* Ph. Mg. 3 (1877) 541-.
- — — — — *Douglas, J. C.* Beng. As. S. P. (1890) 73-.
- — — — — *Forgan, W.* [1894] Sc. Mer. S. P. & T. 1 (1895) 122-.
- Wollaston's, applied to telescope. *Zantedeschi, F.* Ven. At. 15 (1869-70) 1065-.
- Camera obscura, erecting prism for. *Chevalier, C.* C. R. 13 (1841) 233-.
- and microscope, periscopic. *Wollaston, W. H.* Phil. Trans. (1812) 370-.
- — — — — (Wollaston). *Jones, W.* Nicholson J. 34 (1813) 100-.
- Chromosome. *Lüdicke, M. A. F.* Gilbert A. 36 (1810) 127-.
- , experiments on passage of light through angular openings. *Lüdicke, M. A. F.* Gilbert A. 52 (1816) 416-.
- COAST LIGHTING.
- Loo, D. J. S. van.* Batav. Ntk. Ts. 30 (1868) 149-.
- Apparent lights on pierheads of harbours and rocks. *Stevenson, T.* Edinb. T. Sc. S. Arts 4 (1856) 276-.
- Beacons and buoy lamps, means of causing flashes. *Wigham, J. R.* [1899] Dubl. S. Sc. P. 9 (1899-1902) 76-.
- , illumination by electricity. *Stevenson, T. (C. E.)* [1867] Edinb. Sc. S. Arts T. 7 (1868) 306-.
- Electric lighting, coast of France. *Boulart, L.* Rv. Sc. 1 (1881) 226-.
- — — — — *Guéroul, A.* Lum. Élect. 5 (*1881) 25-.
- Illuminating Apparatus for Lighthouses.
(See also 6080.)
- Drummond, T.* Phil. Trans. (1830) 383-.
- Barlow, W. H.* Phil. Trans. (1837) 211-.
- Stevenson, T.* Edinb. N. Ph. J. 1 (1855) 273-; 13 (1861) 273-.
- Masselin, A.* (vi *Adds.*) ME. I. P. (1862) 48-.
- Stevenson, T. (C. E.)* [1867] Edinb. Sc. S. Arts T. 7 (1868) 540-.
- Fraser, A.* Medley I. Eng. 5 (1868) 2-.
- Swan, W.* Edinb. T. Sc. S. Arts 7 (1868) 473-; 507-.
- Stevenson, T. (C. E.)* [1871-75] B. A. Rp. (1871) (Sect.) 37-; Nt. 12 (1875) 333-; Sc. S. Arts T. 9 (1878) 321-.
- Lepaute, H. (Jls.)* As. Fr. C. R. (1877) 223-.
- Stevenson, T. (C. E.)* [1879] Nt. 21 (1880) 156-.
- Harcourt, A. V.* Nt. 35 (1887) 41-, 60-.
- Schöpfleuthner, —.* Dingler 277 (1890) 297-.
- Kenward, J.* Science 21 (1893) 216-.
- Rivière, —.* A. Pon. Chauss. 8 (1894) 190-; (1897) (Trim. 4) 116-.
- Purves, J. A.* Nt. 61 (1899-1900) 393-.
- annular lenses. *Wigham, J. R.* Dubl. S. Sc. P. 6 (1888-90) 525-.
- combination of mirrors used to augment illuminating power, Madras. *Smith, John T.* Madras J. 9 (1839) 273-.
- — — — — polygonal lenses with plain mirrors. *Brewster, (Sir) D.* [1827] Edinb. R. S. T. 11 (1831) 33-.
- dioptric. *Fresnel, A. J.* Par. S. Phlm. Bill. (1822) 123-.
- (Fresnel's). *Lovering, J., & Peirce, —.* Franklin I. J. 18 (1849) 249-.
- *Brebner, A. (jun.)* I. CE. P. 70 (1882) 386-.
- for catoptric. *Melloni, M.* (vi *Adds.*) Majocchi A. Fis. C. 24 (1846) 321-; 25 (1847) 105-, 214-, 318-; 26 (1847) 101-, 216-, 324-; 27 (1847) 100-.
- and catoptric. *Grunert, J. A.* Grunert Arch. 19 (1852) 241-.
- — — — — and catadioptric. *Hamilton, W.* Franklin I. J. 18 (1849) 67-, 161-, 240-, 335-.
- , for electric light. *Chance, J. T.* I. CE. P. 57 (1879) 168-.
- , improvements. *Douglass, W. T., & Purves, J. A.* I. CE. P. 137 (1899) 131-.
- , Kirkaldy Harbour. *Sang, E.* Edinb. N. Ph. J. 25 (1838) 249-.
- , progress. *Stevenson, C. A.* Nt. 46 (1892) 514-.
- , spherical refractor for. *Stevenson, C. A.* [1888] Sc. S. Arts T. 12 (1891) 219-.
- for dipping lights. *Brebner, A.* I. CE. P. 78 (1884) 361-.
- double holophote. *Brewster, (Sir) D.* Edinb. R. S. T. 24 (1867) 635-.
- eclipsing, Belfast Lough. *Bottomley, W. B.* A. Rp. (1874) (Sect.) 220-.
- electric. *Secchi, A.* N. Cim. 3 (1856) 394-.
- *Faraday, M.* [1860] R. I. P. 3 (1858-62) 220-.
- *Reynaud, L.* A. Tél. 6 (1863) 369-.
- *Douglass, (Sir) J. N.* I. CE. P. 57 (1879) 77-.
- *Petit, P. L. N. L.* Brux. A. Tr. Pbl. 37 (1880) 261-.
- (for lighthouses and ships). *Common, A. A.* Nt. 31 (1885) 125-.
- *Adams, W. G.* Elect. 16 (1886) 57-, 76-, 97-, 115-, 135-.
- *Hopkinson, J.* Elect. 17 (1886) 518-.
- *Blondel, A.* Elect. 31 (1893) 478-.

- electric, Isle of May. *Stevenson, D. A.* I. ME. P. (1887) 347-.
- , La Hève. *Quinette de Rochemont*, —. A. Pon. Chauss. 19 (1870) 309-.
- , Macquarie and Tino. *Hopkinson, J. I. CE.* P. 87 (1886) 243-.
- , objections. *Allard, E.* A. Pon. Chauss. 3 (1882) 489-.
- , Penmarch-Eckmuhl. *Du Riche Preller, O.* Sc. Abs. 1 (1898) 673-.
- fixed, new system. *Smith, (Col.) John T.* Madras Eng. Rp. 1 (1839) 41-; R. E. Pp. 5 (1842) 56-.
- and occulting. *Kenward, J.* [1890] Birm. Ph. S. P. 7 (1889-91) 233-.
- gas for. *Wigham, J. R.* [1872] (xr) *Dubl.* S. J. 6 (1875) 192-.
- lamp, double quadriform. *Barrett, W. F.* [1886] *Dubl. S. Sc. P.* 5 (1886-87) 74-.
- lamps, improved forms. *Wigham, J. R.* [1891] *Dubl. S. Sc. P.* 7 (1891-92) 147-.
- holophotal system. *Stevenson, T.* *Edinb. T. Sc. S. Arts* 4 (1856) 1-.
- hyper-radial and other lenses. *Kenward, J.* Birm. Ph. S. P. 6 (1887-89) 213-.
- improvements. *Roberts, R.* [1859] *Manch. Ph. S. Mm.* 15 (1860) 166-.
- *Anon.* [1895] *Nt.* 53 (1895-96) 56-.
- Kitson light. *Wigham, J. R.* [1900] *Dubl. S. Sc. P.* 9 (1899-1902) 471-.
- lamps, continuous, method of increasing power. *Wigham, J. R.* [1894] *Dubl. S. Sc. P.* 8 (1893-98) 347-.
- lenses, relative powers. *Brebner, A. I. CE.* P. 111 (1893) 296-; 122 (1895) 300-.
- magneto-electric. *Gladstone, J. H.* *QJ. Sc.* 1 (1864) 70-.
- oil for. *Macadam, S.* [1878] *Sc. S. Arts T.* 10 (1883) 56-.
- refraction protractor, and application to designing of prisms. *Balfour, J. M.* [1857] (vi *Adds.*) *Edinb. T. Sc. S. Arts* 5 (1861) 95-.
- refractors. *Stevenson, C. A.* I. CE. P. 117 (1894) 341-.
- revolving light in harbour of Porto d'Anzio. *Linotte, L. G.* *Arcad.* 23 (1824) 32-.
- lights, masking for any bearing. *Stevenson, T. (C. E.)* *Nt.* 23 (1881) 560-.
- semi-horizon, eclipsing. *Smith, (Col.) John T.* *CE. I. T.* 2 (1838) 193-; R. E. Pp. 5 (1842) 41-.
- , and fixed. *Thomson, J. T.* *J. I. Archip.* 6 (1852) 94-.
- semi-revolving. *Thomson, J. T.* *Edinb. T. Sc. S. Arts* 4 (1856) 306-.
- sidereal lamp. *Löwenörn, P. de.* (vi *Adds.*) *Kiöb. Ov.* (1822-23) 2-.
- —. *Gaudin, A.* *C. R.* 22 (1846) 170-.
- Lighthouses.*
- Arago, D. F. J. A. C.* 37 (1828) 392-; *Par. Bur. Long. An.* (1831) 172-.
- Hess, A.* *Crelle J. Bauk.* 29 (1850) 70-, 93-, 191-, 349-; 30 (1851) 56-.
- Cowper*, —. [1851] *R. I. P.* 1 (1851-54) 24-.
- Veit-Meyer*, —. [1854] *Berl. Pol. Gs. Vh.* 16 (1855) 18-.
- Purves, J. A.* [1899] *Glasg. I. Eng. T.* 43 (1900) 19-.
- and beacons and buoys, etc. *Sautter, L.* *Rv. Mar. et Col.* 70 (1881) 299-, 561-; 71 (1881) 502-.
- Bell Rock. *Stevenson, R.* *Edinb. Ph. J.* 12 (1825) 18-.
- deep-sea. *Anderson, C.* [1883] *Eng. S. T.* (1884) 45-.
- Denmark. *Löwenörn, P. de.* *Kiöb. Dn. Vd. Selsk. Skr.* 1 (1800) (*Heft* 2) 179-; 4 (1805-06) (*Heft* 2) 41-, 119-; *Kiöb. Dn. Vd. Selsk. Afh.* 1 (1824) 81-; 2 (1826) 1-.
- and Norway. *Anon.* (vi 1125) *Schröder B. Zeev.* 3 (1823) 54-.
- Eddystone. *Douglass, W. T.* [1883] *I. CE. P.* 75 (*1884) 20-.
- floating and fixed. *Stevenson, D.* *Franklin I. J.* 31 (1856) 221-.
- , new. *Fryer, A.* [1860] *Manch. Ph. S. Mm.* 1 (1862) 158-.
- , "Wandelbaar," and fog signal apparatus. *Boulvin, J.* *Brux. A. Tr. Pbl.* 41 (1884) 415-.
- formule and tables for calculating range of light. *Gyldén, H.* *Stockh. Öfv.* 29 (No. 1) (1872) 71-.
- at high elevations, vertical distribution of light. *Stevenson, T. (C. E.)* [1878] *Nt.* 19 (1879) 19-.
- Horsburgh. *Thomson, J. T.* *J. I. Archip.* 6 (1852) 376-.
- intensity and distance of projection of light. *Allard, E.* A. Pon. Chauss. 12 (1876) 5-.
- iron, history and construction. *Merrick, J. V.* *Franklin I. J.* 31 (1856) 145-.
- Italian, ancient and modern. *Cialdi, A.* *Rm. N. Linc. At.* 30 (1877) 303-.
- North British. *Stevenson, R.* *Edinb. N. Ph. J.* 15 (1833) 108-.
- visibility of light in rapid motion. *Stevenson, A.* *Edinb. N. Ph. J.* 32 (1842) 270-.
-
- Colorimetric double pipette. *Hoppe-Seyler's. Albrecht, E.* *Z. Instk.* 12 (1892) 417-.
- Colour, form and motion, reproduction. *Cros, C. C. R.* 82 (1876) 1515; 83 (1876) 291-.
- Concentrator, pyramidal, for solar rays. *De-launier, É.* [1882] *Les Mondes* 4 (1883) 253-.
- Cyclostat for observation of rapidly rotating bodies. *Thury*, —. *Arch. Sc. Ps. Nt.* 15 (1886) 141-.
- Diacaetron. *Gibbes, G. S.* *Tilloch Ph. Mg.* 39 (1812) 127-.
- Dicatopter, von Hagenow's patent. *Emsmann, H.* *Pogg. A.* 88 (1853) 242-.
- Dipleidoscope and passage-prisms. *Kühn, O.* *Cztg. Opt.* 7 (1886) 169-.
- , theory. *Grunert, J. A.* *Grunert Arch.* 5 (1844) 343-.
- Displacements, small, experimental arrangement for measuring. *Right, A.* *Bologna Rd.* 1 (1897) 185-.
- Drawing objects natural size, apparatus for. *Bausch, H.* *Mer. S. J.* (1900) 734-.
- Elementary optics, apparatus for demonstration of laws. *Gariel, C. M.* *As. Fr. C. R.* 3 (1874) 244-; 8 (1879) 423-.

- Firing arrangement, optical, for covered batteries. *Frayssier, B. de.* C. R. 90 (1880) 1350-.
- Flexure, new optical apparatus for studying. *Lavery, M., & Tresca, H. E.* C. R. 95 (1882) 1114-.
- Focometer. *Snellen, H.* Donders Ndl. Gast. Oogl. Vs. 17 (1876) 204-.
- , Abbe's. *Czapski, S.* Z. Instk. 12 (1892) 185-.
- , new. *Mergier, G. E.* As. Fr. C. R. (1886) (Pt. 1) 100; Par. S. Ps. Sé. (1887) 193-.
- , —. *Everett, J. D.* L. Ps. S. P. 12 (1894) 180-; Ph. Mg. 35 (1893) 333-.
- , —. *Guilloz, T.* As. Fr. C. R. (1895) (Pt. 2) 410-.
- , universal. *Weiss, G.* Par. S. Ps. Sé. (1895) 35-.
- Fountain, luminous. *Trouvé, G.* C. R. 113 (1891) 596-; 115 (1892) 424-.
- Gauss plate, most favourable position. *Walter, B.* A. Ps. C. 52 (1894) 762-.
- Glass cell with parallel sides. *Clowes, F.* Ph. Mg. 48 (1874) 61-.
- , varnish to facilitate writing on. *Terquem, A.* Par. S. Ps. Sé. (1876) 114-.
- Heliastrom or solar-compass. *Watt, M.* Edinb. N. Ph. J. 4 (1828) 16-.
- Iconographic apparatus. *Vanghetti, G.* Z. Ws. Mkr. 10 (1893) 457.
- Image-finder, automatic. *Bodkin, (Rev.) R. C.* [1894] *Dubl. S. Sc. P.* 8 (1893-98) 281-.
- Internal reflection in glass rod used for illumination of cavities. *Robison, (Sir) J. B. A.* Rp. (1842) (pt. 2) 27.
- Kaleidopolariscope. *Petrina, F. A.* Pogg. A. 49 (1840) 236-.
- Kaleidoscope. *Bradley, R.* Tilloch Ph. Mg. 51 (1818) 376-.
- , *Brewster, (Sir) D.* Bn. Un. 8 (1818) 155-.
- , *Gilbert, L. W.* Gilbert A. 59 (1818) 341-.
- , *Playfair, J.* QJ. Sc. 5 (1818) 324-.
- , *Roget, P. M.* Thomson A. Ph. 11 (1818) 375-.
- , *Vallot, J. N.* Dijon Sé. Ac. (1818) 106-.
- , *Wurzer, F.* Gilbert A. 59 (1818) 368-.
- , *Mack, K.* Exner Rpm. 21 (1885) 567-.
- and its application to the arts. *Luca, P. A. de.* Il Progresso 14 (1836) 82-; Nap. Rd. 1 (1842) 66 (166)-.
- , problem. *Weiss, A.* Pogg. A. 84 (1851) 145-.
- Kaloscope. *Heys, W. H.* [1861] *Manch. Ph. S. Mm.* 1 (1862) 234-.
- Kinematograph, electric. *Nicholl, W.* Belfast N.H. S. Rp. & P. (1896-97) 62-.
- Kinematography, Marey's apparatus. *Hermann, —.* Königsb. Schr. 36 (1895) [15].
- Lactoscope. *Séguier, A.* C. R. 17 (1843) 585-.
- Laryngoscope, history. *Blumgrund, E.* Czgt. Opt. 20 (1899) 32-.
- Magnification of dioptric apparatus, instrument for experimental demonstration of theory. *Mergier, E.* Par. S. Ps. Sé. (1886) 60-.
- optical instruments, apparatus for measuring. *Govi, G.* [1863] (vii) *Tor. Mm. Ac.* 23 (1866) 455-.
- , —, —. *Oberbeck, A.* N.-Vorp. Mt. 19 (1888) 71-.
- Magnifying apparatus. *Schilberszky, K. (jun.)* Termt. Közl. 22 (1890) (Suppl.) 47-.
- Measuring instruments with movable mirror showing image of fixed scale in telescope, determination of angle of rotation. *Stegmann, F.* Grunert Arch. 25 (1855) 376-.
- Micrometers, methods of cutting rock-crystal for. *Wollaston, W. H.* Phil. Trans. (1820) 126-.
- , prismatic. *Amici, G. B.* Zach Cor. 8 (1823) 67-.
- Micrometric measurement by optical images. *Abbe, E.* [1878] *Jena. Sb.* (1879) xi-.
- Mirror method, modification of Poggendorff's. *Du Bois, H. E. J. G.* A. Ps. C. 38 (1889) 494-.
- reading, apparatus for illuminating scales. *Kamerlingh Onnes, —.* Amst. Ak. Vs. 4 (1896) 311-; Arch. Néerl. 1 (1898) 405-.
- Mirror-lineal. *Reusch, F. E. von.* Carl Rpm. 16 (1880) 255-.
- Momentary attitudes, rapid view instrument for. *Galton, F.* Nt. 26 (1882) 249-.
- Monochromatroscope. *Thierry, M. de.* C. R. 118 (1894) 636-.
- Monostereoscope. *Boblin, A.* Brux. Ac. Bil. 5 (1858) 304-.
- , Boblin's. *Scarpellini, C.* Rm. Cor. Sc. 5 (1859) 137.
- Multireflector for use with galvanometers, etc. *Ayrton, W. E., & Perry, J.* Lum. Élect. 5 (*1881) 38-.
- Optical experiment (wheels rotating in opposite directions). *Arago, F.* Rv. Mar. et Col. 46 (1875) 444-.
- instrument, new (combining compound microscope, camera lucida, etc.). *Waddell, A.* Edinb. Ph. J. 5 (1821) 143-.
- model illustrating character of vibrations in crystal cut parallel to axis, when plane-polarised light is incident upon it. *Rücker, A. W.* L. Ps. S. P. 10 (1890) 11-.
- surfaces, working. *Gautier, P. J. de* Ps. 8 (1899) 477-.

OPTICAL TELEGRAPHY.

- Anon. [1788] (vi 11) *Am. Ph. S. T.* 4 (1799) 162-.
- Cooke, J.* [1794] *Ir. Ac. T.* 6 (1797) 77-.
- Edgeworth, R. L.* [1795-96] *Ir. Ac. T.* 6 (1797) 95-, 313-.
- (Bréguet and Bétancourt.) [*Lagrange, J. L., et alii non*] *Lagrange, J. L., & Legendre, —.* Par. Mm. de l'I. 3 (1800-01) 22-.
- Carney, J. A.* Mntp. Rec. Bil. 2 (1805) 289-.
- Lamanon, P. J.* de Ps. 65 (1807) 5-.
- Pasley, (Sir) C. W.* Tilloch Ph. Mg. 29 (1807) 205-, 292-.
- Le Hardy, C.* Tilloch Ph. Mg. 33 (1809) 343-.
- Edgeworth, R. L.* Nicholson J. 26 (1810) 181-.
- Parrot, G. F.* [1834] *St Pét. Ac. Sc. Mm.* 3 (1838) 239-.
- Laussedat, A.* As. Fr. C. R. (1874) 1267-.
- Léard, A. A.* Tél. 2 (1875) 379-.
- Mercadier, E.* Lum. Élect. 2 (*1880) 146-, 502-; A. Tél. 7 (1880) 5-, 118-, 544-; 8 (1881) 44-, 167-.
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automatic receiver. *Ducrotet, E. C. R. 105* (1887) 664-.

— transmission and reception of messages by. *Martin de Brettes, J. B. C. R. 95* (1882) 25-.

best source of light. *Ellie, R. Bordeaux S. Sc. P. V. (1894-95) 75-*.

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— *Blakesley, T. H. [1887] Un. Serv. I. J. 31* (1887-88) 593-.

— for U.S. military service. *Grugan, F. C. [U.S.] Chief Sig. Off. A. Rp. (1882) (Pt. 1) 95-*.

heliographic. *Leseurre, J. A. Tél. 1* (1856) 113-, 137-.

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in Holland. *Staring, W. C. A. 's Gravenh. I. Ing. Ts. (1890-91) (Vh.) 279-*.

intermittent signals, method of producing. *Crova, A. C. R. 91* (1880) 1061-.

—, methods of producing. *Mercadier, E. C. R. 91* (1880) 982-; 92 (1881) 131-.

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between Mauritius and Réunion. *Adam, L. P. C. R. 95* (1882) 585-.

— — — (Adam's system). *Faye, H. A. É. C. R. 96* (1883) 1763-.

— — —. *Bridet, —. C. R. 99* (1884) 425-.

nocturnal, French marine. *Méritens, A. de. A. Tél. 12* (1885) 152-.

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Optigraph. *Jones, T. Tilloch Ph. Mg. 28* (1807) 66-.

Pantoscope. *Johnson, J. R. Manch. Lt. Ph. S. P. 5* (1866) 135-.

—, Morochove's. *Timiriázev, K. [1892] Mosc. S. Sc. Bil. 78* (No. 2) (1893) 4-.

Perspective drawing, apparatus. *Hansen, W. Dingler 130* (1853) 1-.

Phakinescope for producing moving pictures. *Abadie-Dutemps, E. Toul. Ac. Sc. Min. 8* (1896) 555-.

Phakometer, oscillatory. *Dévé, C. C. R. 128* (1899) 1561-.

Phantasmagoria, improvement. *Ritchie, W. Edinb. J. Sc. 4* (1826) 37.

Phantasmascopes. *Walker, Ez. Tilloch Ph. Mg. 27* (1807) 97-.

Phenakistoscope. *Plateau, J. A. F. A. C. 53* (1833) 304-.

— *Holten, C. Sk. Nf. F. 8* (1860) 565-.

Photochromoscope (heliochromoscope). *Ives, F. E. [1892] Franklin I. J. 135* (1893) 35-.

— (Ives's). *Eder, J. M. Wien Pht. Cor. 30* (1893) 572-.

— *Ives, F. E. [1896] Sc. S. Arts T. 14* (1898) 136-.

— (Ives's). *Heinemann, G. D. Nf. Vh. (1898) (Th. 2, Hälfte 1) 173-*.

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Photochromoscope (Ives's). *Hagenbach, A. Bonn Niedr. Gs. Sb. (1899) 14-*.

— (—). *Petruschky, —. [1899] Danzig Schr. 10* (1899-1902) (Hefte 2 & 3) xx-.

— (—). *Lakowitz, C. [1899] Danzig Schr. 10* (1899-1902) (Hefte 2 & 3) xxviii.

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Plane, parallel, perpendicular and oblique surfaces, optical apparatus to control. *Laurent, L. C. R. 96* (1883) 1035-.

— plates, manufacture. *Pistor, C. H. Gilbert A. 49* (1815) 161-.

—, testing. *Kundt, A. Pogg. A. 120* (1863) 46-.

— — —, apparatus. *Oertling, A. Pogg. A. 59* (1843) 284-.

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—, — (Pulfrich). *Hecht, B. A. Ps. C. 32* (1887) 275-.

—, reversion-, as terrestrial ocular and for measuring angles. *Dove, H. W. Pogg. A. 83* (1851) 189-.

—, —, theory. *Wanach, B. Z. Instk. 19* (1899) 161-, 224-.

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—, —. *Bohn, C. Z. Instk. 8* (1888) 359-.

—, crossed. *Bohn, C. Z. Instk. 9* (1889) 62-.

—, of Starke and Kammerer. *Lorber, F. Z. Instk. 8* (1888) 283-.

—, Luxfer. *Anon. Rv. Sc.-Ind. 32* (1900) 150-.

—, —. *Anon. Rv. Sc.-Ind. 32* (1900) 195-.

—, —, illuminative power. *Anon. Rv. Sc.-Ind. 32* (1900) 257-.

—, right-angled, precision apparatus for measuring. *Halle, G. D. Nf. Vh. (1897) (Th. 2, Hälfte 1) 125-*.

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Uchatius, F. Wien SB. (1853) 482-.

Mach, E. Carl Rpm. 7 (1871) 261-.

Vogel, H. D. C. Gs. B. 6 (1873) 1345-.

Laurent, L. Par. S. Ps. Sé. (1877) 80-.

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Salomons, (Sir) D. [1892] R. I. P. 13 (1893) 534-.

Möhlenbruck, H. Laus. S. Vd. Bil. 33 (1897) xxiv-.

Behrens, W. Z. Ws. Mkr. 15 (1898) 7-.

Measures, J. W. Mer. S. J. (1900) 267-.

Uthoff, —. Bresl. Schl. G. Jbr. (1900) (Ab. 1a) 118-.

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—, portable. *Jehl, V. Toul. S. H. Nt. Bil. (1897) 243-*.

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— suitable for Duboseq lantern. *Thompson, S. P. L. Ps. S. P. 8* (1887) 184-; *Ph. Mg. 23* (1887) 333-.

- arc light, adaptation to projection. *Laudy, L. H.* N. Y. Ac. T. 10 (1890-91) 103-.
- , reflecting and direct acting polariscope for. *Knipe, O.* Science 22 (1893) 272.
- combination. *Hughes, W. C.* Mcr. S. J. (1889) 117-.
- condensers. *Henry, L. d'.* (xii) Lille S. Mm. 5 (1868) 5-.
- construction and uses. *Anon.* Elect. 30 (1893) 713-, 739-.
- diorama, portable. *Tait, G.* Edinb. N. Ph. J. 32 (1842) 142-.
- electric couple for. *Cole, A. D.* Denison Un. Sc. Lib. Bll. 5 (1890) 20-.
- ether-oxygen. *Pellin, P.* Par. S. Ps. Sé. (1891) 171.
- , new form. *Prowse, G. R.* [1891] Cn. R. S. P. & T. 9 (1892) (Sect. 3) 55-.
- explosion of Bourdon manometer. *Lacaze-Duthiers, —.* C. R. 125 (1897) 12-.
- for horizontally placed bodies. *Duboscq, J.* Par. S. Ps. Sé. (1876) 6-.
- incandescent light (Welsbach) with oxygen supply attachment. *Penman, W.* [1895] Sc. S. Arts T. 14 (1898) 43-.
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- for monochromatic and mixed light. *Abney, (Capt.) W. de W.* L. Ps. S. P. 7 (1886) 181-; Ph. Mg. 20 (1885) 172-.
- Newtonian. *Anon.* Mcr. S. J. (1898) 678-.
- photometric properties of lenses. *Blondel, A.* As. Fr. C. R. (1899) (Pt. 2) 316-.
- with polarised light. *Laurent, L. C. R.* 85 (1877) 1162-.
- polarising, modification of Soleil's. *Lovering, J.* Am. As. P. (1853) 24-.
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- rectifying apparatus, Duboscq's. *Bertin, A.* Par. S. Ps. Sé. (1879) 73-.
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- , colouring. *Scott, J. A.* [1894] Dubl. S. Sc. P. 8 (1893-98) 263-.
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- , *Bryan, G. H.* Nt. 57 (1897-98) 511.
- , d'Almeida's. *Morau, E.* Wien Pht. Cor. 28 (1891) 163-.
- turntable. *Müller, F.* Z. Ws. Mkr. 17 (1900) 162-.
- with variable magnification. *Crova, A. J. de* Ps. 10 (1881) 158-.
- Pseudoscope, new form. *Wood, R. W.* Science 10 (1899) 648-.
- , single picture. *Salomons, (Sir) D.* Nt. 57 (1897-98) 317-.
- Railway signals. *Stevenson, A.* Edinb. N. Ph. J. 30 (1841) 347-.
- , *Treutler, G. A.* Dingler 99 (1846) 84-.
- Reflecting instruments. *Dantas Pereira, J. M.* Lisb. Mm. Ac. Sc. 2 (1799) 159-.
- , apparent motion of image when turned round optic axis. *Dubois, E.* Les Mondes 10 (*1866) 306-.
- , correction of errors of eccentricity. *Hilleret, G.* Rv. Mar. et Col. 87 (1885) 237-, 482-.
- for measuring small angles, magnification. *Lermantov, V. V.* Rs. Ps. C. S. J. 22 (Ps.) (1890) 261-; Fschr. Ps. (1890) (Ab. 2) 206.
- , theory. *Čubr [Zuber], E.* Časopis 2 (*1873) 233-; Bll. Sc. Mth. As. 8 (1875) 124-.
- Refractoscope, crystal. *Pulfrich, C. A.* Ps. C. 30 (1887) 317-.
- Rotary motion, optical method of investigating. *Clarke, (Lt.) G. S.* [1877] Camb. Ph. S. P. 3 (1880) 90-.
- Search lights with parabolic glass-mirrors. *Anon.* Elekttech. Z. 11 (1890) 371-.
- Sextant. *Hermans, H.* Brux. A. Tr. Pbl. 1 (1896) 41-.
- for accurate observations. *Schwerer, (Lt.) A.* Rv. Mar. et Col. 105 (1890) 80-.
- , adjustment of mirror. *Braun, C. Z.* Instk. 8 (1888) 238-.
- , errors when mirrors are not perpendicular to graduated arc. *Lemoch, I.* Grunert Arch. 25 (1855) 167-.
- , — and use. *Kayser, E.* [1892] Danzig Schr. 8 (1892-94) (Heft 1) 155-.
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- for night observations, binocular. *Cuerverville, C. de.* Rv. Mar. et Col. 83 (1884) 171-.
- — —, modification. *Blanchin, —.* Rv. Mar. et Col. 80 (1884) 731.
- "Simmetrizzatore" as universal kaleidoscope and as educational instrument. *Luca, P. A. de.* Nap. Rd. 3 (1844) 161-.
- Spherometers, prismatic. *Meyerstein, M. A.* Ps. C. 126 (1865) 589-; D. Nf. B. 40 (1865) 104.
- Stepped lens, theory. *Matthiessen, L.* Cztg. Opt. 7 (1886) 109-.
- Stereometer. *Marie, T., & Ribaut, H.* C. R. 128 (1899) 1003-.
- Stereomonscope, by which single picture produces stereoscopic effect. *Claudet, A.* [1858] R. S. P. 9 (1857-59) 194-.

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Almeida, J. C. d'. C. R. 47 (1858) 61-.

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- Stroh*, A. R. S. P. 40 (1886) 317-; 41 (1887) 274.
- Righi*, A. Rm. R. Ac. Linc. Rd. 5 (1889) (Sem. 1) 862-.
- and its applications. *Himes*, C. F. Franklin I. J. 123 (1887) 398-, 425-.
- binocular vision. *Wheatstone*, (Sir) C. B. A. Rp. (1838) (pt. 2) 16-.
- — *Tyndall*, J. [1856] Pht. S. J. 3 (1857) 96-, 116-, 167-.
- — *Newton*, J. Lanc. T. Hist. S. 9 (1857) 272-.
- — *Claparède*, E. Bb. Un. Arch. 3 (1858) 138-.
- — *Donkin*, W. F. Phot. J. 12 (1888) 45-.
- — *Blath*, L. Magdeb. Nt. Vr. Jbr. u. Ab. (1894-96) 69-.
- diaphragmatic. *Volpicelli*, P. Rm. At. 7 (1853-54) 219-, 275-; N. Cim. 12 (1860) 181-.
- improvements. *Grubb*, (Sir) H. [1879] Dubl. S. Sc. P. 2 (1880) 179-.
- for large pictures, 2 new forms. *Elliot*, J. (vi *Adds.*) Ph. Mg. 13 (1857) 104-.
- lenses and spectacles. *Berger*, E. D. Ps. Gs. Vh. (1900) 160-.
- lenticular, improvement. *Emerson*, E. Silliman J. 32 (1861) 403-.
- mathematics. *Steinhauser*, A. Carl Rpm. 13 (1877) 433-.
- modification. *Oppel*, J. J. (vi *Adds.*) Frkf. Jbr. Ps. Vr. (1855-56) 37-; (iv) (1858-59) 22-.
- with movable pictures. *Halske*, G. G. Pogg. A. 100 (1857) 657-.
- photographs giving exact perspective. *Cazes*, —. Par. S. Ps. Sé. (1885) 115-.
- of moving point. *Marey*, —. Par. S. Ps. Sé. (1885) 67-.
- pictures with one camera. *Dickson*, R. [1855] Pht. S. J. 2 (1856) 170-.
- *Chimenti*. *Reade*, J. B. [1862] Pht. S. J. 8 (1864) 29-.
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- and adjustable. *Stevens*, W. Le C. Ph. Mg. 13 (1882) 322-.
- with rotating prisms. *Schweder*, G. Riga Cor.-Bl. 40 (1898) 95-, 97-.
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- *Marie*, T., & *Ribaut*, H. C. R. 127 (1898) 321-.
- use of camera lucida as. *Wilde*, E. Pogg. A. 85 (1852) 63-.
- Wheatstone's catoptric and Brewster's dioptric. *Massimo*, M. (viii) Rm. At. 4 (1850-51) 140-.
- Stroboscopic discs, phenakistoscope, phantascopie. *Poggendorff*, J. C. Pogg. A. 32 (1834) 636-.
- phenomena. *Fischer*, O. Ph. Stud. 3 (1886) 128-.
- — *Marbe*, K. Ph. Stud. 14 (1898) 376-.
- — *Dürr*, E. Ph. Stud. 15 (1900) 501-.
- Teinoscope for altering lineal proportions of objects. *Brewster*, (Sir) D. Edinb. Ph. J. 6 (1822) 334-.

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- Fallon*, L. A. von. Zach M. Cor. 6 (1802) 246-.
- Doppler*, C. Böhm. Gs. Ab. 3 (1843-44) 769-.
- Laurent*, P. Nancy Mm. S. Sc. (1845) 58-.
- Liagre*, J. Brux. Ac. Bil. 20 (1853) 324-; 21 (1854) (pte. 2) 162-.
- Rottermund*, —. Par. S. Gl. Bil. 11 (1853-54) 230-.
- Albertotti*, G. Tor. Ac. Sc. At. 17 (1881) 749-.
- Audouard*, —. Brest S. Ac. Bil. 13 (1888) 173-.
- Barr*, A., & *Stroud*, W. B. A. Rp. (1890) 499-.
- Drude*, P. Z. Instk. 10 (1890) 323-.
- Barr*, A., & *Stroud*, W. I. ME. P. (1896) 33-.
- Hensoldt*, M. Czgt. Opt. 20 (1899) 191-; 21 (1900) 21-, 91.
- Sprenger*, E. Czgt. Opt. 20 (1899) 231-; 21 (1900) 41, 112.
- Adie's*. *Adie*, P. [1880] Un. Serv. I. J. 24 (1881) 230-.
- Cerebotani's. *Börsch*, A. Z. Instk. 6 (1886) 77-, 125-.
- depression-. *Audouard*, P. Rv. Mar. et Col. 100 (1889) 5-; Brest S. Ac. Bil. 16 (1891) 159-; 17 (1892) 419-.
- *Bourgeois*, A. [1891] Brest S. Ac. Bil. 19 (1894) 237-.
- history. *Hammer*, E. Z. Instk. 12 (1892) 155-; 17 (1897) 278-.
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- Porro's*. *Hensoldt*, M. Z. Instk. 5 (1885) 413-.
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- Romershausen's*. *Wiegand*, A. Grunert Arch. 13 (1849) 162-.
- stereocollimator. *Place*, — de. C. R. 116 (1893) 373-.
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- Telemetrical spherometer and focometer. *Stroud, W.* [1897] *L. Ps. S. P.* 16 (1899) 1-, 206; *Ph. Mg.* 45 (1898) 91-
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 Total reflection method, application to micrometric measurement of dispersion. *Pulfrich, C. Z. Instk.* 13 (1893) 267-
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 — — — — — Maxwell's problem. *Matthiessen, L. Exner Rpm.* 24 (1888) 401-
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 — glass, effects. *Laurent, L. Par. S. Ps. Sé.* (1886) 114-
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 — liquid, refractive index. *Littlewood, T. H. L. Ps. S. P.* 13 (1895) 74-; *Ph. Mg.* 37 (1894) 467-
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 — — — — — wave-propagation. *Boussinesq, J. C. R.* 129 (1899) 794-
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 — — — — — projection. *Cooke, J. P. Am. J. Sc.* 40 (1865) 243-
 — — — — — modification of electric lamp. *Bickerton, A. W. N. Z. I. T.* 7 (1874) 403-
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Börsch, (Dr.) [A.] A. Ps. C. 129 (1866) 384-.
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Poleck, T. [1868] Bresl. Jbr. Schl. Gs. 46 (1869) 28-.
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Young, C. A. Franklin I. J. 60 (1870) 331-.
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 —, with fixed telescope. *Krüss, H. Z. Instk. 8 (1888) 388-.*
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Dewar, J., & Liveing, G. D. R. S. P. 28 (1879) 482-.
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- — — — — (*Thollon*). *Garbe, P.* C. R. 96 (1883) 836-.
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- as instruments of precision. *Oppio, L. dall'.* Ven. I. At. 1 (1883) 953-.
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- for spectroscopic analysis. *Watts, W. M.* L. Ps. S. P. 1 (1876) 160-; Ph. Mg. 50 (1875) 81-.
- and microspectroscope with telescope. *Marpmann, G.* Z. Angew. Mkr. 5 (1900) 309-.
- objective. *Merz, S.* Carl Rpm. 6 (1870) 164-.
- optical investigations with special reference to. *Rayleigh, (Lord).* Ph. Mg. 8 (1879) 261-, 403-, 477-; 9 (1880) 40-.
- optics. *Seabroke, G. M.* Nt. 10 (1874) 467-.
- passage of light through. *Hoorweg, J. L.* Utr. Prv. Gn. Aant. (1874) 20-; A. Ps. C. 154 (1875) 423-.
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- , measuring scales. *Herschel, A. S.* Nt. 18 (1878) 300-.
- with 11 prisms. *Gassiot, J. P.* R. S. P. 13 (1864) 183-.
- 9 prisms, achromatic telescopes, etc. *Gassiot, J. P.* [1863] (vii) Ph. Mg. 27 (1864) 143-.
- prisms, train of. *Cooke, J. P.* Am. J. Sc. 40 (1865) 305-.
- reflection-. *Lippich, F.* Z. Instk. 4 (1884) 1-.
- registering. *Huggins, W.* R. S. P. 9 (1871) 317-.
- with rotating grating. *Lehmann, H.* Z. Instk. 20 (1900) 193-.
- scales. *Chapman, E. J.* (xii) Cn. R. S. P. & T. 1 (1883) (*Sect.* 3) 55-.
- simple. *Osann, G.* Würzb. Nw. Z. 4 (1863) 1-.
- *Kessler, F.* A. Ps. C. 151 (1874) 507-.
- form for lectures. *Cushman, H.* Science 3 (1896) 45-.
- simplification. *Hüfner, C. G.* Carl Rpm. 15 (1879) 116-.
- slit. *Wadsworth, F. L. O.* Am. J. Sc. 48 (1894) 19-.
- , adjustable, simple form. *Tisley, S. C.* B. A. Rp. (1874) (*Sec.*) 27.
- , symmetrical, Vierordt's. *Leiss, C.* Z. Instk. 18 (1898) 116-.
- spectroscopic combination, new. *Fievez, C.* Leip. As. Gs. Vjschr. 16 (1881) 311-.
- theory. *Ditscheiner, L.* A. Ps. C. 129 (1866) 336-.
- for ultra-violet. *Cornu, A.* Par. S. Ps. Sé. (1879) 39-.
- uniformity in spectroscopic measurements. *Steinheil, C. A. von.* A. Ps. C. 122 (1864) 167-.
- Spectrum analysis, main points. *Arneberg, A.* Ts. Ps. C. 24 (1885) 321-, 353-; 27 (1888) 65-.
- , bands in, measuring and recording. *Palmer, T. M.* Mer. J. 16 (1876) 277-.
- camera, applications. *Crookes, W.* Pht. S. J. 2 (1856) 292-.
- , conditions for length. *Dolbear, A. E.* Am. Ac. P. 21 (1886) 361-.
- , curvature of lines. *Ditscheiner, L.* Wien Sb. 51 (1865) (*Ab.* 2) 368-.
- , dispersion-, curvature of lines. *Christie, W. H. M.* As. S. M. Not. 34 (1874) 263-.
- , lines. *Rachinski, K. A.* (xii) Rec. Mth. (Moscou) 2 (1867) (*Pt.* 1) 317-.
- , —, feeble, arrangement for measuring. *Vogel, H. C.* (xii) Z. Instk. 1 (1881) 20-, 47-.
- , longitudinal rays. *Babinet, J.* (vi *Adds.*) C. R. 35 (1852) 413-.
- , —, *Porro, I.* C. R. 35 (1852) 479-.
- , Newton's method of observation. *Kahlbaum, G. W. A.* Basel Vh. 8 (1890) 884-.
- , photographing whole length at once. *Liveing, G. D.* Camb. Ph. S. P. 9 (1898) 141-.
- , photography, simple apparatus. *Vogel, H. W.* A. Ps. C. 154 (1875) 306-.
- , solar, dark lines, apparatus for observing. *Dujardin, F.* C. R. 8 (1839) 253-.
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- , —, longitudinal lines. *Ragona-Scinò, D.* Palomba Rac. 3 (1847) 289-; Pogg. A. 84 (1851) 590-.

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- Prism combinations with coincident direct and emergent rays. *Herschel, (Sir) J. F. W.* Les Mondes 3 (1863) 403-.
- , defect of image of interference bands when seen through. *Straubel, R.* A. Ps. C. 66 (1898) 346-.
- , direct vision. *Fuchs, F.* (xii) Z. Instk. 1 (1881) 326-, 349-.
- , —, *Braun, K.* (xii) Mth. Term. Éts. 1 (1883) 219-; Mth. Nt. B. Ung. 1 (1882-83) 197-.
- , —, of high dispersion. *Thollon, L.* C. R. 88 (1879) 80-.
- , liquid, for spectroscope. *Wernicke, K. W.* (xii) Z. Instk. 1 (1881) 353-.

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- Prism of variable angle. *Melander, G.* Helsingf. Öfv. 40 (1898) 32-.
- Prisms, aberrations, effect. *Crova, A.* [1882] Mntp. Ac. Mm. 10 (1884) 265-.
- , carbon disulphide. *Marlow, G.* C. N. 13 (1866) 28.
- , —, use. *Barker, G. F., & Draper, H.* Am. J. Sc. 29 (1885) 269-.
- , —, —, *Smyth, C. P., & Herschel, A. S.* B. A. Rp. (1885) 942-.
- , —, —, *Hasselberg, B.* A. Ps. C. 27 (1886) 415-.
- , dispersion-parallelepiped, construction and applications. *Zenger, K. V.* Prag Sb. (1881) 416-; As. Fr. C. R. (1883) 298-.
- , error of train. *Zech, P.* Carl Rpm. 2 (1867) 106-.
- of flint glass and carbon disulphide for spectral analysis. *Rood, O. N.* Silliman J. 35 (1863) 356-.
- , liquid, for spectroscopes, etc. new form. *Hardie, W. M.* [1886] Sc. S. Arts T. 11 (1887) 358-.
- , liquids for. *Hartley, W. N.* Nt. 44 (1891) 273.
- , reflecting, with constant deviation. *Bauernfeind, C. M.* Münch. Sb. (1865) (2) 344-; (1868) (1) 495-.
- , refraction-, new shape. *Cornu, F.* Laus. S. Vd. Bil. 33 (1897) xxxiv-.

3160 Gratings.

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- Quincke, G.* A. Ps. C. 146 (1872) 1-.
- Blake, J. M.* Am. J. Sc. 8 (1874) 33-.
- Thorpe, T.* Manch. Mer. S. T. (1894) 26-.
- coefficient of expansion, determination by means of spectrum. *Mendenhall, T. C.* Am. J. Sc. 21 (1881) 230-.

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- Rowland, H. A.* Ph. Mg. 13 (1882) 469-; Am. J. Sc. 26 (1883) 87-.
- diffraction spectra with, experimental arrangement. *Rizzo, G. B.* Tor. Ac. Sc. At. 34 (1898) 794- or 1062-.
- Rowland's.* *Glazebrook, R. T.* L. Ps. S. P. 5 (1884) 243-; Ph. Mg. 15 (1883) 414-; 16 (1883) 377-.
- , *Mascart, É. É. N.* J. de Ps. 2 (1883) 5-.
- , *Waterhouse, (Lt.-Col.) J.* Beng. As. S. P. (1889) 3-.
- , absolute measurements of rulings at 62° F. *Rogers, W. A.* Am. S. Mer. P. (1885) 151-.
- , astigmatism. *Sirks, J. L.* Amst. Ak. Vh. (Sect. 1) 2 (1894) No. 6, 7 pp.
- , asymmetry in. *Rydberg, J. R.* Stockh. Ak. Hndl. Bh. 18 (Afd. 1) (1893) No. 9, 12 pp.
- , comparison of 2. *Bruère, (Miss) A. H.* Ps. Rv. 3 (1896) 301-.
- , mode of erection. *Haga, H.* A. Ps. C. 57 (1896) 389-.

- Rowland's,* spectrum photography with. *Waterhouse, (Lt.-Col.) J.* Spet. It. Mm. 18 (1890) 14-.
- spectra. *Baily, W. L.* Ps. S. P. 5 (1884) 181-; Ph. Mg. 15 (1883) 183-.
- in stellar photography. *Poor, C. L., & Mitchell, S. A. J. H. Un. Cir.* [17 (1897-98)] 61-.
- theorem. *Baily, W. L.* Ps. S. P. 8 (1887) 53-; Ph. Mg. 22 (1886) 47-.
- theory. *Sokolov, A. P.* (xii) Rs. Ps.-C. S. J. 15 (Ps., Pt. 1) (1883) 293-.
- , *Mitchell, S. A. J. H. Un. Cir.* [17 (1897-98)] 56-.
- , adjustments and use. *Ames, J. S. J. H. Un. Cir.* 8 (1888-89) 69-.

- echelon film. *Butler, C. P.* Nt. 61 (1899-1900) 275.
- films, with application to colour photography. *Thorpe, T.* Manch. Lt. Ph. S. Mm. & P. 44 (1900) No. 12, 8 pp.
- large, machine for ruling. *Mallock, A. B. A. Rp.* (1882) 466-.
- manufacture and theory. *Rayleigh, (Lord).* Ph. Mg. 47 (1874) 81-, 193-; 11 (1881) 196-.
- , —, *Rowland, H. A.* Ph. Mg. 13 (1882) 469-.
- on metal, photography. *Izarn, —.* C. R. 116 (1893) 794-.
- photographic reproduction. *Rayleigh, (Lord).* R. S. P. 20 (1872) 414-; B. A. Rp. 42 (1872) (Sect.) 39-.
- , —, *Izarn, —.* C. R. 116 (1893) 506-.
- , —, *Rayleigh, (Lord).* Nt. 54 (1896) 332-.
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- as ruled at Johns Hopkins University. *Anon.* J. H. Un. Cir. 8 (1888-89) 79.
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- Blood, apparatus for spectroscopic analysis. *Hénocque, A.* Par. S. Bl. Mm. 38 (1886) (C.R.) 445-; Par. S. Ps. Sé. (1887) 83-.
- , etc., spectrorolorimeter for. *Arsonval, — d'.* Par. S. Ps. Sé. (1890) 109.
- , spectroscopes for detection of (hémastrosopes). *Thierry, M. de.* C. R. 100 (1885) 1244-; 120 (1895) 775-.
- Bolometer, iron-wire, for investigation of heat-spectra. *Edelmann, M. T.* Elekttech. Z. 15 (1894) 81-.
- Bolometric arrangements. Absorption of long wave radiation by carbon dioxide. *Kurlbaum, F. A.* Ps. C. 61 (1897) 417-.
- investigations in grating spectra. *Paschen, F. A.* Ps. C. 48 (1893) 272-.
- Double prism arrangement for viewing sun by light of any desired wave-length. *Harkness, —.* Smiths. Misc. Col. 33 (1888) Art. 4, 13 (bis)-. (Wash. Ph. S. Bil. 10 (1888).)

- Gases and vapours of sun, comparison of apparatus and methods employed in study. *Deslandres, H.* Spet. It. Mm. 23 (1895) 141 (*bis*)—.
- Interference, spectral, lecture experiments. *Lommel, E. von.* Münch. Ak. Sb. 23 (1894) 133—.
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- Interferometer, spectral. *Zenker, W.* Z. Instk. 7 (1887) 1—.
- Luminous and chromatic intensities of spectral colours and their mixtures, apparatus for studying. *Parinaud, —.* Par. S. Ps. Sé. (1884) 206—.
- Monochromatic light of desired wave-length, instrument for. *Tutton, A. E.* Z. Kr. 24 (1895) 455—.
- , spectral apparatus for producing. *Wülfing, E. A. N.* Jb. Mn. (*Beil.-Bd.*) 12 (1899) 343—.
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- Polyoptometer. *Porro, I.* C. R. 35 (1852) 433.
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- (*Michelson's*). *Butler, C. P.* Nt. 59 (1898-99) 607—.
- , *Michelson, A. A.* Am. Ac. P. 35 (1900) 109—.
- , behaviour of chief lines in mercury spectrum under influence of magnetic field. *Blythwood, (Lord), & Marchant, E. W.* Ph. Mg. 49 (1900) 384—, 503.
- for examination of absorption in considerable thickness of liquids. *Thierry, M. de.* C. R. 101 (1885) 811—.
- — great thicknesses of liquids. *Thierry, M. de.* C. R. 120 (1895) 775—.
- with fluorescent eye-piece. *Soret, J. L.* As. Fr. C. R. 2 (1873) 197—; A. Ps. C. (*Jubelbd.*) (1874) 407—; Arch. Sc. Ps. Nt. 57 (1876) 319—.
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- rigid, observation of lines of spectrum with varying terrestrial gravity. *Gassiot, J. P.* R. S. P. 14 (1865) 320—; 16 (1868) 6—.
- rotatory polarisation-, with great dispersion. *Tait, P. G.* Nt. 22 (1880) 360—.
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- for watching progress of operations in Bessemer converter, etc. *Zenger, K. V.* C. R. 101 (1885) 1005.

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- Babinet, J.* C. R. 4 (1837) 638—.
- Éval'd, T. T.* [1873] (XII) Rs. C. Ps. S. J. 6 (*Ps.*) (1874) [*Pt.* 1] 22—.
- Barber, S. J.* Sc. 4 (1874) 34—.
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- neutral point, Brewster's. *Soret, J. L., & Soret, C.* [1888] C. R. 107 (1888) 621-; Arch. Sc. Ps. Nt. 21 (1889) 28-.
- points, Brewster's, Arago's and Babinet's, comparative visibility. *Chase, P. E.* Ph. Mg. 32 (1866) 156-.
- observations with the new polarimeter of Rubenson. *Thalén, T. R.* Stockh. Öfv. 19 (1862) 29-.
- observed under tropical sky of Havana. *Poey, A.* C. R. 60 (1865) 781-.
- polar clock. *Wheatstone, (Sir) C. B. A.* Rp. (1848) (pt. 2) 10-.

3240 Atmospheric Absorption.

(See also 3850; Astronomy 5400.)

- Langley, S. P.* Am. J. Sc. 28 (1884) 163-.
- Absorption by atmospheric carbon dioxide and water vapour. *Ångström, K. A.* Ps. 3 (1900) 720-.

- Absorption of calorific rays by Earth's atmosphere. *Melloni, M. C.* R. 10 (1840) 18.
- — — heat by layers of air of different thickness. *Magnus, G.* Berl. Mb. (1862) 569-.
- — — — moist air. *Magnus, G.* Berl. Mb. (1862) 572-.
- — — solar radiation by atmosphere, empirical formula for. *Bartoli, A., & Stracciati, E.* N. Cim. 31 (1892) 193-.
- — — — clouds. *Bartoli, A., & Stracciati, E.* Mil. I. Lomb. Rd. 27 (1894) 592-.
- Atmospheric absorption and electric light. *Adams, W. G.* Elect. 15 (1885) 362-, 381-.
- — — estimation. *Cornu, A.* C. R. 95 (1882) 801-.
- — — of heat-rays, according to experiments made at Amsterdam. *Stamkart, F. J.* Amst. N. Vh. 13 (1848) 27-.
- — — Himalayas. *Schuster, A.* Nt. 13 (1876) 393-.
- — — in infra-red. *Abney, (Capt.) W. de W., & Festing, (Col.) —.* R. S. P. 35 (1883) 80-.
- — — of light. *Hausdorff, F.* Leip. Mth. Ps. B. 47 (1895) 401-.
- — — — *Ricco, A.* Catania Ac. Gioen. Bl. 53-54 (1898) 2-.
- — — photographic rays. *Schaeberle, J. M.* Lick Obs. Ct. 3 (1893) 89 pp.
- — — ultra-violet radiation. *Cornu, A.* C. R. 88 (1879) 1285-; 90 (1880) 940-; As. Fr. C. R. (1884) (Pt. 2) 103-.
- Balloon ascents, spectroscopic observations. *Fonvielle, W. de.* C. R. 79 (1874) 816-.
- Calorific effects of sun at extremities of Earth's atmosphere. *Saigey, J. F.* Mon. Sc. 13 (1871) 257-.
- Chiaroscuro and optical phenomenon. *Maggi, P. G.* Verona Mm. Ac. Ag. 20 (1842) 53-.
- Constituent of atmosphere absorbing radiant heat. *Hill, S. A.* R. S. P. 33 (1882) 216-, 435-.
- Extinction of light in atmosphere. *Jacob, W. S.* Edinb. R. S. P. 2 (1851) 271-.
- — — — (Jacob). *Meech, L. W.* Am. As. P. (1858) 42-.
- — — — *Seelig, H.* Münch. Ak. Sb. 21 (1892) 247-.
- — — — influence of selective absorption. *Hepperger, J. von.* Wien Ak. Sb. 105 (1896) (Ab. 2a) 173-.
- Lighthouses and search lights, failure of electric arcs in fog. *Paul, H. M.* Science 5 (1885) 150-.
- Radiant and absorptive properties of vapour in atmosphere, Tyndall's deductions. *Russell, R. B. A.* Rp. (*1867) (Sect.) 11.
- Radiation through Earth's atmosphere. *Tyndall, J.* Ph. Mg. 25 (1863) 200-.
- Red glass, effect in rendering objects more visible through mist. *Luvini, J.* L'I. 17 (1849) 8.
- Solar light, change in passing through atmosphere. *Hassenfratz, J. H.* A. C. 66 (1808) 54-.
- — — — — (Hassenfratz). *Haily, R. J.* J. de Ps. 66 (1808) 356-.
- — — — chemical intensity at different altitudes of sun. *Barwell, J., & Roscoe, H. E.* [1866] R. S. P. 15 (1867) 20-.

3260 Energy of Sun-light

- Solar light, chemical intensity at different altitudes of sun (Baxendell and Roscoe). *Clausius, R. Ph. Mg.* 32 (1866) 41-.
- , curious effect. *Percival, J. G. Silliman J.* 12 (1827) 164-.
- , diminution of intensity in atmosphere. *Forbes, J. D. Edinb. R. S. P.* 1 (1845) 55-.
- , transmission through Earth's atmosphere. *Abney, (Capt.) W. de W.* [1888-92] *Phil. Trans. (A)* 178 (1888) 251-; 184 (1894) 1-.
- , radiation, influence of water in atmosphere. *Abney, (Capt.) W. de W., & Festing, (Col.)* —. *R. S. P.* 35 (1888) 328-.
- Spectrum analysis and rain-band. *Jameson, H. G.* [1888] *Eastbourne NH. S. T.* 2 (1886-94) 62-.
- of atmosphere and that of water vapour. *Janssen, J. B. A. Rp.* 36 (1866) (*Sect.*) 11.
- Transparency of atmosphere and flames. *Allard, E., C. R.* 81 (1875) 1096-; *Par. Mm. Sav. Étr.* 25 (1877) No. 2, 48 pp.
- — — (Allard). *Bequerel, A. C. C. R.* 82 (1876) 1300-.
- —, instrument to measure (diaphanometer). *Saussure, H. B. Turin Mm. Ac.* 4 (1788-89) 425-.
- — and law of extinction of solar rays in passing through it. *Forbes, J. D. Phil. Trans.* (1842) 225-.
- —, photometer for. *Delarive, A. C. R.* 64 (1867) 1221-.
- —, probabilities applied to variations in. *Seidel, L. Münch. Sb.* 2 (1863) 320-.
- — and vision of distant objects. *Meidinger, H. Karlsruhe Nt. Vr. Vh.* 11 (1891) (*Ab.*) 360-.

3260 Energy of Sun-light.

(See also **Astronomy 4200**; **Meteorology 0930.**)

- Actinometric measurements of solar heat on Alps. *Rizzo, G. B. Spet. It. Mm.* 26 (1898) 79-; *N. Cim.* 7 (1898) 120-; *Spet. It. Mm.* 27 (1899) 10-.
- — — — Mt. Whitney. *Langley, S. P. U. S. Sig. Serv. Pp. No.* 15 (1884) 242 pp.
- observations, accuracy obtainable in. *Saveljev, R. N. Rs. Ps.-C. S. J.* 25 (*Ps.*) (1893) 1-; *A. C.* 28 (1893) 394-; 29 (1893) 260-.
- — — (Saveljev). *Wild, H. A. C.* 29 (1893) 283-.
- — — — (-). *Chvolson, O. A. C.* 30 (1893) 141-.
- — — —. *Saveljev, R. N. A. C.* 4 (1895) 424-.
- — on Mt. Blanc, 1887. *Vallot, J. Mt. Blanc Obs. A.* 2 (1896) 77-.
- — — — during partial solar eclipse. *Vallot, J., & Vallot, (Mme.) G. Mt. Blanc Obs. A.* 2 (1896) 71-.
- Actinometry. *Radau, R. Mon. Sc.* 19 (1877) 524-, 563-.
- *Frölich, O.* [1883-87] *Elekttech. Z.* 5 (1884) 3-; *A. Ps. C.* 21 (1884) 1-; *Wien Met. Z.* 19 (1884) 209-; *Met. Z.* 1 (1884) 247-; *A. Ps. C.* 30 (1887) 582-.

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- Actinometry, chemical, at different heights and temperatures. *Vallot, J., & Vallot, (Mme.) G. Mt. Blanc Obs. A.* 3 (1898) 81-.
- , Langley's measurement. *Maurer, J. Z. Instk.* 6 (1886) 237-.
- , slow, process. *Douves, A. C. N.* 42 (1880) 178.
- , use of ice calorimeter. *Michelson, V. A. Rs. Ps.-C. S. J.* 26 (*Ps.*) (1894) 1-; *J. de Ps.* 4 (1895) 578-.
- Atmospheric pressure, influence on chemical action of direct sunlight. *Andresen, M. Mt. Blanc Obs. A.* 4 (1900) 1-.
- Solar energy, conservation. *Siemens, (Sir) C. W. Franklin I. J.* 84 (1882) 57-.
- —, — (Siemens). *Archibald, E. D. Nt.* 25 (1882) 504.
- —, — (Archibald, Morris, Hunt and Fitz Gerald). *Siemens, (Sir) C. W. Nt.* 25 (1882) 504-, 603; 26 (1882) 80.
- —, — (Siemens). *Morris, C. Nt.* 25 (1882) 601-.
- —, — (-). *Hunt, T. S. Nt.* 25 (1882) 602-.
- —, — (-). *FitzGerald, G. F. Nt.* 26 (1882) 80.
- —, — (-). *Faye, H. A. É. C. R.* 95 (1882) 612-.
- —, — (Faye). *Siemens, (Sir) C. W. C. R.* 95 (1882) 769-.
- —, — (Siemens). *Hirn, G. A. C. R.* 95 (1882) 812-.
- —, — (Hirn). *Siemens, (Sir) C. W. C. R.* 95 (1882) 1037-.
- —, —. *Faye, H. A. É. C. R.* 95 (1882) 1110-.
- —, — (Siemens). *Hirn, G. A. C. R.* 95 (1882) 1195-.
- —, —. *Tommasi, D. Les Mondes* 3 (1882) 500-.
- —, — (regenerative theory). *Cook, E. H. Ph. Mg.* 15 (1883) 400-.
- —, — (Cook). *Siemens, (Sir) C. W. Ph. Mg.* 16 (1883) 62-.
- —, — (Faye and Hirn). *Siemens, (Sir) C. W. C. R.* 96 (1883) 43-.
- physics, questions. *Siemens, (Sir) C. W.* [1883] *R. I. P.* 10 (1884) 315-.
- Sun, does Earth receive any direct heat from? *Hovorth, H. H. Manch. Lt. Ph. S. P.* 13 (1874) 131-.
- Sun's temperature. *Le Chatelier, H. C. R.* 114 (1892) 737-, 864.

VELOCITY, WAVE-LENGTH, ETC., OF RADIATION.

3400 General.

(See also 2990.)

- Displacements, continuous, of particles of medium, formulae connected with. *Tait, P. G. Edinb. R. S. P.* 4 (1862) 617-.
- Fourier's double integrals, application to optical problems. *Godfrey, C.* [1899] *Phil. Trans. (A)* 195 (1901) 329-.
- Heat, light and colours. *Blackburne, W. Tilloch Ph. Mg.* 6 (1800) 334-.

- Heat, light and electricity, wave theories. *Hudson, H.* Ph. Mg. 44 (1872) 210-.
- and light, new theory. *Franklin, B.* [1788] Am. Ph. S. T. 3 (1793) 5-.
- —, propagation, theory. *Cauchy, A. L.* C. R. 9 (1839) 283-.
- , light and sound compared. *Clausius, R.* Zür. Mschr. 2 (1857) 73-.
- and light, vibration theory. *Ampère, A. M.* A. C. 58 (1835) 432-.
- — waves, action on movable bodies. *Puschl, K.* Wien SB. 15 (1855) 279-.
- , undulatory theory. *Forbes, J. D.* Ph. Mg. 8 (1836) 246-.
- , —. *Babinet, J.* C. R. 7 (1838) 781-.
- , —. *Powell, B. B. A.* Rp. (1840) (pt. 2) 14-.
- , —. *Mann, F.* Schlömilch Z. 2 (1857) 280-; 3 (1858) 57-; (vi *Adds.*) Sch. Gs. Vh. 42 (1857) 157-.
- , —. *Babinet, J.* C. R. 63 (1866) 581-, 662-.

LIGHT.

- action. *Kastner, K. W. G.* D. Nf. Vsm. B. (1842) 25-.
- apparently monochromatic, analysis by Newton's rings. *Carvalho, E.* C. R. 130 (1900) 496-.
- attraction and repulsion. *Recamier, —.* C. R. 31 (1850) 851-.
- and elasticity, theory. *Barré de Saint-Venant, —.* L'I. 24 (1856) 32-.
- etheral hypothesis. *Samuelson, J.* QJ. Sc. 6 (1869) 1-.
- mathematical development of laws. *Buquoy, G. von.* Oken Isis (1824) 728-.
- monochromatic, as damped vibrations. *Rovida, A.* Rv. Sc. [Ind.] 30 (1898) 225-.
- motion in transparent media. *La Place, P. S.* (marquis) de. [1808] Par. Mm. de l'I. (1809) 300-.
- propagation. *Müller, J. J.* [1871] A. Ps. C. 145 (1872) 86-.
- , *Gouy, A.* C. R. 91 (1880) 877-.
- , and chemical composition, relations between. *Schrauf, A.* Pogg. A. 118 (1863) 359-; 119 (1863) 461-, 553-.
- , — density and composition of the medium, relation between. *Lorentz, H. A.* Amst. Ak. Vh. 18 (1879) 112 pp.; A. Ps. C. 9 (1880) 641-.
- , dependence on density. *Schrauf, A.* Pogg. A. 116 (1862) 192-.
- in isophanous media. *Cauchy, A. L.* C. R. 30 (1850) 33-.
- isotropic media. *Rubenson, R.* Stockh. Öfv. (1884) No. 10, 3-; Fsch. Ps. (1885) (Ab. 2) 7-.
- , lateral, or parageny. *Babinet, J.* Cosmos 25 (1864) 393-, 421-.
- , law. *Poynting, J. H., & Love, E. F. J.* [1886-88] Birm. Ph. S. P. 5 (1885-87) 354-; 6 (1887-89) 168.
- in media at rest and in motion, new theory. *Sagnac, G.* C. R. 129 (1899) 756-, 818-; Par. S. Ps. Sé. (1899) 162-.

- propagation in water and transparent bodies. *Maistre, X. de.* Bb. Un. 57 (1834) 200-.
- property of repulsive forces acting upon. *Malus, É. L.* Arcueil Mm. Ps. 2 (1809) 254-.
- radiation, theory. *Kirchhoff, G.* Berl. Ak. Sb. (1882) 641-.
- recent views. *Witkowski, A.* Kosmos (Lw.) 12 (1887) 71-.
- solar, mechanical energy of cubic mile; and possible density of luminiferous medium. *Thomson, (Sir) W.* [1854] C. R. 39 (1854) 529-; Edinb. R. S. T. 21 (1857) 57-.
- , number of primitive calorific rays. *Young, M.* [1798] Ir. Ac. T. 7 (1800) 119-.
- 2 theories, new critical point of conflict. *Breton, P.* [1872] (xix) Isère S. Bll. 4 (1875) 236-, 237-.
- unpolarised, instrument for exhibiting mode of vibration. *Snell, E. S.* Am. As. P. (1850) 277-.
- velocity and aberration, historical note. *Liagre, J.* Brux. Ac. Bll. 13 (1862) 10-.
- , regarded as velocity of matter. *Preston, S. T.* Elect. 27 (1891) 576-.
- , and size of molecules of medium, relation between. *Joubin, P.* C. R. 115 (1892) 1061-, 1346.
- vibrations of common light. *Tait, P. G.* Edinb. R. S. P. 11 (1882) 418-.
- , law observed in. *Biot, J. B.* Arcueil Mm. Ps. 3 (1817) 132-.
- , regularity. *Gouy, —.* C. R. 120 (1895) 915-.
- wave propagation, anomalous. *Zeeman, P.* Ps. Z. 1 (1900) 542-.
- surface. *Cellérier, C.* (vii) Gen. S. Ps. Mm. 23 (1874) 161-.
- theory, kinematic equivalence. *Croullebois, M.* C. R. 93 (1881) 53-.
- wave-length, supposed dependence on intensity. *Lippich, F.* [1875] Wien Ak. Sb. 72 (1876) (Ab. 2) 355-.
- of different wave-lengths, velocity in vacuo. *Décombe, L.* C. R. 128 (1899) 172-.
- waves, attraction, proofs of phenomenon discovered by Guthrie and Schellbach. *Nieuwenhuijzen Kruseman, J.* Utr. Prv. Gn. Aant. (1875) 36-.
- , 3 kinds, corresponding to simple movements of the ether. *Cauchy, A. L.* C. R. 27 (1848) 621-.
- , motion, Wheatstone's apparatus to illustrate. *Secchi, A.* Rm. Cor. Sc. 2 (1853) 183-.
- , passage through focus. *Joubin, P.* C. R. 115 (1892) 932-.
- , spherical and cylindrical. *Julius, V. A.* Arch. Néerl. 28 (1895) 226-.
- white, form of vibrations in. *Carvalho, E.* C. R. 130 (1900) 79-, 130-; J. de Ps. 9 (1900) 138-.
- , —, —, —. *Gouy, —.* C. R. 130 (1900) 241-.
- , —, —, —. *Carvalho, E.* C. R. 130 (1900) 401-.
- , —, —, —; Fourier's series. *Gouy, —.* C. R. 130 (1900) 560-.

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- white, measurement of large path differences. *Joubin, P. C. R.* 116 (1893) 633-.
- , —, —, — (Joubin). *Cornu, A. C. R.* 116 (1893) 711.
- , —, —, —. *Joubin, P. C. R.* 116 (1893) 872.
- Optics, part of a course. *Duhem, P. Brux. S. Sc. A.* 18 (1894) (*Pt. 2*) 95-; 19 (1895) (*Pt. 2*) 27-; 20 (1896) (*Pt. 2*) 27-.
- Prismatic spectrum, prolongation. *Osann, G. W. Würzb. Nw. Z.* 5 (1864) 121-.
- Radiations, solar, why most refrangible do not produce light. *Kessler, G. Arch. f. Oph.* 1 (1854) 466-.
- Rotating bodies, optical phenomena. *Kurz, A. A. Ps. C. (Ergänz.)* 5 (1871) 653-.
- Transparency of the ether. *Brace, De W. B.* [1888] *Nebr. Un. Stud.* 1 (1888-92) 1-.
- Vibration, influence of motion of source on intensity of vibrations emitted. *Mees, R. A. Amst. Ak. Vs. M.* 9 (1876) 243-; *Arch. Néerl.* 12 (1877) 1-.
- intensity of wavelets diverging from every point of plane wave. *Smith, Arch.* [Signed *H. T.*] *Camb. Mth. J.* 3 (1841) 46-.
- Vibrations of the ether in media isophanous with reference to given direction. *Cauchy, A. L. C. R.* 30 (1850) 93-.
- — — — — medium or system of 2 media. *Cauchy, A. L. C. R.* 7 (1838) 751-.
- Vibratory movements of system of molecules, perturbations produced by another system. *Cauchy, A. L. C. R.* 30 (1850) 17-.
- Wave motion. *Breton, Ph. Les Mondes* 18 (1868) 341-.
- propagation (theorem of Gergonne). *Lévisal, A. J. de Ps.* 2 (1873) 207-.
- in elastic medium. *Smith, Arch.* [Signed *A. S.*] *Camb. Mth. J.* 1 (1839) 97-.
- , Fresnel's laws, deduction from mechanical theory. *Haughton, S. Ir. Ac. P.* 4 (1850) 455-.
- , new theorem. *Stoney, G. J. Ph. Mg.* 43 (1897) 273-.
- Waves, experiments. *Weber, E. H., & Weber, W. Kastner Arch. Ntl.* 7 (1826) 45-.
- , plane, in elastic media. *Haughton, S.* [1849] *Ir. Ac. T.* 22 (1855) 97-.
- , —, 2 kinds in isotropic system of material points. *Cauchy, A. L. C. R.* 10 (1840) 905-.
- , —, propagation in system of molecules. *Cauchy, A. L. C. R.* 7 (1838) 865-.
- Mechanical equivalent of light. *Géraldy, F. Lum. Élect.* 6 (*1882) 18-.
- — — — — (Thomsen's experiments). *Tunlirz, O. Wien Ak. Sb.* 97 (1889) (*Ab. 2a*) 1627-; 98 (1890) (*Ab. 2a*) 826-, 1121-.
- — — — —. *Ravenshear, A. F. Elect. Rv.* 36 (1895) 470.
- Radiation pressure of light. *Lebedev, P. Laus. S. Vd. Bil.* 35 (1899) xxxv.
- — — — —. *Goldhammer, D.* [1900] *Kazan S. Ps.-Mth. Bil.* 10 (1901) 231-; *Arch. Néerl.* 5 (1900) 467-.
- — — — —. Maxwell-Bartoli's. *Lebedev, P. Rs. Ps.-C. S. J.* 32 (*Ps.*) (1900) 211-; *Sc. Abs. A.* (1901) 485.
- — — — —, and motion of the ether. *Lodge, O. Ph. Mg.* 46 (1898) 414-.
- — — — —, showing apparent failure of electromagnetic equations. *Rayleigh, (Lord). Ph. Mg.* 45 (1898) 522-.
- 3410 Velocity of Light, Measurements of.**
- Arago, D. F. J.* [1810] *C. R.* 36 (1853) 38-.
- Parrot, G. F. Gilbert A.* 51 (1815) 292-.
- Fechner, G. T. Kastner Arch. Ntl.* 12 (1827) 22-.
- Astronomicus [Pseud.]. Madras J.* 2 (1835) 290-.
- (Revolving mirror method.) *Arago, D. F. J. C. R.* 7 (1838) 954-.
- Richter, E. Anhalt Vh. Nt. Vr.* 1 (1840-42) 18-.
- Fizeau, H. L. C. R.* 29 (1849) 90-.
- (Revolving mirror method.) *Arago, D. F. J. C. R.* 30 (1850) 489-.
- Bourdat, —. Grenoble Ac. Delph. Bil.* 3 (1850) 45-.
- (Revolving mirror method.) *Foucault, L. C. R.* 30 (1850) 551-.
- (— — —) *Breguet, L., & Fizeau, H. C. R.* 30 (1850) 562-, 771-.
- Lechat, —. (viii) Reims Sé. Ac.* 12 (1850) 182-.
- Scarpellini, C. Rm. Cor. Sc.* 2 (1853) 126-.
- (Revolving mirror method.) *Foucault, L. A. C.* 41 (1854) 129-.
- Frič, A. Živa* (1859) 56-.
- (Revolving mirror method.) *Foucault, L. C. R.* 55 (1862) 501-, 792-.
- (— — —, Foucault's.) *Emery, L.* [1863] *Laus. Bil. S. Vd.* 7 (1864) 389-.
- (— — —, —) *Moberg, A.* [1863] (viii) *Helsingf. Öfv.* 6 (1864) 2-.
- Pick, H.* [1863] (viii) *Wien Schr.* 3 (1864) 449-.
- Delanunay, C. E. Smiths. Rp.* (1864) 135-.
- Cornu, A. C. R.* 73 (1871) 857-.
- Laborde, —. Les Mondes* 29 (1872) 363-.
- (Toothed-wheel method.) *Cornu, A. C. R.* 76 (1873) 338-.
- Burgue, —. C. R.* 78 (1874) 1115.
- Cornu, A. C. R.* 79 (1874) 1361-; *Par. Ec. Pol. J. cah.* 44 (1874) 133-; *Par. Obs. A.* 13 (1876) A. 1-.

3405 Radiation-pressure. Mechanical Equivalent of Light.

(See 4210, 4215.)

- Mechanical equivalent of light. *Thomsen, J.* [1863] (viii) *A. Ps. C.* 125 (1865) 348-; *Sk. Nf. F.* 9 (1865) 341-.
- — — — —. *Farmer, M. G.* [1865] *Am. J. Sc.* 41 (1866) 214.

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- (Error in Cornu's determination.) *Helmert, F.* R. As. Nr. 87 (1876) 123-.
- Michelson, A. A.* Nt. 18 (1878) 195; Am. As. P. (1878) 71-; (1879) 124-.
- Cornu, A.* C. R. 91 (1880) 1019-.
- (Cornu.) *Gouy, A.* C. R. 92 (1881) 34-.
- Cornu, A.* C. R. 92 (1881) 53-.
- Rayleigh, (Lord).* Nt. 24 (1881) 382-; 25 (1882) 52.
- Gouy, A.* C. R. 94 (1882) 1296-.
- Michelson, A. A.* Wash. As. Pp. for Ephem. & Naut. Alm. 1 (*1882) 109-.
- (Revolving mirror method, Foucault's, improvements in apparatus.) *Wolf, C.* C. R. 100 (1885) 303-.
- (— — —, theory.) *Gouy, —.* C. R. 101 (1885) 502-.
- (— — —, —.) *Schuster, A.* Nt. 33 (1886) 439-.
- (— — —, —.) *Gibbs, J. W.* Nt. 33 (1886) 582.
- Gouy, —.* A. C. 16 (1889) 262-.
- Jaumann, G.* Wien Ak. Sb. 100 (1891) (Ab. 2a) 1239-.
- (1880-82.) *Newcomb, S.* Wash. As. Pp. for Ephem. & Naut. Alm. 2 (1891) 107-.
- Ristenpart, —.* [1894] Karlsruhe Nt. Vr. Vh. 11 (1896) (Sb.) 265-.
- Kaiser, —.* Nass. Vr. Jb. 51 (1898) xxxii.
- Cornu, A.* [1900] Sc. Abs. 4 (1901) 360-.
- Ferrotin, —.* C. R. 131 (1900) 731-.
- Finite velocity, Roemer's discovery. *Wernicke, A.* Z. Mth. Ps. 25 (1880) (H.-It. Ab.) 1-.
- Historical note. *Erler, W.* Pogg. A. 88 (1853) 538-.
- — —. *Newcomb, S.* Nt. 34 (1886) 29-.
- Velocity in air and water. *Breguet, L., & Fizeau, H.* C. R. 30 (1850) 562-, 771-.
- — — —. *Foucault, L.* A. C. 41 (1854) 129-.
- — — carbon disulphide. *Gouy, —.* C. R. 103 (1886) 244-.
- — —, of red and blue light. *Michelson, A. A.* B. A. Rp. (1884) 654.
- — crystals. *Kohlrausch, W. F.* [1878-79] A. Ps. C. 6 (1879) 86-; 7 (1879) 427-.
- — elements, and their crystalline form. *Zenger, C. W.* C. R. 75 (1872) 670-.
- — glass, effects of heat. *Fizeau, H. L.* C. R. 54 (1862) 1237-; A. C. 66 (1862) 429-.
- — and Kirkwood's analogy. *Chase, P. E.* Am. Ph. S. P. 18 (1880) 425-.
- — in magnetic field. *Morley, E. W., & Eddy, H. T.* Am. As. P. (1890) 81-.
- — different media. *Abria, —.* Moigno Cosmos 17 (1860) 261-.
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- Emission spectra. *Exner, F., & Haschek, E.* Wien Ak. Sb. 104 (1895) (Ab. 2a) 909-; 105 (1896) (Ab. 2a) 389-, 503-, 707-, 989-; 106 (1897) (Ab. 2a) 36-, 54-, 337-, 494-, 1127-; 107 (1898) (Ab. 2a) 182-, 792-, 813-, 1335-; 108 (1899) (Ab. 2a) 825-, 1071-, 1123-; 109 (1900) (Ab. 2a) 103-.
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Mancini, E. N. Antol. Sc. 115 (1891) 759-.
Marangoni, C. Rv. Sc.-Ind. 23 (1891) 195-.
Thwing, C. B. Am. J. Sc. 42 (1891) 388-.
Vogel, H. W. Berl. Ps. Gs. Vh. (1891) 33-.
Korda, D. Termt. Közl. 24 (1892) 190-.
Krone, H. A. Ps. C. 46 (1892) 426-.
Lippmann, G. C. R. 114 (1892) 961-; Rv. Sc. 50 (1892) 33-; C. R. 115 (1892) 575.
Krone, H. Wien Ph. Cor. 30 (1893) 226-.
Mareschal, G. Gén. Civ. 23 (1893) 125-.
Sire, —. [1893] Doubs S. Mm. 8 (1894) xii-.
Lippmann, G. C. R. 118 (1894) 92-.
Lumière, A., & Lumière, L. [1894] Lyon S. Ag. A. 2 (1895) xl-; Lyon Ac. Mm. 3 (1895) 137-.
Léger, A. [1894] Lyon Ac. Mm. 3 (1895) 211-.
Valenta, E. D. Nf. Vh. (1894) (Th. 2, Hälfte 1) 78-.
Bonacini, C. Spet. It. Mm. 23 (1895) 146 (bis)-.
Lumière, A., & Lumière, L. [1895] C. R. 120 (1895) 875-; Lyon S. Ag. A. 3 (1896) xli-.

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Schütt, F. A. Ps. C. 67 (1896) 533-.
Giesel, F. Braunsch. Vr. Nt. Jbr. (10) (1897) 9-.
Lippmann, G. [1897] Phot. J. 22 (1898) 121-.
Vogel, H. W. Berl. Ps. Gs. Vh. (1897) 176-.
Wiener, O. A. Ps. C. 69 (1899) 488-.
Lüpps-Cramer, —. Wien Ph. Cor. 37 (1900) 552-.
Buss, O. Wien Ph. Cor. 37 (1900) 677-, 761. and Bequerel's. *Meldola, R.* Nt. 54 (1896) 28.
 ——. *Bothamley, C. H.* Nt. 54 (1896) 77.
 ——. *Abney, (Capt.) W. de W.* Nt. 54 (1896) 125.
 light obliquely incident. *Kelvin, (Lord).* Nt. 54 (1896) 12-.
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 ——. *Ives, F. E.* Franklin I. J. 137 (1894) 16-.
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 —. *Crisp, F.* [1878] Quek. Mer. Cl. J. 5 (1878-79) 79-.
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 —. *Wright, L.* M. Mer. S. J. (1889) 811.
 —. *Loune, —.* M. Mer. S. J. (1889) 811-.
 —, bearing of large axial cone on. *Nelson, E. M.* [1889] Quek. Mer. Cl. J. 4 (1892) 9-.
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 —. *Royston-Pigott, G. W.* M. Mer. J. 16 (1876) 175-, 235-.
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 — (Wright). *Stoney, G. J.* Ph. Mg. 46 (1898) 156-.
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- Microscopy. *Nelson, E. M.* [1895] Quek. Mer. Cl. J. 6 (1897) 14-.
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 —. *Royston-Pigott, G. W.* Q.J. Mer. Sc. 12 (1872) 260-.
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 —, estimation. *Preobraženskij, P. V.* Mosc. S. Sc. Bll. 93 (No. 1) (1897) 1 (bis)-.
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 —, focus, diffraction pattern. *Mayall, R. H. D.* Camb. Ph. S. P. 9 (1898) 259-.
 —, resolving power. *Rayleigh, (Lord).* Ph. Mg. 10 (1880) 116-.
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- Invisible or latent colours of bodies. *Govi, —*. Rm. R. Ac. Linc. Rd. 4 (1888) (*Sem.* 1) 572-.
- Light reflected from sea-waves. *Spooner, J.* Zsch. Cor. 6 (1822) 331-; 7 (1822) 65-, 140-.
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- Reflection. *Fresnel, A. J.* [1819] A. C. 15 (1820) 379-; Par. Mm. Ac. Sc. 20 (1849) 195-.
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- of rainbow in still water. *Dufour, H.* [1885] Laus. S. Vd. Bil. 21 (1886) 191-.
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- — by solutions. *Spring, W.* Brux. Ac. Bil. (1899) 300-.
- — in translucent bodies. *Chvolson, O.* [1886-89] St. Pét. Ac. Sc. Bil. 31 (1887) 213-; 33 (1890) 221-.
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- Light and heat, modification on passing through glass. *Coothupe, C. T.* Ph. Mg. 16 (1840) 467-.
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- — — glass of antimony. *Potter, R.* B. A. Rp. (1833) 377-; Ph. Mg. 4 (1834) 6-.
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- — solar radiation through air charged with dust from Etna. *Bartoli, A.* Catania Ac. Gioen. At. 7 (1894) Mem. 15, 6 pp.

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- , elliptic, by reflection; Cauchy's theory, revision. *Ketteler, E.* Bonn NH. Vr. Vh. 32 (1875) 1-, 270-.
- Problem of optics, application of modular systems to. *Hensel, K.* Crelle J. Mth. 108 (1891) 140-.
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- — — — — (Power). *Stokes, G. G.* Ph. Mg. 8 (1854) 42.

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- , Cauchy's and Green's explanation. *Thomson, (Sir) W.* Edinb. R. S. P. 15 (1889) 21-.
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- , and polarisation laws. *Brewster, (Sir) D.* Phil. Trans. (1818) 199-.
- , according to undulatory theory. *Challis, J.* [1847] Camb. Ph. S. T. 8 (1849) 524-.
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- Silk, optical effects. *Chevreul, M. E.* C. R. 21 (1845) 1342-; Lyon S. Ag. A. 10 (1847) 522-.
- Simple luminous rays and evanescent rays. *Cauchy, A. L.* C. R. 28 (1849) 25-; Par. Mm. Ac. Sc. 22 (1850) 29-.
- Slits, very narrow, optical properties. *Ambrohn, H.* A. Ps. C. 48 (1893) 717-.
- Thomson's theory of contractile ether, application to double refraction, etc. *Glazebrook, R. T.* Ph. Mg. 26 (1888) 521-.
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- — —. *Cellérier, C.* [1873] Arch. Sc. Ps. Nt. 49 (1874) 5-.
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- , propagation in absorbing isotropic media. *Brillouin, M.* C. R. 115 (1892) 808-.
- , — crystallised media. (Report on Blanchet's memoirs.) *Cauchy, A. L.* C. R. 14 (1842) 389-.
- , —, free and disturbed, in isotropic medium. *Maggi, G. A.* A. Mt. 16 (1888-89) 21-.
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— sodium salt solutions. *Willigen, V. S. M. van der.* [1870] (xr) Harl. Ms. Teyl. Arch. 3 (1874) 15-.

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— — — mixtures of 2 liquids. *Pulfrich, C.* Z. Ps. C. 4 (1869) 561-.

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(See also Mineralogy 420.)

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Ketteler, E. A. Ps. C. 67 (1899) 879-.

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— — —. *Camerer, R.* A. Ps. C. 54 (1895) 84-.

— — —, doubly refractive. *Senarmont, H. de.* Liouv. J. Mth. 1 (1856) 305-.

— — —. *Liebisch, T.* N. Jb. Mn. (1885) (Bd. 2) 181-; (1886) (Bd. 2) 47-.

- Crystals, doubly refractive. *Norrenberg, J.* A. Ps. C. 34 (1888) 843-; Bonn NH. Vr. Vh. 45 (1888) 1-.
- , Liebisch's theory. *Mallard, E.* Fr. S. Mn. Bil. 9 (1886) 154-; J. de Ps. 5 (1886) 389-.
- Doubly refractive media. *Soret, C.* Arch. Sc. Ps. Nt. 14 (1885) 96-.
- Formulae of Fresnel. *Janet, P.* J. de Ps. 1 (1892) 373-.
- — — and of Cauchy. *Beer, A.* Pogg. A. 91 (1854) 268-.
- Infra-red rays of prismatic spectrum. *Beer, A.* Pogg. A. 87 (1852) 113-.
- Isotropic and anisotropic media, MacCullagh's theory. *Volkmann, P.* Gött. Nr. (1885) 336-; (1886) 341-; A. Ps. C. 29 (1886) 263-.
- Light penetrating the 2nd medium. *Quincke, G.* Berl. Mb. (1865) 294-; A. Ps. C. 127 (1866) 1-.
- — — — —. *Voigt, W.* Gött. Nr. (1898) 294-; A. Ps. C. 67 (1899) 185-.
- Metallic and total reflection of isotropic media. *Ketteler, E.* A. Ps. C. 22 (1884) 590-.
- Newton's experiment, simple method for. *McNair, F. W.* Science 5 (1897) 620-.
- Ordinary media and uniaxial crystals, geometric rule. *MacCullagh, J.* [1841] Ir. Ac. P. 2 (1840-44) 173-.
- Passage of light through thin film. *Fabry, C.* C. R. 120 (1895) 314-.
- Phenomena. *Soret, C.* Arch. Sc. Ps. Nt. 26 (1891) 541-.
- Phenomenon analogous to rainbow. *Pulfrich, C. A.* Ps. C. 33 (1888) 209-.
- Refracted wave. *Voigt, W.* A. Ps. C. 68 (1899) 135-.
- Refractive index, determination. *Kohlrausch, F.* A. Ps. C. 4 (1878) 1-.
- — — — —. *Quincke, G. H.* Halle Nf. Gs. Festschr. (1879) 321-.
- — — — —, of solids. *Kohlrausch, F.* [1877] Würzb. Ps. Md. Vh. 12 (1878) 103-.
- — — — —, Wollaston's instrument. *Cooper, J. T.* C. S. Mm. 1 (1841-43) 234-.
- — — — —, modification. *Kohlrausch, F.* A. Ps. C. 16 (1882) 603-.
- Theory of Quincke's observations. *Voigt, W.* Gött. Nr. (1884) 49-.
- — — — — total reflection and of insensible refraction accompanying it. *MacCullagh, J.* B. A. Rp. (1843) (pt. 2) 4-.
- (*Ketteler.*) *Voigt, W.* A. Ps. C. 23 (1884) 159-.
- Kovalevskij, S.* Acta Mth. 6 (1885) 249-.
- Absorbing crystals, light motion in, laws. *Ketteler, E.* A. Ps. C. 55 (1895) 540-.
- — — — —, and total reflection. *Ketteler, E.* A. Ps. C. 56 (1895) 56-.
- Achromatic doubly refracting prisms. *Brewster, (Sir) D.* Thomson A. Ph. 11 (1818) 175-.
- — — — — polarisation and differential double refraction. *Brace, D. B.* Ph. Mg. 48 (1899) 345-.
- Alum, ammonia, properties. *Jamin, J.* Par. S. Phlm. PV. (1848) 72.
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- — — — — structures, crystalline and otherwise, difference between. *Ebner, V. von.* Wien Ak. Sb. 91 (1885) (Ab. 2) 34-; Mh. C. (1885) 48-.
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- Artificial shell-like substance. *Brewster, (Sir) D., & Horner, L.* Phil. Trans. (1836) 49-.
- Axes, optic, of arragonite, angles for various wave-lengths. *Kirchhoff, G.* Pogg. A. 108 (1859) 567-.
- — — — —, experimental determination and calculation of angles. *Heusser, J. C.* Pogg. A. 89 (1853) 532-.
- — — — —, of general wave-surfaces of Cauchy and Neumann. *Pochhammer, L.* A. Ps. C. 121 (1864) 239-.
- — — — —, gypsum, position and magnitude. *Lang, V. von.* [1877] Wien Az. 14 (1877) 194-; Wien Ak. Sb. 76 (1878) (Ab. 2) 793-.
- — — — —, and magnetic. *Beer, A., & Plücker, —.* Pogg. A. 81 (1850) 115-; 82 (1851) 42-.
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- — — — —, direction. *Douglas, J. C.* Ph. Mg. 36 (1868) 43-.

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3830 Crystalline Media, Refraction in.

(See also Mineralogy 420.)

- Voigt, W.* N. Jb. Mn. (1888) (Bd. 1) 21-.
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- (*Ketteler.*) *Voigt, W.* A. Ps. C. 21 (1884) 534-.
- (*Voigt.*) *Ketteler, E.* A. Ps. C. 22 (1884) 217-.
- Cesàro, G.* Brux. Ac. Bil. 22 (1891) 503-.
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- convergence and divergence of optic axes on heating. *Mitscherlich, E.* Pogg. A. 8 (1826) 519-.
- — — — — — — — — — —. *Marx, C. M.* Schweigger J. 49 (=Jb. 19) (1827) 184-.

- curves of no colour, theory. *Macé de Lépinay, J.* J. de Ps. 2 (1883) 162-.
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- inclination of optic axis to ray axis. *Walton, W.* QJ. Mth. 5 (1862) 317.
- lateral ray-velocities. *Walton, W.* QJ. Mth. 13 (1875) 66-.
- MacCullagh's differential equations for, and their generalisation. *Kobald, E.* Wien Ak. Sb. 99 (1891) (*Ab. 2a*) 826-.
- minimum deviation for prisms. *Liebisch, T.* Gött. Nr. (1888) 197-; N. Jb. Mn. (1900) (*Bd. 1*) 57-.
- obliquity of ray. *Walton, W.* QJ. Mth. 4 (1861) 1-.
- optic axes, determination. *Beer, A.* Pogg. A. 91 (1854) 279-.
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- ray-directions. *Walton, W.* QJ. Mth. 23 (1889) 7-.
- velocity of normal propagation of plane waves in. *Glazebrook, R. T.* [1878] Phil. Trans. 170 (1880) 287-.
- vibration-cone and section-cone. *Walton, W.* QJ. Mth. 13 (1875) 268-.
- wave surface. *Cauchy, A. L.* C. R. 13 (1841) 319-.
- , Fresnel's, quaternion equations for. *Hamilton, (Sir) W. R.* Ir. Ac. P. 7 (1858) 122-, 163-.
- , lines of curvature. *Zech, P.* Crelle J. 54 (1857) 72-; 55 (1858) 94.
- , properties. *Zech, P.* [1855] Crelle J. 52 (1856) 243-.
- , property. *Walton, W.* QJ. Mth. 22 (1887) 268-.
- Birefractometer or eye-piece comparer. *Amann, J.* Z. Ws. Mkr. 11 (1894) 440-.
- Bone-lamellæ and sugar, properties. *Marx, C. M.* Kastner Arch. Ntl. 8 (1826) 385-.
- Boracite and other substances, dimorphism. *Mallard, E.* Par. S. Ps. Sé. (1884) 60-.
- Carbon disulphide, barium carbonate and nitre, properties. *Brewster, (Sir) D.* [1814] Edinb. R. S. T. 7 (1815) 285-.
- Chabazite, properties. *Johnston, J. F. W.* Ph. Mg. 9 (1836) 166-.
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- Colour phenomena of doubly refracting substances in polarised light. *König, W.* Frkf. a. M. Ps. Vr. Jbr. (1892-93) 27-.
- Conical refraction. *Hamilton, (Sir) W. R.* [1832] Ir. Ac. T. 17 (1837) 132-.
- , *Lloyd, H.* [1833] Ir. Ac. T. 17 (1837) 145-.
- , *MacCullagh, J.* (*vi Adds.*) Ph. Mg. 3 (1833) 114-, 197.
- Conical refraction. *Beer, A.* Pogg. A. 83 (1851) 194-; A. C. 34 (1852) 114-; Pogg. A. 85 (1852) 67-.
- , *Januschke, H.* Mh. Mth. Ps. 5 (1894) 129-.
- , apparatus. *Laurent, —.* [1873] Par. Sé. S. Ps. 1 (1873-74) 84-.
- , —, (Laurent). *Lissajous, J.* [1873] Par. Sé. S. Ps. 1 (1873-74) 86-.
- , in biaxial crystals. *Potter, R.* Ph. Mg. 18 (1841) 343-.
- , experiments. *Nodot, —.* Par. S. Ps. Sé. (1875) 133.
- , external, arrangement for observation. *Liebisch, T.* Gött. Nr. (1888) 124-.
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- Quartz, polarisation. *Jamin*, J. Par. S. Phlm. PV. (1849) 36-.
- — — prism cut with one face at right angles to optic axis, property. *Salm-Horstmar*, W. F. Pogg. A. 85 (1852) 318-.
- — — quadruple refraction near axis. *Quesneville*, G. Mon. Sc. 7 (1893) 521-.
- Rays, special, similar to those obtained by simple or double refraction. *Issaly*, (*L'abbé*) —. Bordeaux S. Sc. Mm. 3 (1893) 231-.
- Reflection and refraction. *MacCullagh*, J. B. A. Rp. (1835) (pt. 2) 7-.
- — — *Cauchy*, A. L. C. R. 31 (1850) 257-, 297-.
- — — *Kirchhoff*, G. Berl. Ak. Ab. (1876) (*Ps.*, Ab. 2) 57-.
- — — by æolotropic systems. *Du Bois*, H. E. J. G. A. Ps. C. 46 (1892) 542-.
- Reflection of coloured light. *Heusser*, J. C. Pogg. A. 87 (1852) 454-.
- — — in arragonite and colourless topaz. *Rudberg*, F. Pogg. A. 17 (1829) 1-.
- — — quartz and calcspar. *Rudberg*, F. Pogg. A. 14 (1828) 45-.

REFRACTIVE INDICES.

- of biaxials, determination by total reflection. *Soret*, C. [1888] C. R. 107 (1888) 176-, 479-; Arch. Sc. Ps. Nt. 20 (1888) 263-; Gen. S. Ps. Mm. 30 (1888-90) lxxi.
- — — — — (verification of Soret's method). *Perrot*, L. C. R. 108 (1889) 137-.
- calamine and hyposulphate of soda. *Lang*, V. von. Wien SB. 37 (1859) 379-.
- in doubly refracting crystals, determination. *Senarmont*, H. de. N. A. Mth. 16 (1857) 273-.
- — — — from polarising angles. *Pfaff*, F. A. Ps. C. 127 (1866) 150-.
- fluor spar, to extreme ultra-violet. *Sarasin*, É. C. R. 97 (1883) 850-.
- gypsum. *Dufet*, H. J. de Ps. 7 (1888) 292-.
- Iceland spar. *Dufet*, —. Par. S. Ps. Sé. (1894) 95-.
- — — ordinary and extraordinary, to extreme ultra-violet. *Sarasin*, É. C. R. 95 (1882) 680-.
- quartz. *Esselbach*, E. Pogg. A. 98 (1856) 541-.
- — — *Exner*, K. Wien Ak. Sb. 91 (1885) (Ab. 2) 218-.
- — — *Macé de Lépinay*, J. Mars. Fac. Sc. A. 5 (1896) Fasc. 2, 14 pp.
- — — difference between refractive indices for the 2 rays. *Macé de Lépinay*, J. C. R. 101 (1885) 874-.
- — — and Iceland spar. *Willigen*, V. S. M. van der. [1870] (xi) Haarl. Ms. Teyl. Arch. 3 (1874) 34-.
- — — ordinary and extraordinary, to extreme ultra-violet. *Sarasin*, É. C. R. 85 (1877) 1230-; Arch. Sc. Ps. Nt. 61 (1878) 109-.
- rock forming minerals. *Zimányi*, K. Föl. Közl. 22 (1892) 382, 419-.
- — — (for sodium light). *Zimányi*, K. [1893] Mag. Tud. Ak. Étk. (*Termt.*) 23 (1894) No. 2, 72 pp.; Mth. Nt. B. Ung. 11 (1894) 189-.

3830 Refraction in Crystals

- uniaxials. *Bauer, G.* Berl. Ak. Mb. (1881) 958-.
- Retardation in crystal plate. *Voigt, W.* A. Ps. C. 22 (1884) 226-.
- of wave in crystal. *Walker, J. R. S. P.* 63 (1898) 79-.
- of wave in crystal. *Routh, E. J.* Mess. Mth. 1 (1872) 147-.
- Rock salt, fluor spar and diamond, action on polarised light. *Brewster, (Sir) D.* [1815] Edinb. R. S. T. 8 (1818) 157-.
- Rule in optics, elementary proof. *Gossart, —.* As. Fr. C. R. (1894) (Pt. 1) 119.
- Sulphate of nickel. *Reusch, F. E.* Pogg. A. 91 (1854) 317-.
- Tabasheer, properties. *Brewster, (Sir) D.* Phil. Trans. (1819) 283-.
- Testing crystals, etc. in polarised light. *Kohlmann, —.* (vi Adds.) Halle Jbr. NW. Vr. 4 (1851) 13-.
- Theory, 2 experimental verifications. *Verschaffelt, J.* Brux. Ac. Bil. 24 (1892) 619-; 25 (1893) 16-.
- Thin lens of uniaxial crystal, bounded by surfaces which are of revolution about its axis, focal lengths and aberrations. *Hamilton, (Sir) W. R.* Ph. Mg. 19 (1841) 289-.
- Topaz, artificial, properties. *Nöggerath, J. J.* Kastner Arch. Ntl. 2 (1824) 438-.
- with cavities. *Brewster, (Sir) D.* Ph. Mg. 31 (1847) 101-.
- , structure and colour. *Brewster, (Sir) D.* [1822] Camb. Ph. S. T. 2 (1827) 1-.
- Transmission of light in crystallised media. *Kelland, P.* [1837] Camb. Ph. S. T. 6 (1838) 323-, 353-.
- Triclinic crystals, method of determining optical constants. *Dufet, H.* Fr. S. Mn. Bil. 13 (1890) 341-.
- Trimetric crystals, expansion, axial density and crystalline parameters. *Schrauf, A.* A. Ps. C. 28 (1886) 438-.
- Triply refracting crystals, 3rd ray in. *Perry, G. C. R.* 76 (1873) 497-.
- Uniaxial and biaxial crystals distinguished by absorption of polarised light. *Dove, H. W.* Berl. B. (1853) 228-.
- crystal plates, isochromatics. *Friess, J.* A. Ps. C. 31 (1887) 90-.
- , parallelism to optic axis. *Brunhes, B.* C. R. 115 (1892) 600-, 696.
- crystals, coincidence of ordinary and extraordinary rays. *Cavan, C.* Arch. Mth. Ps. 41 (1864) 199-.
- , dioptries. *Beer, A.* Pogg. A. 88 (1853) 252-.
- , — and catoptries. *Beer, A.* Pogg. A. 89 (1853) 56-.
- , direction of vibrations of refracted rays. *Abria, O. C. R.* 77 (1873) 1268-.
- , positive and negative, distinction, in circularly and elliptically polarised light. *Dove, H. W.* Pogg. A. 40 (1837) 457-, 482-.
- , prisms. *Brendel, M.* Berl. Strnw. Beob.-Ergebn. No. 6 (1892) 37-.
- , —, ordinary image by total reflection. *Abria, O.* Bordeaux S. Sc. Mm. 10 (1875) 443-.

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- Uniaxial crystals, property of extraordinary ray. *Basso, G.* Tor. Ac. Sc. At. 16 (1880) 208-.
- Wave surface. *Raveau, C.* C. R. 112 (1891) 1056-.
- from plane central section, calculation. *Brill, A.* Münch. Ak. Sb. 13 (1883) 423-.
- in media with 3 principal directions. *Ampère, A. M. A. C.* 39 (1828) 113-.
- , new optical properties deduced from geometric study. *Mannheim, A. J. de Ps.* 5 (1876) 137-.
- of quartz, form. *McConnel, J. C.* [1885] Phil. Trans. 177 (1887) 299-.
- Weierstrass's proposition, generalisation. *Seiliger, S. N. Rs. S. Nt. Mm. (Mth.)* 7 (1886) 145-; Fsch. Mth. (1886) 258.

3835 Strained Media, Refraction in.

- Brewster, (Sir) D.* Par. S. Phlm. Bil. (1815) 44.
- (*Brewster.*) *Biot, J. B.* Par. S. Phlm. Bil. (1815) 44-.
- Crystals, optical anomalies, imitation in colloids. *Klocke, F.* [1881-82] N. Jb. Mn. (1881) (Bd. 2) 249-; Carl Rpm. 17 (1881) 454-; Freiburg B. 8 (*1885) 31-, 37-, 48-.

DOUBLE REFRACTION.

- due to compression (annular). *Gramont, A. de.* Fr. S. Mn. Bil. 9 (1886) 213-.
- — —. *Bouasse, —.* Par. S. Ps. Sé. (1890) 245-.
- — — pressure. *Brewster, (Sir) D.* Phil. Trans. (1816) 156-; (1830) 87-.
- — —. *Mach, E.* A. Ps. C. 146 (1872) 313-.
- — — in regular crystals. *Pockels, F. A.* Ps. C. 39 (1890) 440-.
- — — and tension in caoutchouc and jelly. *Bjerken, P. von.* A. Ps. C. 43 (1891) 808-.
- glass, compressed. *Fresnel, A. J.* Par S. Phlm. Bil. (1822) 139-.
- , — or unequally heated. *Neumann, F. E.* Berl. Ab. (1841) (Ph.) 1-.
- plates rapidly cooled. *Czapski, S.* A. Ps. C. 42 (1891) 319-.
- , vibrating. *König, W.* D. Nf. Vh. (1895) (Th. 2, Hälfte 1) 54.
- , strained. *Mach, E.* (xii) Lotos 22 (1872) 17-.
- , —. *Kerr, J.* Ph. Mg. 26 (1888) 321-.
- , "toughened," properties. *Howink, L.* Amst. Ak. Vh. (Sect. 1) 6 (1899) No. 2, 29 pp. influence of change of temperature and pressure. *Pfaff, I. B. A. F.* Erlang. Ps. Md. S. Sb. 10 (1878) 213-.
- liquids in motion. *Mach, E.* (xii) Lotos 26 (1876) (B.) 49-.
- rotating liquid layers. *De-Metc [De Metz], G.* Rs. Ps.-C. S. J. 19 (Ps.) (1887) 20-; A. Ps. C. 35 (1888) 497-.
- liquids. *Umlauf, K.* A. Ps. C. 45 (1892) 304-.

- temporarily produced in isotropic bodies; and relation between mechanical and optical elasticity. *Wertheim, G. A. C.* 40 (1854) 156-.
- vibrating bars. *Kundt, A. A. Ps. C.* 123 (1864) 541-.
- viscous fluid in motion. *Maxwell, J. C.* [1873] *R. S. P.* 22 (1873-74) 46-.
- — — — —, theory, application of laws of internal friction in liquids. *Natanson, W. Wiad. Mt.* 4 (1900) 239-.
- gums. *Ambrohn, H. A. Ps. C.* 38 (1889) 159-.
- — — — —
- Gelatin sheet, optical properties. *Bertin, A. A. C.* 15 (1876) 129-.
- Gums under stress, optical anomalies. *Ebner, V. von. Wien Ak. Sb.* 97 (1889) (Ab. 2a) 39-.
- Gutta percha, stretched, optical properties. *Zimmermann, A. D. Bt. Gs. B.* 9 (1891) 81-.
- Liquids, rigidity. *Colin, J. C. R.* 116 (1893) 1251-.

3840 Metallic Reflection.

- Cauchy, A. L. Liouv. J. Mth.* 7 (1842) 338-.
- Jamin, J. A. C.* 19 (1847) 296-.
- Cauchy, A. L. C. R.* 26 (1848) 86-.
- Stokes, G. G. B. A. Rp.* (1850) (pt. 2) 19-.
- Mascart, É. C. R.* 76 (1873) 866-.
- Stokes, G. G. B. A. Rp.* (1876) (Sect.) 41-.
- Eisenlohr, F. A. Ps. C.* 1 (1877) 199-.
- Conroy, (Sir) J. [1878] R. S. P.* 28 (1879) 242-.
- Wernicke, W. A. Ps. C.* 3 (1878) 126-.
- Conroy, (Sir) J. R. S. P.* 31 (1881) 486-; 35 (1883) 26-.
- Voigt, W. A. Ps. C.* 24 (1885) 495-.
- Hennig, R. Gött. Nr.* (1887) 365-.
- Poincaré, H. C. R.* 112 (1891) 456-.
- Ketteler, E. A. Ps. C.* 67 (1899) 879-.
- Absorbing isotropic media, especially metals, theory. *Voigt, W. A. Ps. C.* 23 (1884) 104-; *Gött. Nr.* (1884) 137-.
- — — — — (Voigt). *Wüllner, A. A. Ps. C.* 23 (1884) 511-.
- Antimony-glance, reflection by. *Drude, P. A. Ps. C.* 34 (1888) 489-.
- Application of principle of transparency of metals. *Melsens, H. L. F. C. R.* 63 (1866) 552-.
- Cauchy's formula. *Beer, A. Pogg. A.* 91 (1854) 561-.
- and Voigt's theories. *Drude, P. A. Ps. C.* 35 (1888) 508-.
- Change of phase by metallic reflection. *Potier, A. C. R.* 75 (1872) 674-.
- — — — —, *Drude, P. A. Ps. C.* 50 (1893) 595-; 51 (1894) 77-.
- — — — —, *Wernicke, W. A. Ps. C.* 51 (1894) 448-.
- — — — —, *Kath, H. A. Ps. C.* 62 (1897) 328-.
- Change of phase by metallic and total reflection. *Quincke, G. A. Ps. C.* 132 (1867) 561-.
- — — — — (Quincke). *Jochmann, E. [1868] A. Ps. C.* 136 (1869) 561-.
- — — — — reflection at mercury. *Wallbott, H. A. Ps. C.* 68 (1899) 471-.
- — — — — silver surface. *Edser, E., & Stansfield, H. Nt.* 56 (1897) 504-.
- Cobalt, optical constants. *Drude, P. A. Ps. C.* 42 (1891) 186-.
- Colour of gold by transmitted light. *Du Pasquier, A. Lyon Mm. Ac. Sc.* 1 (1845) 337-; *C. R.* 21 (1845) 64-.
- — — — —, *Forbes, D. B. A. Rp.* 35 (1865) (Sect.) 30.
- Curves produced by reflection from polished revolving straight wire. *Sang, E. [1877] Edinb. R. S. T.* 28 (1879) 273-.
- — — — —
- ELLIPTIC POLARISATION BY METALLIC REFLECTION. (See also 4005.)
- Biot, J. B. A. C.* 94 (1815) 209-.
- Brewster, (Sir) D. Phil. Trans.* (1830) 287-.
- Neumann, F. E. Pogg. A.* 26 (1832) 89-.
- Jamin, J. C. R.* 21 (1845) 430-.
- Powell, B. Phil. Trans.* (1845) 269-.
- Jamin, J. C. R.* 22 (1846) 477-; 23 (1846) 1103-.
- Quincke, G. A. Ps. C.* 128 (1866) 541-.
- dependent on thickness of metal. *Quincke, G. A. Ps. C.* 129 (1866) 207-.
- instrument for measuring. *MacCullagh, J. [1838] Ir. Ac. P.* 1 (1836-40) 158-.
- of radiant heat. *Knoblauch, C. H. D. Nf. B. (*1877) 117*; *A. Ps. C.* 10 (1880) 654-; *Halle Nf. Gs. Festschr.* (1879) 329-; *A. Ps. C.* 19 (1883) 352-; *Ac. Nt. C. N. Acta* 50 (1887) 485-.
- and transmission. *Meslin, —. A. C.* 20 (1890) 56-.
- of visible and ultra-violet rays (vitreous and metallic reflection). *Cornu, A. C. R.* 108 (1889) 917-, 1211-.
- — — — —
- Intensity of light polarised and reflected by metallic surfaces. *Cauchy, A. L. C. R.* 8 (1839) 658-.
- Laws. *MacCullagh, J. [1836] Ir. Ac. P.* 1 (1836-40) 2-.
- Metallic films, reflection and refraction by. *Jochmann, E. A. Ps. C. (Ergänz.)* 5 (1871) 620-.
- lustre. *Örsted, H. C. Kiøb. Ov.* (1843) 47-; *Pogg. A.* 60 (1843) 49-.
- — — — —, *Brücke, E. Wien SB.* 43 (Ab. 2) (1861) 177-.
- — — — —, *Spring, W. Brux. Ac. Bl.* 16 (1888) 53-.
- — and indirect vision. *Kirschmann, A. Ph. Stud.* 11 (1895) 147-.
- reflection and dispersion. *Mouton, L. C. R.* 86 (1878) 45-.
- refraction and dispersion. *Du Bois, H. E. J. G., & Rubens, H. Berl. Ak. Sb.* (1890) 955-.
- — — — —, *Shea, D. A. Ps. C.* 47 (1892) 177-.
- Non-metallic substances, metallic reflection. *Stokes, G. G. Ph. Mg.* 6 (1853) 393-.

- Polarised heat-rays, reflection. *Mouton, L.* C. R. 84 (1877) 650-; A. C. 13 (1878) 229-.
- light, reflection. *Haughton, S.* [1862] *Phil. Trans.* (1863) 81-.
- —, changes produced by. *Senarmont, H. de.* A. C. 73 (1840) 337-.
- Polarising angle of metals, method of measuring. *Knoblauch, —.* D. Nf. Tbl. (1884) 69-; A. Ps. C. 24 (1885) 258-.
- Reflective power of metallic surfaces. *Conroy, (Sir) J.* R. S. P. 36 (1884) 187-; 37 (1884) 36-.
- — — —, at different incidences. *Cauchy, A. L.* C. R. 8 (1839) 553-.
- — — — metals and dispersion of sylvine. *Trowbridge, A.* A. Ps. C. 65 (1898) 595-.
- — — —, electro-deposited. *Cowper-Coles, S.* *Elect.* 44 (1900) 267.
- — — — plane metallic specula. *Potter, R.* *Edinb. J. Sc.* 3 (1830) 278-.
- — — — silvered glass mirrors. *Wolf, C. C.* R. 74 (1872) 441-.
- — — — (Wolf). *Delanay, C. E.* C. R. 74 (1872) 508-.
- — — — and metals. *Hagen, E., & Rubens, H.* *Berl. Ps. Gs. Vh.* (1898) 143-; A. Ps. 1 (1900) 352-.
- Selective and metallic reflection. *Basset, A. B.* [1891] *L. Mth. S. P.* 23 (1892) 4-.
- reflection of metals. *Rubens, H.* A. Ps. C. 37 (1889) 249-.
- Surface films, reflection from. *Drude, P.* *Gött. Nr.* (1888) 275-; A. Ps. C. 36 (1889) 532-, 865-.
- Theory. *Lloyd, H.* B. A. Rp. (1843) (pt. 2) 6-.
- Total and metallic reflection of isotropic media. *Ketteler, E.* A. Ps. C. 22 (1884) 590-.
- Transparency of red-hot iron. *Secchi, A. C.* R. 64 (1867) 778-.
- Vitreous and metallic reflection. *Potier, A.* *As. Fr. C. R.* 1 (1872) 308-.

3850 Selective Reflection and Absorption, including Objective Colours. Dichroism. Anomalous Dispersion.

(See also 3240, 4200; Chemistry 7320.)

- Absorbing isotropic and anisotropic media, passage of light between. *Ketteler, E.* [1878] *Bonn NH. Vr. Vh.* 36 (1879) 14-.
- — — — medium, theory of light in. *Voigt, W.* A. Ps. C. 31 (1887) 233-.
- — — — media, law of refraction for. *Du Bois, H. E. J. G., & Rubens, H.* A. Ps. C. 47 (1892) 203-.
- — — — power of black surface. *Ångström, K.* *Stockh. Öfv.* (1898) 283-; *Fschr. Ps.* (1898) (Ab. 2) 364-.
- — — — thin metallic lamina. *Bloch, S.* C. R. 117 (1893) 661-, 714.

- Absorptiometer. *Schuster, A.* *Manch. Lt. Ph. S. P.* 15 (1876) 74-.
- Actinic rays, permeability of matter by. *Hunt, R.* *Ph. Mg.* 16 (1840) 138-.
- Actinometry applied to measure of resistance of colours to light. *Doane, P.* *Mulhouse S. In. Bl.* 70 (1900) 207-.
- Analysis of solar light, new (indicating three primary colours). *Brewster, (Sir) D.* [1831] *Edinb. R. S. T.* 12 (1834) 123-.
- — — — (Brewster). *Airy, G. B.* *Ph. Mg.* 30 (1847) 73-.
- — — — (Airy). *Brewster, (Sir) D.* *Ph. Mg.* 30 (1847) 153-.
- — — —, Brewster's. *Zambra, B.* *Ven. At.* (1858-59) 11-.
- — — —, —. *Bizio, B.* *Ven. At.* (1858-59) 375-.
- — — —, —, and synthesis. *Powell, B.* [1846] *Ashmol. S. P.* 2 (1843-52) 171-.

ANOMALOUS DISPERSION.

- Powell, B.* B. A. Rp. (1847) (pt. 2) 37-.
- Kundt, A.* A. Ps. C. 142 (1871) 163-; 143 (1871) 149-, 259-; 144 (1872) 128-.
- Talbot, W. H. F.* [1871] *Edinb. R. S. P.* 7 (1872) 408-.
- Tait, P. G.* [1871] *Edinb. R. S. P.* 7 (1872) 410-.
- Kundt, A.* A. Ps. C. 145 (1872) 67-, 164-.
- Meyer, O. E.* A. Ps. C. 145 (1872) 80-.
- Radau, R.* *Mon. Sc.* 18 (1876) 334-.
- Hurion, A.* *Par. Ec. Norm. A.* 6 (1877) 367-.
- Klercker, C. E. de.* [1879] *Stockh. Ak. Hndl. Bh.* 5 (1878-80) No. 20, 9 pp.; C. R. 89 (1879) 734-.
- Sieben, G.* A. Ps. C. 8 (1879) 137-.
- Ketteler, E.* A. Ps. C. 11 (1880) 210-.
- Kiessling, K. J.* [1883] *Hamb. Mth. Gs. Mt.* 1 (*1889) 57, 59-.
- Klercker, C. E. de.* [1887] *Stockh. Ak. Hndl.* 22 (1886-90) No. 3, 35 pp.
- Bloch, S.* C. R. 116 (1893) 746-.
- König, W.* *Frkf. a. M. Ps. Vr. Jbr.* (1893-94) 29-.
- Petrushevskij, T.* *Rs. Ps.-C. S. J.* 28 (Ps.) (1896) 91-; *Fschr. Ps.* (1896) (Ab. 2) 38.
- absorbing substances. *Pflüger, A.* A. Ps. C. 58 (1896) 670-.
- and absorption in doubly refracting media, theory. *Ketteler, E.* [1876] A. Ps. C. (*Ergänz.*) 8 (1878) 444-.
- — — —, especially of fuchsine, theory. *Voigt, W.* *Gött. Nr.* (1884) 261-.
- — — —, relations. *Kundt, A.* A. Ps. C. (*Jubelbd.*) (1874) 615-.
- acute prisms. *Lang, V. von.* A. Ps. C. 143 (1871) 262-.
- carbon. *Wood, R. W.* [1900] *L. Ps. S. P.* 17 (1901) 657-.
- coloured glass. *Winkelmann, A.* A. Ps. C. 40 (1890) 661-.
- curve of medium with more than one absorption band. *Ketteler, E.* A. Ps. C. 1 (1877) 340-.

3850 Anomalous Dispersion

- cyanine. *Lang, V. von.* [1881] Wien Ak. Sb. 84 (1882) (Ab. 2) 361-.
- (*Lang*). *Sieben, G.* Carl Rpm. 18 (1882) 737-.
- *Wood, R. W.* Ph. Mg. 46 (1898) 380-.
- *Magnusson, C. E.* [1900] Wisc. Un. Bil. (Sc.) 2 (1901) 247-.
- , solid, test of Cauchy's formulæ of metallic reflection. *Pfûger, A.* A. Ps. C. 65 (1898) 214-.
- experiments with aid of interference. *Osno-bischin, G. von, & Mach, E.* Wien Az. 12 (1875) 51-, 82-.
- fast dyes, curves of some. *Pfûger, A.* A. Ps. C. 56 (1895) 412-.
- , test of Ketteler-Helmholtz theory. *Pfûger, A.* A. Ps. C. 65 (1898) 173-, 225-.
- fuchsine. *Christiansen, C.* A. Ps. C. 146 (1872) 154-.
- solutions. *Šeglaev, I.* J. de Ps. 4 (1895) 546-; Rs. Ps.-C. S. J. 28 (Ps.) (1896) 43-; J. de Ps. 6 (1897) 604-.
- incandescent metallic vapours. *Winkelmann, A.* A. Ps. C. 32 (1887) 439-.
- — — and coloured glass. *Winkelmann, —.* D. Nf. Tbl. (1887) 83.
- sodium vapour. *Kundt, A.* A. Ps. C. 10 (1880) 321-.
- — —. *Becquerel, H.* C. R. 128 (1899) 145-.
- in infra-red. *Aschkinass, E.* A. Ps. 1 (1900) 42-; Ps. Z. 1 (1900) 53-.
- iodine vapour. *Leroux, F. P.* C. R. 55 (1862) 126-.
- laws. *Ketteler, E.* (viii) A. Ps. C. (*Jubelbd.*) (1874) 166-.
- mechanical analogue. *Glazebrook, R. T. B.* A. Rp. (1893) 688-.
- and normal, theory. *Lommel, E. C. J.* Erlang. Ps. Md. S. Sb. 10 (1878) 65-.
- plates and prisms. *Govi, G.* Tor. At. Ac. Sc. 7 (1871-72) 362-.
- reflection and refraction by bodies having. *Bloch, R. S.* C. R. 111 (1890) 822-.
- relation between refractive indices and concentration of solution and temperature. *Sieben, G.* Giessen Oberh. Gs. B. 23 (1884) 140-.
- singly and doubly refracting media, theory. *Ketteler, E.* Bonn NH. Vr. Vh. 33 (1876) 197-.
- and solar phenomena. *Julius, W. H.* Amst. Ak. Vs. 8 (1900) 510-; Amst. Ak. P. 2 (1900) 575-.
- certain substances. *Soret, J. L.* Arch. Sc. Ps. Nt. 40 (1871) 280-; 44 (1872) 81-.
- , explanation. *Sellmeier, W.* A. Ps. C. 143 (1871) 272-.
- theory. *Helmholtz, H. L. F. von.* Berl. Ak. Mb. (1874) 667-.
- *Rayleigh, (Lord).* Ph. Mg. 48 (1899) 151-.
- and total reflection, experiments. *Mach, E., & Arbes, J.* Wien Ak. Sb. 92 (1886) (Ab. 2) 416-.
- waves. *Gouy, —.* C. R. 111 (1890) 33-; A. C. 24 (1891) 145-.

Selective Reflection, etc. 3850

- Apparatus for examination of light reflected from different bodies (erythrotyloscope). *Simmeler, R. T.* Pogg. A. 115 (1862) 593-.
- Black not a colour. *Osann, G.* [1859] Würzb. Vh. 10 (1860) 1-.
- lustrous surface, production by combination of colourless transparent bodies. *Dove, H. W.* Berl. Mb. (1863) 397-.
- Blue light of grotto of Capri, cause. *Melloni, M.* Nap. Rd. 5 (1846) 363-.
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- Colour and mechanical state, effect on radiant heat. *Tyndall, J.* Phil. Trans. 156 (1866) 83-.
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— — — (Janovsky). *Brühl, J. W.* Berl. B. 14 (1881) 1306-.

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— *Brühl, J. W.* Berl. B. 30 (1897) 158-.

— — of high dispersive power. *Nasini, R.* Rm. R. Ac. Linc. Rd. 3 (1887) (Sem. 1) 128-, 164-.

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Wien D. 11 (1856) (*Ab.* 2) 41-.
- Theory. *Fresnel*, A. J. Par. S. Phlm. Bil.
(1824) 147-.
- , *Challis*, J. [1846] Camb. Ph. S. T. 8
(1849) 371-.
- , *Billet*, [F.] Dijon Ac. Mm. 1 (1851) 73-.
- , *Plana*, G. (viii) Tor. Mm. Ac. 18 (1859)
lxii.
- , *Kölp*, L. Arch. Mth. Ps. 48 (1868) 78-.
- , mathematical. *Laurent*, P. A. C. R. 19
(1844) 329-.
- , —. *Issaly*, (*l'abbé*) —. Bordeaux S. Sc.
Mm. 4 (1894) 165-.
- , mechanical. *MacCullagh*, J. [1841] Ir.
Ac. P. 2 (1840-44) 139-.

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- Babinet*, J. C. R. 29 (1849) 514-.
- Haidinger*, W. Wien SB. 8 (1852) 52-.
- (*Stokes.*) *Haidinger*, W. Wien SB. 12 (1854)
685-.
- Stokes*, G. G. Wien SB. 12 (1854) 686-.
- [*Beer*, A. non] *Haidinger*, W. Wien SB. 15
(1855) 6-.
- Holtzmann*, C. H. A. Pogg. A. 99 (1856) 446-.
- Moigno*, F. B. A. Rp. (1857) (*pt.* 2) 9-.
- Challis*, J. Ph. Mg. 17 (1859) 102-.
- Bartlett*, W. H. C. Silliman J. 30 (1860)
361-.
- Lorenz*, L. Sk. Nf. F. 8 (1860) 473-.
- Briot*, C. C. R. 52 (1861) 393-.
- Quincke*, G. Berl. Mb. (1862) 714-.
- Landur*, N. Presse Sc. 1 (1863) 418-.
- Mascart*, É. C. R. 63 (1866) 1005-.
- Ketteler*, E. A. Ps. C. 1 (1877) 206-, 556-.
- Réthy*, M. [1880] (xii) Mag. Tud. Ak. Étk.
(*Mth.*) 7 (1881) (No. 16) 17 pp.
- Geigel*, R. Würzb. Ps. Md. Vh. 23 (1890)
(29)-.
- Wiener*, O. A. Ps. C. 40 (1890) 203-, 744.
(*Wiener's experiment.*) *Drude*, P. A. Ps. C.
41 (1890) 154-; 48 (1893) 119-.
- (—) *Cornu*, A. C. R. 112 (1891) 186-.
- (—) *Poincaré*, H. C. R. 112 (1891) 325-.
- (—) (*Poincaré.*) *Berthelot*, —. C. R. 112
(1891) 329-.
- (—) (—) *Cornu*, A. C. R. 112 (1891)
365-.
- (—) (—) *Potier*, A. C. R. 112 (1891)
383-.

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- Carvalho, E. C. R.* 112 (1891) 431-.
- Drude, P. A. Ps. C.* 43 (1891) 177-.
- (Wiener's experiment.) *Gilbert, P. Rv. Quest. Sc.* 30 (1891) 225-, 558-.
- Lommel, E.* [1891] *Münch. Ak. Sb.* 21 (1892) 181-.
- (Wiener's experiment.) *Potier, A. J. de Ps.* 10 (1891) 101-.
- connection with diffraction. *Eisenlohr, F. Pogg. A.* 104 (1858) 337-.
- , —, *Stokes, G. G. Ph. Mg.* 18 (1859) 426-.
- determination by diffraction. *Lorenz, L. Pogg. A.* 111 (1860) 315-.
- , —, *Gilbert, P. C. R.* 64 (1867) 161-.
- dispersion in doubly refracting crystals. *Carvalho, E. Par. S. Ps. Sé.* (1890) 76-.
- reflection and refraction. *Lorenz, W. Pogg. A.* 114 (1861) 238-.
- in doubly refracting crystals. *Ebner, V. von. Z. Ws. Mkr.* 9 (1892) 289-.
- 2 hypotheses, probability. *Haidinger, W.* [1854] *Wien SB.* 15 (1855) 86-.
- Vibrations of light, theory. *Biot, J. B. Par. Mm. de l'I.* (1812) (pte. 2) 1-.
- in non-polarised and partially polarised light, nature. *Lippich, F. Wien SB.* 48 (1863) (Ab. 2) 146-.
- of plane polarised light. *Rankine, W. J. M. Ph. Mg.* 1 (1851) 441-.
- — — at right angles to plane of polarisation. *Cauchy, A. L. C. R.* 29 (1849) 645.
- , transverse, of crystalline disk. *Sundberg, E. Stockh. Öfv.* (1885) (No. 5) 77-; *Fschr. Mth.* (1885) 965.
- , —, light. *Wright, L. Nt.* 21 (1880) 370.
- Wave surface, Fresnel's, Hamilton's singular points on. *Booth, W.* [1896] *Dubl. S. Se. P.* 8 (1893-98) 381-.
- , optical properties. *Mannheim, A. C. R.* 81 (1875) 369-; *As. Fr. C. R.* (1875) 231-; *C. R.* 82 (1876) 368-; 122 (1896) 708-.
- theory applied to polarisation. *Osann, G.* [1857] *Würzb. Vh.* 8 (1858) 153-.
- Waves, plane, propagation in incompressible medium, and double refraction. *Kohl, E. Mh. Mth. Ps.* 10 (1899) 343-.
- , —, — system of molecules. *Cauchy, A. L. C. R.* 7 (1838) 865-.

4005 Elliptic and Circular Polarisation. General.

CIRCULAR POLARISATION.

- Dove, H. W. Pogg. A.* 35 (1835) 579-.
- Brezina, A. Wien Sb.* 60 (1870) 891-.
- of amethyst. *Brewster, (Sir) D.* [1819] *Edinb. R. S. T.* 9 (1823) 139-.
- cinnabar. *Descloizeaux, A. C. R.* 44 (1857) 876-, 909-.
- circular polarisation, determination of sense of circular vibration. *Cotton, A. J. de Ps.* 7 (1898) 81-.

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- circularly polarised light, interference fringes with. *Billet, [F.] Dijon Ac. Mm.* 2 (1852-53) (pte. 2) 147-.
- — —, phenomena, and new apparatus. *Soleil, H. C. R.* 40 (1855) 1058-.
- — —, —, — (Soleil). [*Bertin, A. non*] *Nörreberg, —. A. C.* 20 (1870) 214-.
- ray of light, production of magnetic field by. *Righi, A. Rm. R. Ac. Linc. Rd.* 8 (1899) (*Sem.* 1) 325-.
- polarising media, reflection from. *Voigt, W. A. Ps. C.* 30 (1887) 190-.
- — — and refraction at boundary. *Voigt, W. A. Ps. C.* 21 (1884) 522-, 712-.
- — —, theory. *Clebsch, A. Crelle J.* 57 (1860) 319-.
- and double refraction, joint effect. *Wiener, O. A. Ps. C.* 35 (1888) 1-.
- of heat by reflection. *Forbes, J. D. Ph. Mg.* 8 (1836) 246-.
- production by mica plates. *Pfaff, I. B. A. F. Münch. Ak. Sb.* 6 (1876) 211-.
- related to symmetry of homogeneous structures. *Barlow, W. Ph. Mg.* 43 (1897) 110-.
- of sodium chlorate. *Marbach, H. Bresl. Schl. Gs. Übs.* (1854) 17-; *Pogg. A.* 91 (1854) 482-.
- Circularly and elliptically polarised light, distinction of positive and negative uniaxial crystals in. *Dove, H. W. Pogg. A.* 40 (1837) 457-, 482-.
- — — polarising media, theory. *Ketteler, E. A. Ps. C.* 16 (1882) 86-.
- Elliptic and circular and plane polarisation. *Flesch, J. Grunert Arch.* 4 (1844) 1-.
- — — polarisation in crystals. *Krejčí, J. Prag Sb.* (1887) (*Mth.-Nt.*) 401-.

ELLIPTIC POLARISATION.

- Powell, B.* [1833-44] *Ashmol. S. P.* 1 (1844) No. 2, 3-; *B. A. Rp.* (1842) (pt. 2) 13; *Ashmol. S. P.* 2 (1854) No. 21, 47-, 98-; *B. A. Rp.* (1844) (pt. 2) 7-.
- Dale, J. B. A. Rp.* (1846) (pt. 2) 5.
- Mouton, L. Par. S. Ps. Sé.* (1875) 32-.
- Sissingh, R. Arch. Néerl.* 20 (1886) 171-.
- cause. *Tovey, J. Ph. Mg.* 12 (1838) 10-.
- connection of wave theory with. *Powell, B. B. A. Rp.* (1839) (pt. 2) 2-.
- determination of axes. *Hecht, B. A. Ps. C.* 20 (1883) 426-.
- ellipsoid of polarisation relative to electromagnetic waves in selenite, and elliptic polarisation of waves. *Righi, A. Rm. R. Ac. Linc. Rd.* 6 (1897) (*Sem.* 1) 207-.
- elliptic rays, analysis. *Croullebois, M. C. R.* 79 (1874) 470-.
- — —, interference. *Croullebois, M. C. R.* 77 (1873) 1269-; *A. C.* 4 (1875) 406-.
- vibrations in rotatory, doubly refracting medium. *Lefebvre, P. J. de Ps.* 1 (1892) 121-.
- geometrical representation. *Lafay, A. J. de Ps.* 4 (1895) 178-.

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- of heat, by reflection from metals. *Knoblauch, C. H.* D. Nf. B. (*1877) 117; A. Ps. C. 10 (1880) 654-; Halle Nf. Gs. Festschr. (1879) 329-; A. Ps. C. 19 (1883) 352-; Ac. Nt. C. N. Acta 50 (1887) 485-.
- — — total reflection. *Knoblauch, H.* Ac. Nt. C. N. Acta 55 (1891) 281-.
- intensity of light when vibration is elliptical. *MacCullagh, J.* Edinb. J. Sc. 5 (1831) 86-.
- measurement of elements. *Meslin, G. J.* de Ps. 9 (1890) 436-.
- — — (Meslin). *Bouasse, —.* J. de Ps. 10 (1891) 61-.
- in quartz. *Tovey, J.* Ph. Mg. 14 (1839) 169-, 321-.
- — — *Hecht, B. A.* Ps. C. 30 (1887) 274-.
- by reflection. *Powell, B.* Phil. Trans. (1843) 35-; Pogg. A. 72 (*Ergänz.*) (1848) 285-.
- — — (total). *Quincke, G. A.* Ps. C. 127 (1866) 199-.
- — — (ordinary). *Quincke, G. A.* Ps. C. 128 (1866) 355-.
- — — *König, W. A.* Ps. C. 17 (1882) 1016-.
- — — from calcite. *Schmidt, K. E. F.* A. Ps. C. 37 (1889) 353-; 38 (1889) 676-.
- — — at crystalline surfaces. *Schenck, E. A.* Ps. C. 15 (1882) 177-.
- — — from metals. *Biot, J. B.* A. C. 94 (1815) 209-.
- — — *Brewster, (Sir) D.* Phil. Trans. (1830) 287-.
- — — *Neumann, F. E.* Pogg. A. 26 (1832) 89-.
- — — *Jamin, J.* C. R. 21 (1845) 430-.
- — — *Powell, B.* Phil. Trans. (1845) 269-.
- — — *Jamin, J.* C. R. 22 (1846) 477-; 23 (1846) 1103-.
- — — *Quincke, G. A.* Ps. C. 128 (1866) 541-.
- — — (polarisation of visible and ultra-violet rays). *Cornu, A.* C. R. 108 (1889) 917-, 1211-.
- — — dependent on thickness of metal. *Quincke, G. A.* Ps. C. 129 (1866) 207-.

REFLECTION AT TRANSPARENT MEDIA, ELLIPTIC POLARISATION BY.

- Potier, A.* C. R. 75 (1872) 617-.
- (Potier.) *Quincke, G. A.* Ps. C. 148 (1873) 311-; 149 (1873) 571-.
- (Quincke.) *Potier, A. A.* Ps. C. 148 (1873) 650-.
- Cornu, A.* C. R. 86 (1873) 649-.
- Ryn van Alkemade, A. C. van.* A. Ps. C. 20 (1883) 22-.
- Wernicke, W.* A. Ps. C. 30 (1887) 452-.
- (Wernicke.) *Voigt, W.* A. Ps. C. 31 (1887) 326-.
- (Voigt.) *Wernicke, W.* A. Ps. C. 31 (1887) 1028-.
- (Wernicke.) *Voigt, W.* A. Ps. C. 32 (1887) 526-.
- Potier, A.* C. R. 108 (1889) 599-.
- (Polarisation of visible and ultra-violet rays.) *Cornu, A.* C. R. 108 (1889) 917-, 1211-.

- Schmidt, K. E. F.* Berl. Ak. Sb. (1893) 1041-; A. Ps. C. 51 (1894) 417-; 52 (1894) 75-.
- Drude, P. A.* Ps. C. 53 (1894) 69-.
- (Drude.) *Schmidt, K. E. F.* A. Ps. C. 53 (1894) 769-.
- (Schmidt.) *Drude, P. A.* Ps. C. 54 (1895) 191-.
- at incidence near polarising angle. *Mathieu, É. L.* Liouv. J. Mth. 7 (1881) 219-.
- by refraction through metal. *Rollmann, W.* Pogg. A. 90 (1853) 188-.
- relation to surface colour. *Wiedemann, E.* Leip. B. 24 (1872) 263-.
- — — experiments. *Merkel, J. A.* Ps. C. 19 (1883) 1-.
- theory. *Challis, J.* Ph. Mg. 17 (1859) 285-.
- by transmission through, and reflection from, metallic films. *Meslin, —.* A. C. 20 (1890) 56-.
- — — transparent metallic films. *Meslin, G.* C. R. 106 (1888) 197-.

4010 Production of Polarised Radiation.

- Beam of light compounded of 4 polarised beams. *Almeida, C. A. M. de.* [1877] Lisb. J. Sc. Mth. 6 (1878) 34-.
- Experiments, optical. *Merz, L.* Pogg. A. 63 (1844) 49-.
- Lamellar polarisation. *Biot, J. B.* C. R. 12 (1841) 967-; 13 (1841) 391-; Par. Ac. Sc. Mm. 18 (1842) 539-.
- — so-called, of alum. *Reusch, E.* Berl. Mb. (1867) 424-.
- Pile of plates, intensity of light reflected from or transmitted through. *Stokes, G. G. R.* S. P. 11 (1860-62) 545-.
- — — (glass), intensity of light transmitted. *Erhard, T.* A. Ps. C. 12 (1881) 655-.
- Plates, thin, light reflected and transmitted by. *Lloyd, H.* [1859] (viii) Ir. Ac. T. 24 (1871) 3-.
- Polarisation of chemical rays of light by double refraction, reflection, and repeated single refraction. *Sutherland, J.* Ph. Mg. 19 (1841) 52-.
- — convergent light. *Quesneville, G.* Mon. Sc. 2 (1888) 225-.
- — by crystals. *Biot, J. B.* C. R. 13 (1841) 155-.
- — diffraction. *Ezner, K.* Wien Ak. Sb. 99 (1891) (Ab. 2a) 761-; 101 (1892) (Ab. 2a) 190-; A. Ps. C. 49 (1893) 387-.
- — — *Poincaré, H.* Acta Mth. 16 (1892-93) 297-; 20 (1897) 313-.
- — emission. *Violle, J.* C. R. 105 (1887) 111-; Par. S. Ps. Sé. (1888) 18-.

POLARISATION OF HEAT.

- Bérard, J. É.* A. C. 85 (1813) 309-.
- (alleged.) *Powell, B.* Edinb. J. Sc. 3 (1830) 297-; 5 (1831) 206-.
- Forbes, J. D.* Ph. Mg. 7 (1835) 349-; C. R. 2 (1836) 156; 6 (1838) 705-.

Melloni, M. C. R. 3 (1836) 133-; A. C. 61 (1836) 375-; 65 (1837) 5-; C. R. 5 (1837) 530-.

Forbes, J. D. [1838] Edinb. R. S. T. 14 (1840) 176-.

(Forbes and Melloni.) *Melloni, M.* A. C. 68 (1838) 107-.

Desains, P., & La Provostaye, F. de. C. R. 29 (1849) 121-; A. C. 27 (1849) 109-; C. R. 29 (1849) 757-; 33 (1851) 444-; A. C. 34 (1852) 192-.

(and its passage through parallel plates.) *Mag-nus, G.* Berl. Mb. (1866) 62-; (1868) 158-, 249-.

Tyndall, J. Ph. Mg. 39 (1870) 280-.

Foster, G. C. L. Ps. S. P. 2 (1879) 143-; Ph. Mg. 3 (1877) 261-.

by double refraction. *Knoblauch, H.* Pogg. A. 74 (1849) 177-.

— progressive rotation. *Biot, J. B., & Melloni,* —. C. R. 2 (1836) 194-.

— reflection. *Knoblauch, H.* Pogg. A. 74 (1849) 161-.

— refraction. *Forbes, J. D.* [1835] Edinb. R. S. T. 13 (1836) 181-, 446-.

— —. *Melloni, M.* C. R. 2 (1836) 140-.

— simple refraction. *Knoblauch, H.* Pogg. A. 74 (1849) 170-.

— —. *Desains, P., & La Provostaye, F. de.* C. R. 31 (1850) 19-; A. C. 30 (1850) 159-.

— tourmaline. *Melloni, M.* C. R. 2 (1836) 95-; (vi *Adds.*) Bb. Un. 60 (1835) 367-.

— wire gratings. *Du Bois, H. E. J. G., & Rubens, H.* Berl. Ak. Sb. (1892) 1129-; A. Ps. C. 49 (1893) 593-.

Polarisation by living animals. *Goddard, J. F.* (vi *Adds.*) Ph. Mg. 15 (1839) 152-.

— oblique transmission. *Brewster, (Sir) D.* Phil. Trans. (1814) 219-.

— of obliquely emitted rays. *Uljanin, W. von.* Berl. Ps. Gs. Vh. (1895) 40-.

— — — — —, and Lambert's law. *Uljanin, W. von.* A. Ps. C. 62 (1897) 528-.

— — — — —. *Koláček, F.* A. Ps. C. 64 (1898) 398-, 812.

— — — — —. *Uljanin, V.* Kazan Un. Mm. (1899) (*Pts.* 7 & 8) 185-; *Fschr.* Ps. (1899) (*Ab.* 2) 42.

POLARISATION BY PARTICULAR SUBSTANCES.

American oil of turpentin. *Mahla, F.* Silliman J. 32 (1861) 107-.

Aragonite. *Dove, H. W.* Pogg. A. 114 (1861) 169-.

Glacier ice. *Müller, Joh. Sch. Nf. Gs. Vh.* 55 (1872) 258-; A. Ps. C. 147 (1872) 624-.

Iodine crystals. *Conroy, (Sir) J.* [1876] R. S. P. 25 (1877) 51-.

Mica. *Forbes, J. D. B. A. Rp.* (1839) (*pt.* 2) 6-.

—, gypsum, etc. *Kobell, F. von.* Pogg. A. 20 (1830) 342-, 412-.

Mother-of-pearl. *Brewster, (Sir) D.* Phil. Trans. (1814) 397-.

Organic substances. *Steeg, W.* Pogg. A. 111 (1860) 511-.

Quinine sulphato-periodide (herapathite). *Hera-path, W. B.* Ph. Mg. 3 (1852) 161-; 6 (1853) 346-; 7 (1854) 352-.

— — — — —. *Hauers, R.* Z. C. 1 (1865) 481-.

Tesseral crystals, optical anomalies. *Ben-Saude, A.* Portugal Trab. Gl. Com. 1 (*1883-87) 15-.

Tourmaline. *Biot, J. B.* A. C. 94 (1815) 191-.

— *Breithaupt, A.* Gilbert A. 64 (1820) 424-.

Polarisation by pressure. *Biot, J. B.* A. C. 3 (1816) 386-; *Par. S. Phlm. Bil.* (1816) 49-.

POLARISATION BY REFLECTION.

Malus, É. L. Par. Mm. de l'I. (1810) (*pte.* 2) 105-; *Gilbert A.* 37 (1811) 109-.

(Transparent bodies.) *Brewster, (Sir) D.* Phil. Trans. (1815) 125-.

Brewster's law, geometric interpretation. *Grolous, J.* Par. S. Phlm. Bil. 1 (1877) 146-.

Case. *Quetelet, L. A. J.* Quetelet Cor. Mth. 3 (1827) 30-.

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Incomplete polarisation at bounding surface of certain media by reflection of simple ray. *Cauchy, A. L.* C. R. 9 (1839) 727-.

Media in which simple ray may be completely polarised. *Cauchy, A. L.* C. R. 9 (1839) 726-.

Modifications of polarised light produced by reflection. *Fresnel, A. J.* [1823] Par. S. Phlm. Bil. (1823) 29-; *Par. Mm. Ao. Sc.* 11 (1832) 393-.

Partial polarisation, law. *Brewster, (Sir) D.* Phil. Trans. (1830) 69-.

— — — — — (Brewster). *Brandes, H. W.* Kastner Arch. Ntl. 24 (1832) 312-.

— — — — — by total reflection. *Geigel, R.* A. Ps. C. 68 (1899) 698-.

Polarisation by diffuse reflection. *Govi, G.* C. R. 51 (1860) 360-; *Pogg. A.* 111 (1860) 349-.

— — — — —. *Soret, J. L.* Arch. Sc. Ps. Nt. 48 (1873) 231-; 50 (1874) 243-; C. R. 78 (1874) 1299-; 79 (1874) 35-.

— — — — — from turbid media. *Hurion, A.* C. R. 114 (1892) 910-; A. C. 7 (1896) 456-.

— — — — — reflection at crystal surfaces. *MacCullagh, J.* Ph. Mg. 8 (1836) 103-.

— — — — —. *Seebeck, A.* Pogg. A. 38 (1836) 276-.

— — — — —. *Kelland, P.* [1840] Edinb. R. S. T. 15 (1844) 37-.

— and reflection by crystals, relations. *Biot, J. B.* Par. Mm. de l'I. (1811) 135-.

— by reflection from doubly-refracting plates. *Babinet, J.* C. R. 61 (1865) 705-.

— — — — — glass. *Desains, É.* C. R. 31 (1850) 676-; A. C. 31 (1851) 286-.

— — — — — hard rubber. *Brûère, A. H.* Ps. Rv. 6 (1898) 140-.

— — — — — Iceland spar. *Brewster, (Sir) D.* Phil. Trans. (1819) 145-.

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- Polarisation by reflection from Iceland spar. *Conroy, (Sir) J.* R. S. P. 40 (1886) 173-.
- — — — — rough surfaces. *Desains, P., & La Provostaye, F. de.* C. R. 33 (1851) 444-; A. C. 34 (1852) 192-.
- — — — — *Gouy,* —. C. R. 98 (1884) 978-.
- — — — — *Lafay, A.* C. R. 119 (1894) 154-; A. C. 16 (1899) 503-.
- — — — — and white surfaces. *Brewster, (Sir) D. B. A. Rp.* (1844) (pt. 2) 11; Edinb. R. S. T. 23 (1861) 205-.
- — — — — surfaces of low refractive index. *Cornu, A.* As. Fr. C. R. 11 (1882) 221-.
- — — — — repeated reflection. *Dove, H. W.* A. Ps. C. 132 (1867) 474-.
- Polarised condition of coloured reflected light. *Haidinger, W.* Haidinger B. 1 (1847) 27-.
- Polarising angle in calcspar. *Seebeck, A.* Pogg. A. 21 (1831) 290-; 22 (1831) 126-.
- — — — — fuchsine. *Glan, P.* A. Ps. C. 7 (1879) 321-.
- — — — — and refractive index, relation between. *Seebeck, A.* Pogg. A. 20 (1830) 27-.
- Transparent bodies, property of light reflected by. *Malus, É. L.* Par. S. Phlm. Bil. 1 (1808) 266-; *Arcueil* Mm. Ps. 2 (1809) 143-.
- — — — — (Malus). *Tralles, J. G.* Gilbert A. 31 (1809) 294-.
- Polarisation by reflection and refraction. *Malus, É. L.* Par. Mm. de l'I. (1810) (pte. 2) 112-.
- — — — — *Mossotti, O. F.* Amici G. Tosc. 1 (1840) 330-.
- — — — — : polarisation planes of incident reflected and refracted rays. *Cornu, A. C.* R. 56 (1863) 87-.
- — — — — or refraction at surface of separation of 2 isophanous bodies. *Cauchy, A. L. C.* R. 9 (1839) 676-.
- — — — — refraction, laws. *Brewster, (Sir) D.* Phil. Trans. (1830) 133-.
- — — — — simple refraction. *Bohn, C.* Pogg. A. 117 (1862) 117-.
- — — — —, laws. *Pfaff, F.* Pogg. A. 114 (1861) 173-.
- — — — — of undiffracted light by grating. *Du Bois, H. E. J. G.* A. Ps. C. 48 (1893) 546-.
- Propagation and polarisation of light in crystals. *Sarrau, É.* C. R. 60 (1865) 1174-; *Liouv. J.* Mth. 12 (1867) 1-; 13 (1868) 59-.
- Successive polarisation, experiments. *Wheatstone, (Sir) C.* R. S. P. 19 (1871) 381-.
- — — — — (Wheatstone). *Spottiswoode, W.* Ph. Mg. 41 (1871) 398-.
- — — — — in homogeneous liquids. *Biot, J. B.* Par. S. Phlm. Bil. (1815) 190-.

4020 Measurement of Polarised Radiation.

- Crystals, angle of extinction in, variation. *Cesaro, G.* Brux. Mm. Cour. 4^e, 54 (1896) No. 3, 26 pp.
- — — — —, doubly refracting, application. *Wulff, L.* Z. Instk. 17 (1897) 292-.

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- Degree of polarisation of light refracted through 4 parallel plates, table to determine. *Adams, W. G.* As. S. M. Not. 31 (1871) 162-.
- — — — — in reflected or transmitted light, determination. *Adams, W. G.* Ph. Mg. 41 (1871) 205-.
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—, —, specific rotatory power. *Landolt, H. H.* Berl. B. 9 (1876) 914–.

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—, —, rotatory power, and Reusch's mica combination. *Sohncke, L. D. Nf. Tbl.* (*1875) 52–; A. Ps. C. (Ergänz.) 8 (1878) 16–.

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—, —, possessing opposite rotatory powers for rays at opposite ends of spectrum. *Jellet, J. H.* [1866] Ir. Ac. P. 9 (1867) 530–.

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- and their vapours. *Gernez, D.* C. R. 58 (1864) 1108-; Par. Éc. Norm. A. 1 (1864) 1-.
- Malic acid, anomalous rotatory dispersion. *Nasini, R., & Gemari, G.* Ven. I. At. (1894-95) 915-.
- , optical properties. *Bell, L.* [1885] Am. C. J. 7 (1885-86) 120-.
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- derivatives. *Bouchardat, G.* C. R. 76 (1873) 1550-.
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- , —, —. *Loir, A.* Lyon Ac. Mm. (Sc.) 22 (1876-77) 157-.
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- , —. *Wyrouboff, G.* Par. S. Ps. Sé. (1892) 357-; A. C. 1 (1894) 5-.
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- (Bell and Tainter's experiments.) *Breguet, A. C. R.* 91 (1880) 595-.
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- (Tests with spectra.) *Mercadier, E. C. R.* 91 (1880) 929-, 982; 92 (1881) 409-, 450-, 1224-, 1226-.
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- Visibility, minimum temperature. *Gray, P. L.* L. S. P. 13 (1895) 122-; Ph. Mg. 37 (1894) 549-.
- , —, —. *Pettinelli, P.* Rm. R. Ac. Linc. Rd. 4 (1895) (Sem. 1) 107-.
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4215 Radiation-Pressure.

(See also 3405.)

- Boltzmann, L.* A. Ps. C. 31 (1887) 140.
- Lebedev, P.* Mosc. S. Sc. Bll. 73 (No. 2) (1891) 1-; A. Ps. C. 45 (1892) 292-; Laus. S. Vd. Bll. 35 (1899) xxxv.
- (Maxwell-Bartoli's.) *Lebedev, P.* Rs. Ps.-C. S. J. 32 (Ps.) (1900) 211-; Sc. Abs. 4 (1901) 485.
- Attraction and repulsion, apparent, of light of sun, moon and candles. *Pfaff, C. H.* Schweigger J. 55 (=Jb. 25) (1829) 53-.
- — — of light and heat rays. *Neesen, F.* A. Ps. C. 156 (1875) 144-.
- Mechanical action of radiant heat or light. *Thomson, (Sir) W.* Ph. Mg. 4 (1852) 256-; Edinb. R. S. P. 3 (1857) 108-.
- Repulsive power of heat. *Talbot, W. H. F.* Ph. Mg. 8 (1836) 189-.

4220 Chemical Luminescence.

(See also 6840.)

- Wiedemann, E., & Schmidt, G. C. A. Ps. C. 54 (1895) 604-.
- König, W. Frkf. a. M. Ps. Vr. Jbr. (1895-96) 38.
- Arnold, W. A. Ps. C. 61 (1897) 313-.
- "Albo-carbon light." Pattinson, J. [1882] Newcastle C. S. T. 5 (1883) 135-.
- Animal luminosity, nature. Lupti, A. Genova S. Lig. At. 4 (1893) 325-.
- Arsenious anhydride from hydrochloric acid, luminescence produced by crystallising. Böttger, R. Pogg. A. 43 (1838) 655-.
- Benzene, luminosity when burnt with non-luminous combustible gases. Frankland, E., & Thorne, L. T. C. S. J. 33 (1878) 89-.
- Chlorine, action on metals, light produced by. Böttger, R. Pogg. A. 43 (1838) 655-.
- Coloration, peculiar, manifested by bodies exposed to chemical radiation. Melloni, M. Nap. Rd. 1 (1842) 11-; Mod. S. It. Mm. 23 (1844) (Vis.) 97-.
- Combustion, source of light in. Rumford, B. (Count.) Schweigger J. 9 (1813) 240-.
- Crystallisation, light. Anon. (v) 185) Bb. It. 83 (1836) 139-.
- , optical phenomena attending. Rose, H. Berl. Ab. (1835) 321-; Pogg. A. 52 (1841) 443-, 585-.
- , —, —. Bandrowski, E. Z. Ps. C. 15 (1894) 323-; Krk. Ak. (Mt.-Prz.) Rz. 10 (1896) 337-; 11 (1897) 1-; Z. Ps. C. 17 (1895) 234-; Crc. Ac. Sc. Bil. (1896) 199-.
- Electric discharge and luminescence. Wiedemann, E. Arch. Sc. Ps. Nt. 2 (1896) 516-, 641.
- Fire-fly, photometric efficiency, cheapest form of light. Langley, S. P., & Very, F. W. Am. J. Sc. 40 (1890) 97-.
- Flame of hydrogen or alcohol containing turpentine, light produced by. Hare, R. Silliman J. 2 (1820) 172.
- Flames containing vaporised salts, luminosity. Smithells, A., Dawson, H. M., & Wilson, H. A. [1899] Phil. Trans. (A) 193 (1900) 89-.
- Gas, luminosity increased by carburization at high temperatures. Paquelin, (Dr.)— As. Fr. C. R. (1878) 332-.
- Gases, electrically glowing, absorption of light in. Cantor, M. A. Ps. 1 (1900) 462-.
- , —, —, — (Cantor). Pringsheim, E. A. Ps. 2 (1900) 199-.
- , incandescent, light. Mach, E. Z. Mth. Ps. 9 (1864) 69-.
- , luminosity. Smithells, A. Ph. Mg. 37 (1894) 245-; 39 (1895) 122-.
- Glass, electro- and photo-luminescence. Wiedemann, E. A. Ps. C. 38 (1889) 483-.
- , luminescence due to cathode rays. Burke, J. [1894] L. Ps. S. P. 13 (1895) 287-; Ph. Mg. 39 (1895) 115-.
- Glow-worm and fire-fly, phosphorescence. Herapath, T. J. Chemist 3 (1856) 714-.
- , luminosity. Gothard, J. Wien Pht. Cor. 24 (1887) 443-.
- , —. Muraoka, H. [1896-97] Tōk. Coll. Sc. J. 9 (1895-98) 129-.
- , —. Muraoka, H., & Kasuya, M. A. Ps. C. 64 (1898) 186-.
- , phosphorescent substance from. Carus, C. G. C. R. 59 (1864) 607-.
- , radiation. Henry, C. C. R. 123 (1896) 400-.
- Heated lime and magnesia on charcoal, luminosity. Brewster, (Sir) D. Edinb. Ph. J. 3 (1820) 343-.
- Hydrocarbons, oil, etc., variable light from. Payen, A. Par. S. Phlm. N. Bil. (1826) 163-; Par. Bil. S. Encour. 26 (1827) 22-.

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- Doë, —. Gilbert A. 70 (1822) 225-.
- Bischof, G. Kastner Arch. Ntl. 5 (1825) 178-.
- Mitchell, J. Silliman J. 16 (1829) 246-.
- Wailles, G. E. Mg. 1 (1833) 350-.
- Chambers, Rich. Mg. NH. 1 (1837) 353-.
- White, W. H. Mg. NH. 1 (1837) 551-.
- Weissenborn, W. Mg. NH. 1 (1837) 552-.
- Bessel, F. W. Pogg. A. 44 (1838) 366-.
- [Barilli, G. non] Barilli-Filopante, Q. (v) Add.) Majocchi A. Fis. C. 3 (1841) 36-.
- Galle, J. G. Pogg. A. 82 (1851) 593-.
- Baer, —. Halle Z. 2 (1853) 110-.
- Knorr, E. Pogg. A. 89 (1853) 620-.
- Looff, W. Pogg. A. 108 (1859) 656-.
- Wachtmeister, H. G. T. Götheb. N. Hndl. 5 (1859) 153-.
- Meijboom, C. [1870] (x) Batav. Ntk. Ts. 32 (1873) 265-.
- Reimann, E. Wetter 13 (1896) 207-.
- Gellermann, C. Wetter 13 (1896) 215-.
- Insect luminosity. Gilbert, P. Rv. Quest. Sc. 30 (1891) 225-, 558-.
- , —. Garbasso, A. Tor. Ac. Sc. Mm. 46 (1896) 179-.
- Light magnets (Lichtmagnete), Canton's phosphorus, decaying fish, etc. John, J. F. Gilbert A. 55 (1817) 453-.
- Luminous phials, Davy's. Jacquin, J. von. Gilbert A. 31 (1809) 213-.
- Magnesium light. Nicklès, J. Nancy Mm. Ac. Stanislas (1866) 242-.
- Phosphorus, intermittent luminosity. Munk of Rosenschöld, P. S. Pogg. A. 32 (1834) 216-.
- , luminosity in connection with atmospheric conditions. Maffatt, W. [1862] Br. Met. S. P. 1 (1863) 197-.
- Platinum heated by hydrogen as a source of light. Silliman, B. (jun.) Silliman J. 12 (1851) 256-.
- Pyrogallic acid. Lenard, P., & Wolf, M. A. Ps. C. 34 (1888) 918-.
- Sodium light. Nicklès, J. Nancy Mm. Ac. Stanislas (1866) 242-.
- Solids and solid solutions. Wiedemann, E., & Schmidt, G. C. A. Ps. C. 56 (1895) 201-.

- Triboluminescence (light emitted by bodies broken in darkness). *Schiassi, P.* Bologna N. Cm. 1 (1834) 1-.
- , *Pope, W. J.* Nt. 59 (1898-99) 618-.
- , *Herschel, A. S.* Nt. 60 (1899) 29.
- , calcium chloride. *Tomlinson, C.* Sturgeon A. Electr. 1 (1836-37) 212-.
- , flints. *Doppler, C.* Pogg. A. 49 (1840) 505-.
- , stones. *Morozzo, C. L.* [1798] Turin Mm. Ac. 6 (1792-1800) 140-.
- , — and sugar. *Böttger, R.* Pogg. A. 43 (1838) 655-.
- , sugar. *Mons, J. B. van.* Brux. Ac. Bil. 6 (1839) 164-.
- , —. *Burke, J.* C. N. 78 (1898) 156-.
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- Majocchi, G. A.* (vi Add.) *Majocchi A. Fis.* C. 18 (1845) 3-.
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- Herschel, (Sir) J. F. W.* Edinb. J. Sc. 3 (1825) 107.
- Roscoe, H. E.* [1856] R. I. P. 2 (1854-58) 223-.
- Draper, J. W.* Ph. Mg. 14 (1857) 161-.
- Draper, H. N.* [1859] Pht. S. J. 6 (1860) 37-.
- Wills, A. W.* [1859] Pht. S. J. 6 (1860) 62-.
- Proctor, B. S.* Pht. S. J. 6 (1860) 160-.
- Bing, L.* C. N. 18 (1868) 126-.
- Holetschek, J.* Wien Pht. Cor. 15 (1878) 177-.
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- Pizzighelli, G.* Wien Pht. Cor. 19 (1881) 178-; 19 (1882) 4-, 36-, 49-, 69-, 81-, 134-, 166-, 181-, 194-, 210-, 226-, 239-, 255-, 269-; 20 (1883) 55-, 73-, 92-, 131-, 159-, 173-, 190-, 238-, 253-, 269-, 299-.
- Bartoli, A.* Catania Ac. Gioen. Bil. 16 (1891) 12-.
- Chvolson, O.* St. Pet. Ac. Sc. Mm. (Rs.) 69 (1892) (App. No. 4) 245 pp.; Wild Rpm. Met. 15 (1892) No. 1, viii + 166 pp.
- Saveljev, R. N.* Rs. Ps.-C. S. J. 25 (Ps.) (1893) 1-; A. C. 28 (1893) 394-; 29 (1893) 260-.
- (Saveljev.) *Wild, H.* A. C. 29 (1893) 283-.
- (—) *Chvolson, O. D.* Rs. Ps.-C. S. J. 25 (Ps.) (1893) 172-; A. C. 30 (1893) 141-.
- Lemoine, G. C. R.* 120 (1895) 441-.
- Saveljev, R. A. C.* 4 (1895) 424-.
- Actinism, photographic. *La Blanchère, H. de.* A. Gén. Civ. 2 (1863) 131-.
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- , *Woods, T.* Ph. Mg. 19 (1860) 39-.
- , chemical. *Poey, A.* Fr. S. Mét. An. 11 (*1863) Pt. 2, 90-.
- for determining time of exposure. *Stefanowski, C. von.* Wien Pht. Cor. 14 (1877) 207-.
- , electrochemical. *Gouy, —, & Rigollot, H.* C. R. 106 (1888) 1470-.
- , —. *Rigollot, H.* Lyon Un. A. [29] (1897) 138 pp.
- , Hurter and Driffeld. *Eder, J. M.* Wien Pht. Cor. 29 (1892) 396-.
- Actinometry, electro-chemical. *Maréchal, C.* Éclair. Élect. 6 (1896) 445-, 540-, 588-.
- Bunsen-Roscoe law of intermittent lighting of gelatino-bromide. *Englisch, E.* D. Nf. Vh. (1898) (Th. 2, Hälfte 1) 171-.
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- , —, —, — (Marchand). *Becquerel, E.* A. C. 30 (1873) 572-.
- Heliograph. *Jordan, T. B.* Cornwall Pol. S. T. (1839) 115-.
- Intensity, chemical, of sunlight, effect of prism. *Hessler, F.* Baumgartner Z. 3 (1835) 336-.
- , —, —, —, measurement. *Roscoe, H. E.* [1860] R. I. P. 3 (1858-62) 210-.
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- , —, —, —. *Roscoe, H. E.* R. I. P. 4 (1863) 128-.
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- , —, —, —. *Thorpe, T. E.* [1874] Glasg. Ph. S. P. 9 (1875) 108-.
- , —, —, —. *Andresen, M.* Wien Pht. Cor. 35 (1898) 502-.
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- — —, measurement for photographic experiments. *Heeren, F.* Pogg. A. 64 (1845) 309-.
- — — — — purposes. *Lipowitz, A.* Pogg. A. 61 (1844) 140-; 63 (1844) 348-.
- Movable plates. *Haton de la Goupillière, —.* C. R. 100 (1885) 953-.
- Photo-chemical researches. (Chemical action of light, laws.) *Roscoe, H. E., & Bunsen, R. W.* B. A. Rp. (1855) (pt. 2) 48-.
- —. *Roscoe, H. E., & Bunsen, R. W.* Pogg. A. 96 (1855) 373-; B. A. Rp. (1856) 62-.
- —. (Chemical action of light, measurement.) *Roscoe, H. E., & Bunsen, R. W.* [1856] Phil. Trans. (1857) 355-.
- —. (Photo-chemical induction.) *Roscoe, H. E., & Bunsen, R. W.* Phil. Trans. (1857) 381-.

- Photo-chemical researches. (Photo-chemical induction.) (Roscoe & Bunsen.) *Baeyer, A.* Lieb. A. 103 (1857) 178-.
- (Chemical rays, optical and chemical extinction.) *Roscoe, H. E., & Bunsen, R. W.* Phil. Trans. (1857) 601-.
- (— action of sunlight, daylight, solar spectrum, measurement.) *Roscoe, H. E., & Bunsen, R. W.* Phil. Trans. (1859) 879-.
- (— — — — —) (Roscoe & Bunsen.) *Fonvielle, W. de.* Presse Sc. (1861) 326-.
- (— — — — —, measurement.) *Roscoe, H. E., & Bunsen, R. W.* [1862] Phil. Trans. (1863) 139-.
- Photographometer. *Claudet, A.* (vi *Adds.*) Ph. Mg. 33 (1848) 329-.
- Photometer for determination of strength of chemical rays. *Vogel, H.* [W.] A. Ps. C. 134 (1868) 146-; (xii) Berl. Ps. Gs. Vh. 1 (1882) 59-.
- , grease spot, accuracy in measurement of density of photographic plates. *Abney, (Capt.) W. de W.* S. C. In. J. 9 (1890) 722-.
- , — — — — — (Abney.) *Hurter, F., & Driffield, V. C.* S. C. In. J. 9 (1890) 725.
- , — — — — —, measures. *Abney, (Capt.) W. de W.* S. C. In. J. 10 (1891) 18-.
- , — — — — — and sector, measures. *Hurter, F., & Driffield, V. C.* S. C. In. J. 10 (1891) 20-, 98-.
- , — — — — —, —. *Hurter, F.* S. C. In. J. 10 (1891) 318.
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- Schwarzschild, K.* Wien Pht. Cor. 36 (1899) 398-.
- Eder, J. M.* Wien Pht. Cor. 37 (1900) 238-.
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- Plates. *Eder, J. M.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 1407-; 109 (1900) (Ab. 2a) 1103-.
- , dry. *Pickering, W. H.* Am. Ac. P. 20 (1885) 159-.
- , —. *Eder, J. M.* Wien Pht. Cor. 35 (1898) 654-.
- , gelatin, testing with electric glow-lamp. *Stein, S. T.* Wien Pht. Cor. 23 (1886) 215-.
- , orthochromatic, use of Scheiner's sensitometer. *Eder, J. M.* Wien Pht. Cor. 36 (1899) 648-.
- , sensitometry of, and photochemical investigations. *Hurter, F., & Driffield, V. C.* S. C. In. J. 9 (1890) 455-.
- , — — — — — (Hurter & Driffield.) *Acworth, J. J., & Acworth, (Mrs.) M. W.* Phot. J. 19 (1895) 208-.
- , — — — — — (Dr. & Mrs. Acworth.) *Sterry, J.* Phot. J. 19 (1895) 288-.

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- , — — — — — (Dr. & Mrs. Acworth.) *Sterry, J.* Phot. J. 19 (1895) 371-.
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- , — — — — — (Hurter & Driffield, & Sterry.) *Acworth, J. J., & Acworth, (Mrs.) M. W.* [1895] Phot. J. 20 (1896) 48-.
- Sensitometer, new form. *Donkin, W. F.* Phot. J. 12 (1888) 109-.
- , and photographic plates. *Vogel, H. W.* C. Ztg. 21 (1897) 650.
- , universal. *Scheiner, J.* Z. Instk. 14 (1894) 201-.
- Sensitometers and measuring densities of photographic deposit. *Abney, (Capt.) W. de W.* Phot. J. 11 (1887) 38-.
- Transparency, photographic, of various bodies. *Miller, W. A.* Phil. Trans. (1862) 861-; R. I. P. 4 (1863) 42-.

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- Discovery of forgeries. *Dennstedt, M., & Schöpf, M.* Hamb. Ws. Anst. Jb. 15 (1898) 1-.
- Drops, splash, photography. *Cole, R. S.* Nt. 50 (1894) 222-.
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- , — by electric spark. *Boys, C. V.* Nt. 47 (1892-93) 415-, 440-; Un. Serv. I. J. 37 (1893) 855-.
- , —, Toepler's "Schlierenmethode." *König, W.* Frkf. a. M. Ps. Vr. Jbr. (1892-93) 24-.

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- Bequerel, E.* C. R. 39 (1854) 63-; A. C. 42 (1854) 81-.
- Henderson, P.* [1855] Pht. S. J. 2 (1856) 122-.
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- Ives, F. E.* Franklin I. J. 131 (1891) 1-.
- Vogel, H. W.* Wien Pht. Cor. 28 (1891) 551-.
- Meslin, G.* A. C. 27 (1892) 369-.
- Valenta, E.* Wien Pht. Cor. 29 (1892) 432-; 30 (1893) 577-.
- Pfaundler, L.* Steierm. Mt. (1894) xlv-.
- Wall, E. J.* Cornwall Pol. S. Rp. (1894) 93-.
- Warneke, L.* [1894] Phot. J. 19 (1895) 80-.
- Neuhauss, R.* Berl. Ps. Gs. Vh. (1895) 17-.
- Wiener, O.* A. Ps. C. 55 (1895) 225-.
- Glan, P.* A. Ps. C. 58 (1896) 402-.
- Joly, J.* [1896] Dubl. S. Sc. T. 6 (1898) 127-.
- Kirbuss, O.* Königsb. Schr. 37 (1896) [3]-.
- König, W.* Frkf. a. M. Ps. Vr. Jbr. (1895-96) 33-.
- Wall, E. J.* S. C. In. J. 15 (1896) 400-.
- Freuchen, P.* N. Ts. Fs. K. 2 (1897) 337-.
- Niewenglowski, G. H.* Smiths. Rp. (1898) 209-.
- Shepherd, E. S.* Phot. J. 23 (1899) 316-.
- Drecker, J.* [1900] Ps. Z. 2 (1901) 44-.
- Eder, —.* Z. Angew. C. (1900) 1273-.
- König, —.* [1900] N.-Vorp. Mt. 32 (1901) xiv-.
- Kohl, F. G.* Wien Pht. Cor. 37 (1900) 602-, 650.
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- *Eder, J. M.* Wien Pht. Cor. 36 (1899) 26-.
- *Hinchley, J. W.* S. C. In. J. 19 (1900) 5-.

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- Lippmann, G.* [1891] C. R. 112 (1891) 274-; A. Cons. Arts et Mét. 4 (1892) 161-.
- Bequerel, E.* C. R. 112 (1891) 275-.
- Berget, A.* Rv. Sc. 48 (1891) 33-.
- Ives, F. E.* Franklin I. J. 132 (1891) 141-.
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- Marangoni, C.* Rv. Sc.-Ind. 23 (1891) 195-.
- Thwing, C. B.* Am. J. Sc. 42 (1891) 388-.
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- Krone, H.* Wien Pht. Cor. 30 (1893) 226-.
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- Sire, —.* [1893] Doubs S. Mm. 8 (1894) xii-.
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- —, and tricolour prints. *König, W.* [1898] Erkf. a. M. Ps. Vr. Jbr. (1898-99) 30-.
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- , and sensitisers. *Hruza, O., & Hazura, K.* Wien Pht. Cor. 30 (1893) 332-, 427-.
- , sensitometry. *Abney, (Capt.) W. de W.* Phot. J. 19 (1895) 328-, 389.
- , tone photography, correct. *Ives, F. E.* Franklin I. J. 122 (1886) 123-.
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- , erythrosin-ammonia bathed. *Mallmann, F., & Scolik, C.* Wien Pht. Cor. 23 (1886) 322-, 589-.
- , erythrosin-azalin-cyanin. *Mallmann, F., & Scolik, C.* Wien Pht. Cor. 23 (1886) 373-.
- , experiments with. *Scolik, C.* Wien Pht. Cor. 22 (1885) 367-.
- , preparation. *Tarasov, K. F.* Mosc. S. Sc. Bil. 93 (No. 1) (1897) 5 (bis)-.
- Principles. *Schultz-Hencke, D.* Wien Pht. Cor. 32 (1895) 325-.
- Sensitisers. *Eder, J. M.* Wien Pht. Cor. 31 (1894) 457-.
- Spectrum, influence of pigments on photographic image. *Stillman, W. J.* Nt. 11 (1875) 505-.
- Theoretical aspect. *Abney, (Capt.) W. de W.* Phot. J. 12 (1888) 105-.
- Theory and practice. *Albert, E.* Wien Pht. Cor. 21 (1884) 132-, 208.
- Panoramic photography. *Moessard, (comm.)* —. A. Cons. Arts et Mét. 4 (1892) 451-.
- , —, *Carpentier, J.* C. R. 120 (1895) 496-.
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- Rumford, B. (Count).* Scherer J. C. 2 (1799) 3-.
- Wollaston, W. H.* Nicholson J. 8 (1804) 293-.
- Schweigger, J. S. C.* Schweigger J. 5 (1812) 233-.
- Bérard, J. E.* A. C. 85 (1813) 309-.
- Grotthus, T. von.* Gilbert A. 61 (1819) 50-.
- Bischof, G.* Kastner Arch. Ntl. 1 (1824) 442-.
- Fischer, N. W.* Karsten Arch. 9 (1826) 345-.
- Bussy, A.* J. Phm. 18 (1832) 117-.
- Dulk, F. P.* Erdm. J. Pr. C. 3 (1834) 225-.
- Anon.* (v. 201) Bb. It. 95 (1839) 358-.
- Biot, J. B.* C. R. 12 (1841) 170-.
- Fusiniéri, A.* A. Sc. Lomb. Ven. 11 (1841) 92-.
- Macaire-Prinsep, J.* Bb. Un. 31 (1841) 379-.
- Anon.* (v. 388) Erdm. J. Pr. C. 24 (1841) 91-.
- Ascherson, F. M.* Pogg. A. 55 (1842) 467-.
- Bianconi, G. B.* (v. Add.) Majocchi A. Fis. C. 5 (1842) 213-.
- Natterer, J.* D. Nf. Vsm. B. (1842) 76-.
- Arago, D. F. J.* C. R. 16 (1843) 402-.
- Fischer, N. W.* Bresl. Schl. Gs. Übs. (1848) 30-.
- Draper, J. W.* Ph. Mg. 1 (1851) 368-.
- Slater, J. W.* Erdm. J. Pr. C. 57 (1852) 239-.
- Rautert, A.* (viii) Reclam Kosmos 1 (1857) 67-.
- Chevreul, M. E.* C. R. 47 (1858) 1006-.
- Baudrimont, A.* Fr. Cg. Sc. 28 (1861) (pte. 2) 614-.
- Krone, H.* Dresden Sb. Isis (1865) 34-.
- Chastaing, P.* A. C. 11 (1877) 145-.
- (Chastaing's theory.) *Vogel, H. W.* Berl. B. 10 (1877) 1638-.
- Lemoine, G.* C. R. 93 (1881) 514-.
- Eder, J. M.* Wien Ak. Sb. 92 (1886) (Ab. 2) 340-; Mh. C. (1885) 495-.
- Vogel, H. W.* D. Nf. Tbl. (1886) 410.
- (E. Becquerel's researches.) *Becquerel, H.* A. Cons. Arts et Mét. 4 (1892) 481-.
- Hankó, V.* Mth. Termt. Étis. 12 (1894) 149-.
- Gibson, J.* Z. Ps. C. 23 (1897) 349-.
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- Action of light in discolouring organic substances. *Bidet, A.* Par. S. Ps. Sé. (1894) 267. Chemical and photographic action of light. *Lermantov, V. V.* (xii) Rs. Ps.-C. S. J. 11 (Ps.) (1879) [(Pt. 1)] 3-, 31-.
- Effect of shearing stress on sensitive salt. *Abney, (Capt.) W. de W.* Phot. J. 8 (1884) 80-.
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- Invisible radiation, changes produced by. *Hunt, R.* (vi *Adds.*) *Majocchi A. Fis. C.* 28 (1847) 117-.
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- — printer's ink. *Tucker, W. T.* Nt. 58 (1898) 32.
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- — — — (Le Paige). *Heen, P. de.* Brux. Ac. Bil. 33 (1897) 437-.
- — — —. *Le Paige, C.* Brux. Ac. Bil. 34 (1897) 16-.
- , chemical intensity. *Larsen, A. N. Ts.* Fs. K. 3 (1898) 401-; *C. Ztg.* 23 (1899) (*Rpm.*) 89.
- , effects produced by. *Becquerel, E. A.* C. 9 (1843) 257-.
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- Spectrum, theory of absorption bands in, and its bearing in photography and chemistry. *Amory, R.* Am. Ac. P. 13 (1879) 216-.
- Yellow and red rays, photography, chemical action of light, and solarisation. *Eder, J. M.* Wien Pht. Cor. 16 (1879) 24-.

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- , physical action of light. *Roloff, M.* Z. Ps. C. 26 (1898) 337-.
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- , — — light on, and theory of photography. *Vogel, H.* *Pogg. A.* 119 (1863) 497-.
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- , — — potassium ferrocyanide on, producing sensitive photographic preparation. *Hunt, R.* B. A. Rp. (1841) (*pt.* 2) 47.
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- , —, —, measure. *Abney, (Capt.) W. de W.* [1888] Phot. J. 13 (1889) 2-, 26-.
- sub-bromide in latent image, and silver-germ theory. *Eder, J. M.* Wien Pht. Cor. 36 (1899) 276-, 332-.
- sub-chloride, action of light and oxygenated salts. *Poitevin, L. A. C. R.* 61 (1865) 1111-.
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- “aduroil” (monobromohydroquinone). *Bogisch, A.* Wien Pht. Cor. 36 (1899) 426-.
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- alkaline. *Abney, (Capt.) W. de W.* Ph. Mg. 3 (1877) 46-.
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- , for dry plates, fatty amines as accelerators. *Waterhouse, (Col.) J.* Phot. J. 23 (1899) 117-.
- , modification for silver-bromide plates. *Lohse, O.* Wien Pht. Cor. 24 (1887) 56-.
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- , isomers. *Andresen, M.* Wien Pht. Cor. 31 (1894) 505-.
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- etc., action on silver haloids. *Schiendl, C.* Wien Pht. Cor. 23 (1886) 263-.
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- , influence in rendering silver compounds sensitive to light. *Hunt, R.* Phil. Trans. (1840) 325-.
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- Cunningham, (Lt.) A.* (vii) R. E. Pp. 11 (1862) 169-.
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- Meldola, R.* [1890] R. I. P. 13 (1893) 134-.
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- composition. *Hardwich, T. F.* [1856] Pht. S. J. 3 (1857) 20-, 77-.
- *Spiller, J.* Ph. Mg. 19 (1860) 186-.
- *Malone, T. A.* [1862] Pht. S. J. 8 (1864) 179-.
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- *Lermantov, V. V.* (xii) Rs. C. Ps. S. J. 9 (Ps.) (1877) [Pt. 1] 296-; (x) J. de Ps. 6 (1877) 376-.
- , theory. *Golfier-Besseyre, —.* C. R. 9 (1839) 378-.
- latent. *Vogel, H.* [W. non] C. D. C. Gs. B. 4 (1871) 825-.
- , development. *Hardwich, T. F.* [1855] Pht. S. J. 2 (1856) 211-.
- , —. *Lea, M. C.* Am. J. Sc. 14 (1877) 49-; 19 (1880) 480-.
- , and development. *Hurter, F., & Driffield, V. C.* Phot. J. 22 (1898) 145-, 186-, 277-, 360-.
- , —. *Bothamley, C. H.* Phot. J. 23 (1899) 123-.
- , — Eder's experiment. *Luther, R.* Wien Pht. Cor. 36 (1899) 584-.
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- , — — — — —. *Hussey, W. J.* As. S. Pac. Pb. 7 (1895) 102.
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- — — — —. *Gaudin, A.* C. R. 12 (1841) 1187-.
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- Channing, W. F.* Silliman J. 43 (1842) 73-.
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- M'Crave, W. B. A.* Rp. (1858) (pt. 2) 18-.
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- Biot, J. B. J. Sav.* (1839) 173-, 198-.
- Petzholdt, A.* Erdm. J. Pr. C. 18 (1839) 111-.
- Poggendorff, J. C.* Pogg. A. 48 (1839) 193-.
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- Melloni, M. G.* Arcad. 82 (1840) 1-.
- Berres, —.* Dingler 81 (1841) 149-.
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- Bousignes, F.* C. R. 31 (1850) 726-.
- Bayard, H.* C. R. 32 (1851) 552-.
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— — —. *Thompson, S. P.* C. R. 122 (1896) 807-.

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- Lumière, A., & Lumière, L.* *C. R.* 122 (1896) 463-.
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- Colson, R.* *C. R.* 122 (1896) 598-.
- (Condensation on metal.) *Le Bon, G.* *C. R.* 122 (1896) 1054-.
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- (Radiations by influence of light, electric properties.) *Le Bon, G.* *C. R.* 124 (1897) 892-; *Rv. Sc.* 7 (1897) 558-.
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- Light, invisible. *Seckendorf, (President) —.* *Görl. Ab.* 6 (*Heft* 1) (1851) 1-.
- , new action. *Nièpece de Saint-Victor, A.* *C. R.* 65 (1867) 505-.

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 —, invisible radiations. *Becquerel, H. C. R.* 122 (1896) 689-.
 —, — (Becquerel). *Troost, L. C. R.* 122 (1896) 694.
 —, radiation. *Becquerel, H. C. R.* 123 (1896) 855-.
 —, —. Becquerel's experiments. *Sagnac, G. J. de Ps.* 5 (1896) 193-.
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- Adaptation of eye to nature of rays which emanate from bodies. *Stewart, B.* Vict. T. Ph. S. 1 (1855) 265-.
- Apperception, complexity and duration. *Friedrich, M.* Ph. Stud. 1 (*1883) 39-.
- Artificial lighting from hygienic point of view. *Gariel, C. M.* Rv. Sc. 38 (1886) 73-; A. Hyg. Pbl. 27 (1892) 268.
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- Interferences observed on viewing one coarse grating through another, and projection of one piece of wire gauze by a parallel piece. *Barus, C.* Science 12 (1900) 617-.
- Inversion in telescopes. *Marangoni, C.* Rv. Sc.-Ind. 17 (1885) 347-.
- Laws. *Scheffler, H.* Halle Z. Nw. 27 (1866) 325-.
- Light. *Dwight, T.* Conn. Mm. Ac. 1 (1810) 387-.
- *Bor, —.* Amiens Ac. Mm. 38 (1891) 305-.
- *Volger, G. H. O.* Emden Nf. Gs. Jbr. (1890-91) xiv + 177 pp.
- , amount entering eye from luminous object. *Schultén, N. G. af (fl.).* [1823] St. Pét. Mm. Sav. Étr. 1 (1831) 39-.
- , colour, and form. *Henry, C.* Rv. Sc. 46 (1890) 289-, 364-.
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- Brunot, C.* Rv. Sc. 52 (1893) 210-.
- Sanford, E. C.* Science 21 (1893) 92-.
- Javal, É.* Par. S. Ps. Sé. (1895) 271-.
- Franklin, (Mrs.) C. L.* Science 3 (1896) 274-.
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- Guillaume, C. É.* Par. S. Ps. Sé. (1899) 2*-.
- Wyceźtkowska, A.* [1899] Krk. Ak. (Mt.-Prz.) Rz. 18 (1901) 160-; Cr. Ac. Sc. Bll. (1900) 7-.
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- (Wundt). *Heymans, G.* Ph. Stud. 13 (1898) 613-.
- (Heymans). *Wundt, W.* Ph. Stud. 13 (1898) 616-.
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- maxima and minima of apparent brightness resulting from. *Wind, C. H.* [1898] Amst. Ak. Vs. 7 (1899) 12-; Amst. Ak. P. 1 (1899) 7-.
- of motion. *Dove, H. W.* Berl. Mb. (1865) 129-.
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- — dædaleum. *Horner, W. G.* Ph. Mg. 4 (1834) 36-.
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- electric fan. *Kenyon, F. C.* Science 8 (1898) 371-.
- light. *Hefner-Alteneck, F. von.* Berl. Ps. Gs. Vh. (1897) 72-.
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- — Ritchie's horizontal artificial voltaic magnet. *Tomlinson, C.* Surgeon A. Electr. 1 (1836-37) 108-.
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- Landerer, J.* Les Mondes 11 (1866) 9-.
- Tupper, J. L.* Ph. Mg. 39 (1870) 423-.

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 — — — Welsbach light. *Loring, F. H.* *Nt.* 54
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Kater, H. (vi *Adds.*) *Ph. Mg.* 5 (1834)
 375-.
Crahay, J. G. *Brux. Ac. Bil.* 2 (1835) 76-.
Brewster, (Sir) D. (vi *Adds.*) *Majocchi A.*
Fis. C. 16 (1844) 24-.
Marangoni, C. *N. Cim.* 27 (*1868) 22-.
Mallock, A. *Nt.* 14 (1876) 350-.
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Riccò, A. *Mod. Ac. Sc. Mm.* 17 (1877) 239-.
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 92 (1881) 522-.
S., F. J. *Science* 3 (1884) 275, 475.
Le Conte, J. *Science* 3 (1884) 404, 644.
Oliver, J. E. *Science* 3 (1884) 475, 563.
Hastings, C. S. *Science* 3 (1884) 501-.
Herschel, J. *Science* 3 (1884) 704.
Tchiriew, S. *C. R.* 119 (1894) 915-.
Warring, C. B. *Nt.* 55 (1896-97) 232.
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Mm. Ac. Ag. 20 (1842) 53-.
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 108 (1889) 1271-.
 — — —. *Landerer, J. J.* *C. R.* 109 (1889)
 74-.
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 vapours. *Omalius d'Halloy, J. B. J.* *Par.*
S. Phlm. Bil. 2 (1810) 159-.
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 —. *König, A.* *Berl. Ps. Gs. Vh.* (1884) 40-;
Arch. f. Oph. 30 (1884) (*Ab.* 3) 329-.
 —. *Millar, W. J.* *Nt.* 60 (1899) 391.
 —, on gazing at contours. *Mayerhausen, G.*
Arch. f. Oph. 30 (1884) (*Ab.* 2) 191-, (*Ab.* 4)
 311-.
 — phenomena, analytic bibliography. *Plateau,*
J. [1883] *Brux. Ac. Mm.* 45 (*1884) (*No.* 4)
 20 pp.

Optics of ancient Greeks. *Hirschberg, J. Z.*
Psychol. 16 (1898) 321-.
 Panorama. *Chevreur, M. E.* *C. R.* 61 (1865)
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C. R. (1891) (*Pt.* 2) 310-.
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Soret, J. L. *Sch. Nf. Gs. Vh.* (1885-86) 1-.
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 — — —, curved figures produced by. *Tomlin-*
son, C. *Thomson Rc.* 4 (1836) 135-.
 — — — mirror, curves produced by. *Anderson, A.*
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C. H. *Science* 7 (1898) 425-.
 — — —, theory of formation. *Gal, J.* *Nim. S.*
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W. S. *Science* 9 (1899) 70-.
 Talbot's law, theory. *Marbe, K.* *Ph. Stud.* 12
 (1896) 279-.
 Ultra-violet rays, protection of eye from.
Schulek, V. *Mth. Termt. Éts.* 17 (1899)
 510-; *Mth. Nt. B. Ung.* 17 (1901) 341.
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 353-.
 (Pater.) *Horn, A.* *Tilloch Ph. Mg.* 49 (1817)
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Aimé, G. *Eure S. Ag. Rec.* 5 (1834) 445-.
Sturm, J. C. F. *C. R.* 20 (1845) 1238-.
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 —. *Reade, J.* *Tilloch Ph. Mg.* 54 (1819) 48-.
 —. *Lehot, C. J.* *Brugnatelli G.* 7 (1824) 290-.
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- theory. *Grimaldi, G.* [1829] *Lucca At. Ac. 6* (1830) 69-.
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- , *Sturm, J. C. F.* *C. R. 20* (1845) 554-, 761-; *Pogg. A. 65* (1845) 116-, 374-.
- , *Trouessart, —.* *C. R. 35* (1852) 134-; 36 (1853) 144-, 227.
- , *Uribe Troncoso, M.* *Méx. S.* "Alzate" *Mm. 14* (1899) 145-.
- , mathematical. *Lucas, F.* *Les Mondes 9* (1866) 546-.
- under water. *Horsburgh, J.* *Nicholson J. 15* (1806) 265-.
- , *Muncke, G. W.* *Pogg. A. 2* (1824) 257-.
- , *Dudgeon, R. E.* *Ph. Mg. 41* (1871) 350-.
- , in dark, and at a distance. *Anon.* (vt 346) *Edinb. N. Ph. J. 6* (1829) 61-.

- Visual angle in decreasing light. *Albertotti, G.* *Mod. Ac. Sc. Mm. 10* (1894) 353-.
- perceptions, number of possible. *Doppler, C.* *Böhm. Gs. Ab. 5* (1847) 391-.
- Volkmann's line of sight, and cause of indistinctness outside axis of eye. *Stamm, W.* *Pogg. A. 57* (1842) 346-.

4410 Construction and Dioptrics of the Eye.

(See also *Physiology, 3711.*)

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- Schoeler, —.* *Arch. f. Oph. 30* (1884) (Ab. 3) 301-.
- Blind spot, visibility. *Charpentier, A.* *C. R. 126* (1898) 1634-.
- Cornea, radius of curvature. *Chapman, H. C., & Brubaker, A. P.* *Philad. Ac. Nt. Sc. P.* (1893) 349-.
- , shape, and influence on vision. *Sulzer, —.* *Arch. Sc. Ps. Nt. 26* (1891) 483-.
- Direct distance of negative physiological scotoma from fixed point and from Mariotte's spot. *Basevi, V.* [1890] *Arch. Augenh. 22* (1891) 1-.
- Directions of sight and of rays. *Bartels, C. M. N.* *Oken Isis* (1834) 698-.
- Fundus, anterior limit of portion visible with ophthalmoscope. *Groenouw, A.* *Arch. f. Oph. 35* (1889) (Ab. 3) 29-.
- Illumination of inner eye by heterocentric glass mirrors. *Zehender, W.* *Arch. f. Oph. 2* (1856) (2 Ab.) 103-.
- Images of human eye, the seven. *Tscherning, —.* *Par. S. Ps. Sé.* (1892) 288-.
- Indirect vision, parallax, and pupil of cats. *Kirschmann, A.* *Ph. Stud. 9* (1894) 447-.
- Insects' eyes. *Grüel, C. A.* *Pogg. A. 119* (1863) 640-.

- Insects' eyes, cornea. *Gorham, J. J. Mcr. Sc. 1* (1853) 76-.
- , defining power. *Mallock, A. R. S. P.* 55 (1894) 85-.
- , path of rays through coaxial cylinders. *Matthiessen, L.* *Exner Rpm. 22* (1886) 333-.
- Line of sight, position, and centration of refractive surfaces. *Ehrrooth, M.* *Pflüg. Arch. Pl. 35* (1885) 390-.
- Model of eye. *Beetz, W.* *Carl Rpm. 2* (1867) 302-.
- Ophthalmoscopic image, seat and character. *Bassi, G.* *Rv. Sc. [Ind.] 30* (1898) 143-.
- Optometric notation. *Schötz, H.* *Arch. Augenh. 16* (1896) 190-; *Arch. Oph. 15* (1886) 203-.
- Permeability of iris and lens capsule to fluids. *Ulrich, —.* *Arch. Augenh. 36* (1898) 197-.
- Retina, light-sensitive layer. *König, A., & Zumft, J.* *Berl. Ps. Gs. Vh.* (1894) 56.
- , number of visual elements in central portion. *Wertheim, T.* *Arch. f. Oph. 33* (1887) (Ab. 2) 137-.
- , vision. *Griffiths, M.* *Ph. Mg. 4* (1834) 43-.
- Retinal activity, law. *Thompson, S. P. B. A. Rp.* (1879) 404-.
- points, identical, theory. *Bezold, W. von. Z. Bl. 1* (1865) 169-.
- Schematic eye. *Kurz, A.* *Exner Rpm. 25* (1889) 587-, 755-.
- , periscopic, geometric form of theoretical retina. *Matthiessen, H. F. L.* *Arch. f. Oph. 25* (1879) (Ab. 4) 257-.
- Visual axis. *Heyl, A. G.* *Int. Md. Cg. T.* (1887) (Vol. 3) 738-.
- elements and least angle of vision. *Du Bois-Reymond, C.* *Arch. f. Oph. 32* (1886) (Ab. 3) 1-.
- Yellow spot, sensitiveness. *Charpentier, A. C. R. 126* (1898) 1711-.

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- Moser, L.* *Rpm. Ps. 5* (1844) 337-.
- Dudgeon, R. E.* [1870] *Nt. 3* (1871) 124-.
- Landolt, E., & Nuël, J. P. A. d'Ocul. 1* (1874) 30-.
- Delahousse, C.* *Arch. Gén. Md. 27* (1876) 674-.
- Landsberg, C.* *Cztg. Opt. 7* (1886) 241-, 253-, 277-.
- Javal, —.* *Int. Md. Cg. Vh.* (1890) (Bd. 2, Ab. 2) 67-.
- Mislavskij, N. A.* *Kazan S. Nt. (Ps.-Mth.) P.* 8 (1890) 282-.
- Mensbrugge, G. van der.* *Brux. S. Sc. A. 16* (1892) (Pt. 2) 263-.
- Tscherning, M.* *Z. Psychol. 3* (1892) 429-.
- Ostwalt, F.* *Arch. f. Oph. 44* (1897) 565-.
- Absorption of infra red by water and humours of eye. *Aschkinass, E.* *A. Ps. C. 55* (1895) 401-.
- Accuracy of focus necessary for sensibly perfect definition. *Rayleigh, (Lord).* *Ph. Mg. 20* (1885) 354-.
- Cardinal points of eye of fox. *Klingberg, A. Meckl. Vr. Nt. Arch.* (1892) 118-.
- — — — hare. *Klingberg, A. Meckl. Vr. Nt. Arch.* (1898) 49-.

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- Cardinal points of eye for light of different colours. *Einhoven, W.* [1895] Ndl. Gast. Oogl. Vs. 38 (1897) 203-; Arch. Néerl. 29 (1896) 346-.
- , —, — of stag. *Klingberg, A.* Meckl. Vr. Nt. Arch. (1893) 35-.
- Crystalline lens and cornea, refractive indices. *Azenfeld, T.* Z. Psychol. 15 (1897) 71-.
- , —, refractive index. *Templeton, R.* Ph. Mg. 32 (1866) 425-.
- , —, —. *Stadfeldt, A.* J. Pl. Pth. Gén. 1 (1899) 1149-.
- , —, —, calculation. *Matthiessen, H. F. L.* Arch. f. Oph. 22 (1876) (Ab. 3) 131-.
- , —, —, —. *Berlin, E.* Arch. f. Oph. 43 (1897) 287-.
- , —, —, law of increase in mammals and fishes. *Matthiessen, L.* Arch. f. Oph. 31 (1885) (Ab. 2) 31-.
- , —, —, power. *Matthiessen, L.* Meckl. Vr. Nt. Arch. (1886) xii-.
- , —, —, in vertebrates. *Moennich, P.* Pflüg. Arch. Pl. 40 (1887) 397-.
- , —, —, stratified, differential equations. *Matthiessen, H. F. L.* Pflüg. Arch. Pl. 19 (1879) 480-; Z. Mth. Ps. 24 (1879) 304-; 26 (1881) 179-; 28 (1883) 211-.
- , —, —, structure and optical phenomena. *Matthiessen, L.* Meckl. Vr. Nt. Arch. (1888) iv-.
- Development of light in eye. *Kastner, K. W. G.* Kastner Arch. Ntl. 26 (1834) 290-.
- Dispersion of human eye, exact determination. *Matthiessen, Ad.* Bb. Un. Arch. 5 (1847) 221-.
- Eye as camera obscura. *Wilson, G.* [1855] Edinb. R. S. T. 21 (1857) 327-.
- , —, optical instrument. *Cherrill, A. K.* Eastbourne NH. S. Pp. (1874-75) (May) 2 pp.
- Field of vision. *Leroy, C. J. A.* C. R. 116 (1893) 377-.
- , —, —, best form of schemata. *Groenouw, A.* Arch. Augenh. 31 (1895) (Festschr.) 73-.
- , —, —, experimental determination. *Leboucher, —.* Caen Mm. S. L. 13 (1864) No. 4, 26 pp.
- , —, —, and spectacles, definition of meridian in estimating. *Knapp, H.* Arch. Augenh. 16 (1886) 195-; Arch. Oph. 15 (1886) 207-.
- Horoptics, theory. *Studiati, C.* N. Cim. 8 (1858) 382-.
- Light waves, analysis by eye. *Göller, A.* Arch. An. Pl. (Pl. Ab.) (1888) 139-.
- Liquids of eye, refractive indices. *Cyon, E.* Arch. de Pl. 2 (1869) 555-.
- Meaning of dioptrics. *Gullstrand, A.* [1899] Arch. f. Oph. 49 (1900) 46-.
- , —, — (Gullstrand). *Ostwalt, F.* Arch. f. Oph. 49 (1900) 712-.
- Media of eye, diathermancy. *Franz, R.* Pogg. A. 115 (1862) 266-.
- , —, —, dispersive power and achromatism. *Powell, B.* B. A. Rp. (1833) 374-.
- , —, —, refractive indices. *Krause, W.* A. C. 45 (1855) 501-.
- Path of rays through eye. *Acqua, P. dell'.* Omodei A. Un. 69 (1834) 524-.
- Spectra of eye and seat of vision. *Griffiths, M.* Ph. Mg. 5 (1884) 192-.

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- Vision, lines of direction. *Knochenhauer, K. W.* Pogg. A. 46 (1839) 248-.
- Vitreous body and aqueous humour, refractive indices. *Cyon, E.* Wien Sb. 59 (1869) (Ab. 2) 101-.

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(See also Physiology, 3715, 3740.)

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- Baehr, G. F. W.* [1870] Amst. Vs. Ak. 5 (1871) (Ntk.) 273-; Arch. Néerl. 5 (1870) 233-; 6 (1871) 127-.
- Hoppe, R.* Arch. Mth. Ps. 61 (1877) 146-.
- Apparent direction of eyes in a portrait. *Wollaston, W. H.* Phil. Trans. (1824) 247-.
- , —, —, —. *Raymond, G. M.* Chambéry Mm. Ac. Sav. 5 (1828) 109-.
- Centre of motion of eye. *Maxwell, J. C.* [1875] Camb. Ph. S. P. 2 (1876) 365-.
- Fusion-movements of eyes in prism experiments. *Graefe, A.* Arch. f. Oph. 37 (1891) (Ab. 1) 243-.
- Iris movements, mechanics. *Gruenhagen, A.* [1892] Pflüg. Arch. Pl. 53 (1893) 348-.
- , —, theory, mathematical basis. *Rüppell, —.* Arch. f. Oph. 38 (1892) (Ab. 2) 174-.
- Listing's law. *Duane, A.* Arch. Oph. 26 (1897) 497-; Arch. Augenh. 38 (1899) 185-.
- , —, —, disputed points. *Weiland, C.* Arch. Oph. 28 (1899) 191-; Arch. Augenh. 40 (1900) 359.
- Movements and binocular perspective. *Böttcher, (Dr.) —.* Arch. f. Oph. 12 (1866) (Ab. 2) 23-.
- , —, —, conducive to binocular vision. *Scheller, —.* Arch. f. Oph. 38 (1892) (Ab. 1) 71-.
- , —, —, of lateral decentration of crystalline lens. *Giraud-Toulon, —.* C. R. 52 (1861) 383-.
- Ocular muscles, axes of rotation. *Wilson, H.* Arch. Oph. 29 (1900) 404-.
- , —, —, simple tests. *Randall, B. A.* Am. Oph. S. T. (1889) 362-.
- Plane of vision, relative breadth of fusion on raising and depressing. *Schmiedt, W.* Arch. f. Oph. 39 (1893) (Ab. 4) 233-.
- Rotation of eye, effect on projection of retinal images. *Helmholtz, H.* [1864] Heidl. Vh. Nt. Md. 3 (1865) 170-.

ACCOMMODATION.

- Walker, Ez.* Tilloch Ph. Mg. 29 (1807) 340-; 35 (1810) 82-.
- Simonoff, I.* Zach. Cor. 11 (1824) 438-.
- Respighi, L.* [1856] Bologna Mm. Ac. Sc. 8 (1857) 355-.
- Laugier, P. A. E.* C. R. 44 (1857) 841-.
- Jones, T. W.* R. S. P. 10 (1859-60) 380-.
- Tscherning, M.* [1900] Sc. Abs. 4 (1901) 581.
- and age, relation, dioptric curve and formula. *Sous, —.* Bordeaux S. Md. Mm. (1892) 36-.
- apparent, in aphakic long eyes. *Schoute, G. J.* Arch. f. Oph. 48 (1899) 438-.

apparent, in aphakics, and vision in dispersion circles. *Salzmann, M.* [1899] *Arch. f. Oph.* 49 (1900) 168-.

— proximity of lower of 2 distant double images. *Sachs, M.* *Arch. f. Oph.* 36 (1890) (*Ab.* 1) 193-.

changes in eye. *Tscherning, —.* *Arch. de Pl.* 4 (1892) 158-; 7 (1895) 158-, 181-; *A. d'Ocul.* 122 (1899) 211-.

and convergence in lateral vision. *Koster, W.* *Arch. f. Oph.* 42 (1896) (*Ab.* 1) 140-.

—, significance in perception of depth of visual field. *Arer, M.* *Ph. Stud.* 13 (1898) 116-, 222-.

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displacements of lens in, measured subjectively and objectively. *Heine, L.* *Arch. f. Oph.* 44 (1897) 293-.

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— — — — (Graefe). *Landolt, E.* *Arch. f. Oph.* 35 (1889) (*Ab.* 3) 265-.

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— — — —. *Delarive, A.* *Bb. Un. Arch.* 10 (1849) 300-.

explanation. *Forbes, J. D.* [1844-45] *Edinb. R. S. T.* 16 (1849) 1-.

—, Forbes's. *Haldat du Lys, C. N. A. de.* *Nancy Mm. S. Sc.* (1845) 51-; *C. R.* 20 (1845) 1561-.

external, from muscular compression. *Sattler, H.* *Arch. f. Oph.* 40 (1894) (*Ab.* 3) 239-.

force and amplitude. *Weiss, —.* *A. d'Ocul.* 113 (1895) 232-.

and magnification. *Strehl, K.* *Cztg. Opt.* 20 (1899) 21.

mechanism. *Tscherning, M. A.* *d'Ocul.* 112 (1894) 121-; *Arch. de Pl.* 6 (1894) 40-.

in optical instruments. *Lallemant, A.* *Mntp. Mm. Ac. Sect. Sc.* 6 (1864-66) 382-.

and play of pupil. *Weidlich, J.* *Arch. Augenh.* 15 (1885) 164-.

pressure phenomenon. *Reddingius, R. A. Z.* *Psychol.* 16 (1898) 188-.

relative breadth. *Pereles, H.* *Arch. f. Oph.* 35 (1889) (*Ab.* 4) 84-.

—, and convergence. *Howe, L.* *Am. Oph. S. T.* (1900) 92-.

and spectacle lenses. *Steinheil, A.* *Z. Bl.* 2 (1866) 366-.

subnormal, as cause of asthenopia. *Theobald, S.* *Am. Oph. S. T.* (1891) 127-.

theory. *Hess, C.* *Arch. f. Oph.* 42 (1896) (*Ab.* 1) 288-, (*Ab.* 2) 80-; 43 (1897) 477-; 46 (1898) 440-; 49 (1900) 241-.

— (Hess). *Koster, W.* [1898] *Arch. f. Oph.* 45 (1898) 97-; 47 (1899) 242-.

—, Hess, C., & Heine, L. *Arch. f. Oph.* 46 (1898) 243-.

—, Tscherning's. *Crzellitzter, A.* *Arch. f. Oph.* 42 (1896) (*Ab.* 4) 36-.

unequal, in normal and anisometropic eyes. *Fick, A. E.* [1888] *Arch. Augenh.* 19 (1889) 123-, 196; *Arch. Oph.* 18 (1889) 292-.

4430 Defects of the Eye and their Correction. Short Sight, Astigmatism, Irradiation, etc.

Powell, B. B. A. *Rp.* (1852) (*pt.* 2) 11.

Howe, L. *Am. S. Mer. P.* (1885) 91-.

Kokemüller, D. *Cztg. Opt.* 7 (1886) 2-.

Aberration. *Henry, C. C. R.* 118 (1894) 1140-.

—, chromatic. *Thompson, S. P. L.* *Ps. S.* P. 2 (1879) 157-; *Ph. Mg.* 4 (1877) 48-.

—, monochromatic. *Tscherning, M.* *Z. Psychol.* 6 (1894) 456-.

—, —, general theory, and results for ophthalmology. *Gullstrand, A.* [1900] *Ups. S. Sc. N. Acta* 20 (1904) *No.* 4, 204 pp.

— and sensitiveness. *Henry, C. C. R.* 119 (1894) 794-, 872.

—, spherical. *Meyer, M. H.* *Pogg. A. 89* (1853) 540-; 96 (1855) 607-.

—, —, *Leroy, C. J. A. C. R.* 116 (1893) 636-.

—, —, correction. *Tscherning, —.* *J. Pl. Pth. Gén.* 1 (1899) 312-.

—, symmetrical (meridional astigmatism). *Jackson, E.* *Am. Oph. S. T.* (1888) 141-.

Abnormal voluntary movements. *Lechner, C. S.* *Arch. f. Oph.* 44 (1897) 596-.

Achromatism. *Powell, B.* [1834] *Ashmol. S. T.* 1 (1838) *No.* 1, 32 pp.

—, *Provenzali, F. S.* *Rm. N. Linc. At.* 34 (1881) 49-.

—, imperfect. *Leroux, F. P.* *A. C. 66* (1862) 173-.

Aphakic eyes, length, and correction glasses. *Percinal, A. S.* *Arch. Oph.* 26 (1897) 1-; *Arch. Augenh.* 37 (1898) 286-.

Astigmatic eye, form of retinal image. *Koller, C.* *Am. Oph. S. T.* (1892) 425-.

— pencils of rays, infinitely slender, focal lines, with oblique incidence of homocentric pencils of rays upon curved surface. *Mathiessen, L.* *Arch. f. Oph.* 30 (1884) (*Ab.* 2) 141-.

ASTIGMATISM.

Kayser, E. [1883-84] *Danzig Schr. 6* (*1884-87) (*Heft* 1) xiv-, (*Heft* 2) xv.

Berlin, —. *Meckl. Vr. Nt. Arch.* (1893) xix-; (1897) i-.

Broca, A. C. R. 128 (1899) 450-.

correction. *Heilborn, F.* *Cztg. Opt.* 17 (1896) 61-.

—, *Broca, A. As. Fr. C. R.* (1899) (*Pt.* 2) 283-.

— by cylindrical lenses. *Anderson, T. B. A.* *Rp.* (1894) 586.

— — — —. *Roure, F.* *A. d'Ocul.* 115 (1896) 99-.

— pince-nez. *Moitais, —.* *Angers S. Sc. Bll.* (1885) 253-.

— plano-cylindrical lenses. *Hay, G.* *Arch. Oph. 5* (1876) 497-.

— — — —, toro lenses. *Goldzieher, V.* [1893] *Termt. Közl.* 26 (1894) 45; *Mth. Nt. B. Ung.* 11 (1894) 435.

- detection. *Chauvel, J.* Arch. Md. Phm. Mil. 7 (1886) 357-.
- determination. *Halle, G.* D. Nf. Vh. (1897) (Th. 2, Hälfte 1) 124-.
- and keratometry. *Weiland, C.* Arch. Oph. 22 (1893) 37-.
- measurement. *Stokes, G. G.* B. A. Rp. (1849) (pt. 2) 10-.
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- and statics of retina. *Scheffler, H. A.* Ps. C. 127 (1866) 105-.
- vision. *Schröder, H.* Pogg. A. 87 (1852) 306-; 105 (1858) 298-.
- , —, illusion. *Willigen, V. S. M. van der.* Amst. Vs. Ak. 2 (1854) 153-.
- through prisms. *Dancer, J. B.* Manch. Lt. Ph. S. P. 4 (1865) 157-.
- Pseudoscopy. *Zöllner, F.* Pogg. A. 110 (1860) 500-.
- (Zöllner). *Bacaloglo, E.* Pogg. A. 113 (1861) 333-.
- , monocular and binocular. *Dove, H. W.* Berl. Mb. (1857) 221-.
- Relief, apparent, of hollow casts, apparatus to produce. *Moussard, E.* C. R. 124 (1897) 182-.
- , mechanism of production. *Giraud-Teulon, —.* C. R. 45 (1857) 566-.
- , — — — (Giraud-Teulon). *Studiati, C.* N. Cim. 8 (1858) 265-.
- phenomena. *Burckhardt, F. A.* Ps. C. 137 (1869) 471-.
- , stereoscopic perception, and by direct vision. *Douliot, E.* N. Cim. 10 (1859) 342-.
- Retinal impression, inability to determine which retina is impressed. *Rogers, W. B.* Am. As. P. (1860) 192-.
- Simultaneous contrasts of brightness, metric experiments on regularity. *Hess, C., & Pretori, H.* Arch. f. Oph. 40 (1894) (Ab. 4) 1-.
- Space perception. *Jaesche, E.* Dorpat Sb. 9 (1892) 166-.
- , —. *Wundt, W.* Ph. Stud. 14 (1898) 1-.
- , —, monocular indirect vision. *Müller, R.* Ph. Stud. 14 (1898) 402-.
- , —, region, demonstration of contrast phenomena. *Loeb, J.* Pflüg. Arch. Pl. 60 (1895) 509-.
- Stenographic projection. *Simon, P. L.* Gilbert A. 32 (1809) 57-.
- Stereograms of surfaces, construction. *Marwell, J. C.* [1868] L. Mth. S. P. 2 (1869) 57-.
- Stereograph, pocket. *Plucker, J.* Brux. Ac. Bll. 30 (1870) 388-.
- Stereographs produced by hand. *Rood, O. N.* Silliman J. 31 (1861) 71-.
- Stereoscopic detection of forgeries, etc. *Dove, H. W.* Berl. Mb. (1859) 280-.
- images, anomalies. *Claudet, A.* [1856] R. S. P. 8 (1856-57) 104-.
- methods, 2 new. *Rollmann, W.* Pogg. A. 90 (1853) 186-.
- photography, compound. *Ellie, R.* As. Fr. C. R. (1896) (Pt. 1) 146.
- giving exact perspective. *Cazes, —.* Par. S. Ps. Sé. (1885) 115-.
- pictures. *Steinhauser, A.* Carl Rpm. 12 (1876) 389-.
- , —, angle. *Claudet, A. B. A.* Rp. (1853) (pt. 2) 4.
- , geometrical construction. *Steinhauser, A.* Halle Z. Nw. 36 (1870) 66-.
- , —, new form (anaglyphs). *Giltay, J. W.* [1895] Mbl. Nt. (1895-96) 1-, 13-.
- , —, — (—). *Watch, A. F.* Franklin I. J. 140 (1895) 401-.
- with ordinary camera. *Barnard, F. A. P.* Silliman J. 16 (1853) 348-.
- , —, preparation. *Hessemer, J. M.* Dingler 139 (1856) 111-.
- with single camera. *Clark, L.* [1853] Pht. S. J. 1 (1854) 57-.
- representation of bodies. *Dove, H. W.* Berl. Mb. (1857) 291.
- continuous gaseous spectra. *Poleck, T.* Bresl. Jbr. Schl. Gs. 49 (1871) 34-.
- — type as seen with both eyes through calc-spar. *Dove, H. W.* Berl. Mb. (1859) 278-.
- shadow figures. *Szili, A.* [1894] Term. Közl. 27 (1895) 158; Mth. Nt. B. Ung. 12 (1895) 426-.
- slide, new. *Rogers, W. B.* Am. Ac. P. 4 (1857-60) 360-.

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- Towne, J.* Guy's Hosp. Rp. 8 (1862) 70-, 81-.
- Listing, J. B.* Gött. Nr. (1869) 431-.
- Kohlrausch, F.* Gött. Nr. (1870) 415-; A. Ps. C. 143 (1871) 144-.
- Righi, A.* N. Cim. 14 (1875) 55-.
- Helmholtz, H. L. F. von.* L. Ps. S. P. 4 (1881) 260-; Ph. Mg. 11 (1881) 507-.
- Himes, C. F.* N. Y. Ac. T. 1 (1881-82) 114-.
- Hoppe, J.* Pflüg. Arch. Pl. 40 (1887) 523-.
- Stevens, W. Le C.* Science 9 (1887) 14.
- Anderson, W. W.* Science 9 (1887) 56.
- Jastrow, J.* Science 7 (1898) 615-.
- Grützner, —.* [1899] Würtb. Jh. 56 (1900) lv-.
- accommodation in. *Oppel, J. J.* (xii) Frkf. a. M. Ps. Vr. Jbr. (1860-61) 48-.
- apparent relief in. *Oppel, J. J.* Frkf. Jbr. Ps. Vr. (1858-59) 64-.
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- — —. *Pratt, W. H.* Science 8 (1886) 631-.
- illusion. *Monro, C. J.* [1864] Ph. Mg. 29 (1865) 15-.
- by optic divergence. *Stevens, W. Le C.* Am. J. Sc. 22 (1881) 358-, 443-.
- phenomena. *Dove, H. W. B. A. Rp.* (1854) (pt. 2) 9-.
- *Cima, A. N.* Cim. 6 (1857) 185-; C. R. 45 (1857) 664.
- *August, F.* Pogg. A. 110 (1860) 582-.
- *Meyer, O. E.* Bresl. Schl. Gs. Jbr. (1895) (Ab. 2a) 4.
- without stereoscope. *Dufour, L.* Laus. Bll. S. Vd. 5 (1857) 263-.
- *Lamy, C. A.* [1861] (xii) Lille S. Mm. 8 (1862) 447-.
- strain on eyes in. *Oppel, J. J.* Frkf. Jbr. Ps. Vr. (1858-59) 64-.

Stereoscopy. *Rollmann, W.* Pogg. A. 89 (1853) 350-.

- *Dove, H. W.* Pogg. A. 110 (1860) 494-.
- *Donders, F. C.* (xii) Amst. Ak. Wet. P. (1872-73) (No. 7) 8-.
- *Hugel, T.* Carl Rpm. 13 (1877) 268-.
- with exact relief. *Cazes, L.* Par. S. Ps. Sé. (1895) 124-.
- and photography, applications. *Mach, E.* Wien Sb. 54 (1866) (Ab. 2) 123-.
- , radiographic. *Chabaud, V.* Par. S. Ps. Sé. (1898) 154-.
- , —. *Lambertz, —.* [1900] Fsch. Röntgenstr. 4 (1900-01) 1-.

Stereotrope. *Shaw, W. T.* [1861] R. S. P. 11 (1860-62) 70-.

Telestereoscopic vision, limits. *Wächter, F.* Wien Ak. Šb. 105 (1896) (Ab. 2a) 856-.

Vision, disparate. *Stevens, W. Le C.* Science 11 (1888) 241.

— of landscapes with normal and abnormal adjustment of eyes. *Müller, Alex.* Pogg. A. 86 (1852) 147-.

— objects with converging lines, inversion. *Hoppe, —.* Pfüg. Arch. Pl. 43 (1888) 295-.

—, single and double. *Lathrop, S. P.* Silliman J. 7 (1849) 343-.

—, — —, and illusion as to distance. *Locke, J.* Silliman J. 7 (1849) 68-.

—, — —, stereoscopic study. *Wylde, R. S.* Edinb. R. S. P. 8 (1875) 505-.

—, solid, with or without stereoscope. *Müller, H.* Czgt. Opt. 19 (1898) 201-.

Visual appearance of high monuments. *Rémy, A.* Rv. Sc. 43 (1889) 668-.

— — — —. *Bourdon, B.* Rv. Sc. 43 (1889) 763-.

— — — —. *Rozier, F.* Rv. Sc. 44 (1889) 26-.

— — — —. *Rémy, A.* Rv. Sc. 44 (1889) 237-.

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Visual appearance of high monuments. *Rozier, F.* Rv. Sc. 44 (1889) 653-.

— — — — objects. *Sorel, G.* Rv. Sc. 45 (1890) 564-.

— axes, inclination. *Prevost, P. A. C.* 14 (1820) 397-.

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Maxwell, J. C. Ph. Mg. 14 (1857) 40-.

Gladstone, J. H. B. A. Rp. (1860) (pt. 2) 12-.

Aitken, J. (ix) Sc. S. Arts T. 8 (1872) 375-.

Peirce, C. S. Am. J. Sc. 13 (1877) 247-.

Weinhold, A. F. A. Ps. C. 2 (1877) 631-.

Hoh, T. (xii) Bamb. Nf. Gs. B. (12) (1882) (No. 6) 4 pp.

Swan, J. W. Nt. 26 (1882) 246.

Droop, H. R. L. Ps. S. P. 5 (1884) 217-; Ph. Mg. 15 (1883) 373-.

St. Clair, G. [1884] Birm. Ph. S. P. 4 (1883-85) 117-.

Vogel, H. W. A. Ps. C. 28 (1886) 130-.

Cooke, F. G. [1887] Eastbourne NH. S. T. 2 (1886-94) 35-.

Isaachsen, D. Pfüg. Arch. Pl. 43 (1888) 289-.

Vogel, H. W. Berl. Ps. Gs. Vh. (1888) 56-; Humb. 7 (1888) 315-; Lpldina. 24 (1888) 106-, 128-.

Whitmell, C. T. Card. Nt. S. T. 19 (1888) 67-.

Vogel, H. W. Berl. Ps. Gs. Vh. (1890) 1-.

Roy, Soc. Comm. R. S. P. 51 (1892) 280-.

Guëbhard, A. As. Fr. C. R. (1894) (Pt. 1) 121.

Nicati, W. C. R. 119 (1894) 917-, 974.

Vogel, H. W. Berl. Ps. Gs. Vh. (1894) 97-; D. Nf. Vh. (1897) (Th. 2, Hälfte 1) 44-.

Stevens, W. Le C. Science 7 (1898) 513-, 677-.

Titchener, E. B. Science 7 (1898) 603-, 832-.

Franklin, (Mrs.) C. L. Science 7 (1898) 773-; 8 (1898) 329-.

Whitman, F. P. Am. As. P. (1898) 83-.

Apparatus. *Glan, P.* [1880] Pfüg. Arch. Pl. 24 (1881) 307-.

Apparent motion of figures of certain colours. *Loomis, E.* Am. As. P. (1850) 293-; (1851) 78-.

Bichromatic vision. *Stephenson, J. W. M.* Mer. J. 7 (1872) 215-.

Brightness of pigments by oblique vision. *Whitman, F. P.* Science 9 (1899) 734-.

Chromatrope, new. *Morton, H. A.* Ps. C. 157 (1876) 150-.

Chromostroboscopic experiments. *Ricciò, A.* Mod. S. Nt. An. 10 (1876) 81-.

Colorimeter. *Houton de la Billardièrre, J. J.* Rouen Tr. Ac. (1827) 73-.

— *Beek, A. van.* Amst. N. Vh. 2 (1829) 217-; Schweigger J. 62 (=Jb. 2) (1831) 246-.

— *Müller, Alex.* Erdm. J. Pr. C. 60 (1853) 474-.

- Colorimeter. *Iosvay, L.* [1892] *Termt. Közl.* 25 (1893) 158-; *Mth. Nt. B. Ung.* 11 (1894) 426.
- , complementary. *Müller, Alex.* *Erdm. J. Pr. C.* 66 (1855) 193-; *Fresenius Z.* 2 (1863) 143-.
- , detached, and colorimetry. *Mills, E. J.* *Ph. Mg.* 7 (1879) 437-.
- , portable. *Mills, E. J.* *Glasg. Ph. S. P.* 10 (1877) 310-.
- Colour box, experiments with Lord Rayleigh's. *Schuster, A.* [1890] *R. S. P.* 48 (1891) 140-.
- change apparatus. *Hessel, J. F. C.* *Pogg. A.* 79 (1850) 442-.
- combinations by polarised light. *Spottiswoode, W.* [1874] *R. S. P.* 22 (1874) 354-; *R. I. P.* 7 (1875) 291-.
- constants. *Rood, O. N.* *J. Sc.* 6 (1876) 458-.
- — and intensity of clouded light for chromometry. *Müller, Alex.* *D. C. Gs. B.* 4 (1871) 105-.
- discrimination, formation of shadow and perspective in. *Einhoven, W.* *Brain* 16 (1893) 191-; *Ndl. Gast. Oogl. Vs.* 35 (1894) 14 pp.
- and distance, relation between perception. *Rood, O. N.* *Silliman J.* 32 (1861) 184-.
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- COLOUR MIXTURE.
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- Moutier, J.* [1882-83] *Par. S. Phlm. Bll.* 7 (1883) 19-; *Lum. Élect.* 8 (*1883) 22-.
- Schelske, L. E. R.* *A. Ps. C.* 16 (1882) 349-.
- (Lecture experiment.) *Vogel, H. W.* *Berl. Ps. Gs. Vh.* (1887) 28-.
- apparatus. *Ketteler, E.* *A. Ps. C.* 141 (1870) 604-.
- , *Szildgyi, E.* (xii) *Orv.-Term. Éts.* 6 (1881) (*Orv. Szak*) 60-.
- , *Hoffert, H. H.* *L. Ps. S. P.* 6 (1885) 200-; *Ph. Mg.* 18 (1884) 81-.
- , *Aitken, J.* *Edinb. R. S. P.* 13 (1886) 122-.
- , new Helmholtz. *Schmidt, F., & Haensch,* —. *Z. Instk.* 13 (1893) 200-.
- binocular. *Bezold, W. von.* (vii) *Pogg. A. (Jubelbd.)* (1874) 585-.
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- by dissolved dyes. *Klobukow, N. von.* *A. Ps. C.* 43 (1891) 433-.
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- , *Preyer, W. T.* *Bonn. Cor.-Bl. NH. Vr.* (1868) 57-.
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- law. *König, W.* *Frkf. a. M. Ps. Vr. Jbr.* (1897-98) 35-.
- , Newton's. *Bezold, W. von.* *Berl. Ps. Gs. Vh.* (1887) 55 (*bis*)-.
- law, Newton's. *Hering, E.* *Lotos* 35 (1887) 177-.
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- , —. *Tonn, E.* *Z. Psychol.* 7 (1894) 279-.
- , —, in green blindness. *Brodhun, E. Z. Psychol.* 5 (1893) 323-.
- method. *Bezold, W. von.* *Münch. Ak. Sb.* 6 (1876) 106-.
- , *Hilbert, R.* *Humb.* 3 (1884) 257-.
- monocular. *Szildgyi, E.* (xii) *Cb. Md. Ws.* 19 (1881) 513-.
- optical and mechanical, differences. *Petruševskij, T. T.* *Rs. Ps.-C. S. J.* 25 (*Ps.*) (1893) 264.
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- , *Graulich, W. J.* *Wien SB.* 12 (1854) 783-; 13 (1854) 201-.
- , and colour vision. *Bohn, C. A. Ps. C.* 125 (1865) 87-.
- Colour patterns in natural productions. *Higgins, H. H.* *Lpool. Lt. Ph. S. P.* 11 (1856-57) 133-.
- photometry in spectrum. *Abney, (Capt.) W. de W., & Festing, (Maj.-Gen.) E. R.* [1886] *Phil. Trans.* 177 (1887) 423-.
- of red or yellow objects viewed through red or yellow glass. *Le Gentil,* —. *A. C. 10* (1791) 225-.
- scale. *Biot, J. B.* *Par. S. Phlm. Bll.* (1816) 144-; (1818) 90-.
- , Newtonian. *Govi, G.* *C. R.* 105 (1887) 733-.
- scheme, standard. *Pillsbury, J. H.* [1892-95] *Science* 19 (1892) 114; 21 (1893) 310-; *Nt.* 52 (1895) 390-; 53 (1895-96) 55.
- sensations, mathematical representation. *Feret, R.* *C. R.* 102 (1886) 44-, 256-, 608-.
- , persistence. *Stein, W.* *J. Pr. C.* 113 (1872) 328-.
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- , intensity distribution in spectrum. *König, A., & Dieterici, C.* *Berl. Ak. Sb.* (1886) 805-; *Z. Psychol.* 4 (1893) 241-.
- systems. *Donders, F. C.* [1880-84] *Utr. Oz.* 6 (1881) 79-; 8 (1883) 1-; *Arch. f. Oph.* 30 (1884) (*Ab.* 1) 15-.
- , *Rood, O. N.* [1891] *Am. J. Sc.* 44 (1892) 263-.
- , *Kries, J. von.* *Z. Psychol.* 13 (1897) 241-, 473.
- , dichromatic. *Donders, F. C.* [1878] (xii) *Amst. Ak. Wet. P.* (1878-79) No. 6, 3-.
- , —. *König, A.* *A. Ps. C.* 22 (1884) 567-.
- , shortest lines in. *Helmholtz, H. von.* *Berl. Ak. Sb.* (1891) 1071-.
- , trichromatic. *Kries, J. von.* *Z. Psychol.* 19 (1899) 63-.
- top, cinephantic. *Hunt, E.* [1859] *Glasg. Ph. S. P.* 4 (1860) 252-.
- triangles by mixtures of real colours. *Bezold, W. von.* [1885] *Münch. Ak. Sb.* 15 (1886) 305-.
- Coloured glasses, binocular vision through. *Dove, H. W.* *Pogg. A.* 101 (1857) 147-; *Berl. Mb.* (1861) 1054-.

Coloured glasses, optical observation with. *Marx, C. M.* D. Nf. Vsm. B. (1843) 235.
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 — surfaces, efficiency of eye in distinguishing two. *Broca, A.* Par. S. Ps. Sé. (1894) 119-.
 — —, reflex action in artists' studios. *Wiener, L. C.* [1880] (xii) Karlsruhe Nt. Vr. Vh. 8 (1881) 265-; 9 (1883) 10-.

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 —. *Forbes, J. D.* Ph. Mg. 34 (1849) 161-; Edinb. R. S. P. 2 (1851) 214-.
 — and definition. *Rosenstiehl, A.* As. Fr. C. R. (1878) 303-.
 — in series. *Carpentier, J. C. R.* 100 (1885) 808-.
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Maumené, E. J. (viii) Reims Sé. Ac. 11 (1850) 274-.
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Lenssen, E. Lieb. A. 104 (1857) 177-.
Osann, G. Würzb. Nw. Z. 1 (1860) 61-.
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 —. *De la Rive, L.* Arch. Sc. Ps. Nt. 19 (1888) 391-.
 —, theory. *Challis, J.* Ph. Mg. 12 (1856) 329-.
 —, — (Challis). *Stokes, G. G.* Ph. Mg. 12 (1856) 421-.
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 —, — (Helmholtz). *Plateau, J. A. F.* Pogg. A. 88 (1853) 172-.
 —, —, with reference to mixtures of blue and yellow light. *Maxwell, J. C. B. A. R.* (1856) (*pt. 2*) 12-.
 —, —, and relations of colours of spectrum. *Maxwell, J. C.* Phil. Trans. (1860) 57-; R. S. P. 10 (1859-60) 484-.
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 —, smallest perceptible, alteration of wave-length of light necessary to produce. *Uthoff, W.* [1888] Arch. An. Pl. (*Pl. Ab.*) (1889) 171-.
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 — — — — — sodium yellow. *Donders, F. C.* Amst. Ak. Wet. P. (1883-84) No. 9, 9-.
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- , improved artificial light for. *Dufton, A., & Gardner, W. M. S. Dyers Col. J. 16* (1900) 238-.
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- moving, perception. *Chevreul, M. E.* [1878-81] *C. R. 86* (1878) 621-, 854-, 985-; 87 (1878) 576-, 707-; 88 (1879) 929-; *Par. Ac. Sc. Mm. 41* (1879) *No. 7*, 229 pp.; *C. R. 95* (1882) 956-, 1086-; 96 (1883) 18-; *Par. Ac. Sc. Mm. 42* (1883) *No. 4*, 378 pp.
- mutual behaviour. *Seebeck, T. J. Schweigger J. 1* (1811) 4-.
- natural, production, and law of colour mixture. *König, W. Frkf. a. M. Ps. V. Jbr. (1897-98)* 36-.
- nervous centres for perception of separate colours. *Chauveau, A. C. R. 115* (1892) 908-.
- (Chauveau). *Guéhard, A. Par. S. Ps. Sé. (1893)* 129-.
- nomenclature. *Bredsdorff, J. H. Ørsted Ts. 3* (1824) 182-; *Froriep Not. 8* (1824) 161-.
- numerical registration. *Abney, (Capt.) W. de W. R. S. P. 49* (1891) 227-.
- origin. *Rosenbach, —. Bresl. Schl. Gs. Jbr. (1893) (Ab. 2a)* 34-.
- perimetry. *Hegg, E. Arch. f. Oph. 38* (1892) (Ab. 3) 145-.
- phenomena on intermittent stimulation with white light. *Percival, A. S. [1899] Durham Un. Ph. S. P. 1* (1900) 219-.
- , new apparatus for studying. *Nardroff, E. R. von. Science 2* (1895) 352.
- pigment-, analysis. *Kolbe, B. Arch. f. Oph. 30* (1884) (Ab. 2) 1-, 288, (Ab. 4) 313-.
- polarity. *Himly, (Dr.) C. Oph. Bb. 1* (1802) (pte. 2) 1-.
- power of distinguishing, quantitative determination. *Donders, F. C. Donders Ndl. Gast. Oogl. Vs. 18* (1877) 77-; *Arch. Néerl. 13* (1878) 91-.
- Primary Colours.*
- Brewster, (Sir) D. B. A. Rp. (1855) (pt. 2)* 7-.
- Rosenstiehl, A. C. R. 92* (1881) 1286-; *Par. S. Ps. Sé. (1881)* 166-.
- Morton, G. H. Lpool. Lt. Ph. S. P. 36* (1882) 249-.
- Wilser, —. Karlsruhe Nt. Vr. Vh. 10* (1888) (Sb.) 176-.
- and law of colour mixture. *Bezold, W. von. A. Ps. C. 150* (1873) 71-, 221-.
- — — — — *Bouty, E. C. N. 30* (1874) 152-.
- number. *Cooper, P. R. S. P. 3* (1834) 284-; *Thomson Re. 3* (1836) 58-, 94-; *Sturgeon A. Electr. 2* (1838) 464-.
- and nature. *Anon. (vi 535) Gergonne A. Mth. 10* (1819-20) 228-.
- point of intersection of curves of intensity. *König, Ar. [1883] (xii) Berl. Ps. Gs. Vh. 2* (1884) 24-.
- reduction of Newton's 7 to smaller number. *Mollweide, C. Gehlen J. 1* (1806) 651-.
- succession and persistence of sensation. *Riccd, A. Mod. Ac. Sc. Mm. 16* (1875) 13-.
- theory. *Kearney, J. B. Phm. J. 3* (1862) 210-.
- *Preyer, W. Z. Psychol. 11* (1896) 405-.
- white light composed of 4 colours. *Fusini, A. A. Sc. Lomb. Ven. 2* (1832) 337-; 12 (1842) 94-.
- problem. *Franklin, (Mrs.) C. L. Science 12* (1900) 408-.
- production. *Young, (Dr.) T. Phil. Trans. (1802)* 387-.
- purple obtained by recombination of 2 colours of solar spectrum. *Koechlin, C. C. R. 103* (1886) 432-.
- relations to painting, decoration and printing. *Irvine, R. [1895] Sc. S. Arts T. 14* (1898) 22-.
- relative intensity. *Rosenstiehl, A. Par. S. Ps. Sé. (1882)* 103-; *C. R. 94* (1882) 1411-.
- — — — — effect of illumination. *Dove, H. W. Berl. B. (1852)* 69-.
- — — — — *Oppel, J. J. (vi Add.) Frkf. Jbr. Ps. Vr. (1853-54)* 44-.
- reproduction and notation. *Steinheil, —. C. R. 122* (1896) 1414-.
- of sky light, sun light, cloud light and candle light. *Abney, (Capt.) W. de W. R. S. P. 54* (1894) 2-.
- and sounds, association. *Maggi, P. G. Verona Mm. Ac. Ag. 23* (1849) 345-.
- — — — — *Rochas, — de. Midl. Ntlist. 8* (1885) 141.
- — — — — *Gheyn, (le rév. père) — van den. Brux. S. Sc. A. 9* (1885) (Pt. 1) 69-.
- — — — — *Gruber, É. Rv. Sc. 51* (1893) 394-.
- — — — — *Wallian, S. S. Science 21* (1893) 360.
- — — — — in the blind. *Philippe, J. Rv. Sc. 1* (1894) 806-.
- Spectral Colours.*
- Davies, J. A. [1861] Edinb. N. Ph. J. 15* (1862) 187-.
- brightness. *König, A. A. Ps. C. (Berl. Ps. Gs. Vh. 1892)* 45 (1892) 604-.
- changes in tone from fatigue of retina by homogeneous light. *Hess, C. Arch. f. Oph. 36* (1890) (Ab. 1) 1-.
- discrimination by normal eye. *Uthoff, W. Arch. f. Oph. 34* (1888) (Ab. 4) 1-.
- influence of threshold of visibility. *Ebert, H. A. Ps. C. 33* (1888) 136-.
- mixture. *Lüdicke, M. A. F. Gilbert A. 34* (1810) 1-, 229-, 362-.
- *Helmholtz, H. Pogg. A. 94* (1855) 1-.
- *Frey, M. von, & Kries, J. von. Arch. An. Pl. (Pl. Ab.) (1881)* 336-.
- and their mixtures, apparatus for study of luminous and chromatic intensities. *Pari- naud, —. Par. S. Ps. Sé. (1884)* 206-.
- number and brightness. *König, A. Z. Psychol. 8* (1895) 375-.
- and pigment-colours, comparison. *Bezold, W. von. Münch. Ak. Sb. 6* (1876) 30-.
- sensitiveness of eye to. *Lamansky, S. A. Ps. C. 143* (1871) 633-.

- sensitiveness of eye to. *Meslin, G.* [1899] Mntp. Ac. Mm. 2 (1900) 429-.
- visibility limits. *Abney, (Capt.) W. de W.* R. S. P. 49 (1891) 509-.
- stereoscopic combination. *Rood, O. N.* Am. J. Sc. 39 (1865) 254-.
- unequal visibility at twilight and unequal actinic properties in full daylight. *Keller, F. A. E.* C. R. 69 (1869) 278-.
- 1st visible, of incandescent iron. *Noble, A.* Nt. 45 (1892) 484-.
- , —, —. *Porter, T. C.* Nt. 45 (1892) 558-.
- yellow. *Monro, C. J.* Nt. 3 (1871) 246.
- (mixed red and green), and spectral yellow, comparisons. *Donders, F. C.* Donders Ndl. Gast. Oogl. Vs. 24 (1883) 147-.
- Development of colour perception in children. *Magnus, H.* Humb. 3 (1884) 1-.
- Efficiency of eye in photometry. *Broca, A.* Par. S. Ps. Sé. (1894) 119-; *Éclair. Élect.* 6 (1896) 23-.
- Emissive power of incipient glow, Weber's experiments. *Knies, M.* D. Nf. Tbl. (1889) 217-.
- Energy and vision. *Langley, S. P.* Wash. Nat. Ac. Mm. 5 (1891) 7-.
- Erythroscopie and melanoscopie. *Lommel, E.* Erlang. Sb. Ps. Md. S. 3 (1871) 102-; A. Ps. C. 143 (1871) 483-.
- Experiments. *Rayleigh, (Lord).* Nt. 3 (1871) 234-; 25 (1882) 64-.
- , *Mentz, P.* Ph. Stud. 13 (1898) 481-.
- , and photo-voltaic theory of vision. *Burton, C. V.* [1888] Camb. Ph. S. P. 6 (1889) 308-.
- Fatigue phenomena, certain, incompatibility with three-fibre theory. *Hess, C.* Arch. f. Oph. 39 (1893) (Ab. 2) 45-.
- Illusions. *Oppel, J. J.* (XII) Frkf. a. M. Ps. Vr. Jbr. (1869-70) 96-.
- Indirect vision. *Fick, A.* Pflüg. Arch. Pl. 47 (1890) 274-.
- , *Kirschmann, A.* Ph. Stud. 8 (1893) 592-.
- , *Hellpach, W.* Ph. Stud. 15 (1900) 524-.
- Invisibility of rays of wave-length greater than red and less than violet of spectrum. *Czermak, J. N.* (vi Add.) Böhm. Gs. Ab. 9 (1857) (Sect. B.) 27-.
- Leucoscope for testing. *König, A.* A. Ps. C. 17 (1882) 990-.
- Light and colour in direct and indirect vision. *Charpentier, A., & Landolt, E.* C. R. 86 (1878) 495-.
- , —, measurement. *Lovibond, J. W.* Mer. S. J. (1893) 275-.
- , —, sensations, relation between intensity. *Henry, C.* C. R. 115 (1892) 811-.
- , —, —, theory. *Kries, J. von, & Brauneck,* —, Arch. An. Pl. (Pl. Ab.) (1885) 79-.
- , —, —, —, *Wundt, W.* Ph. Stud. 4 (1888) 311-.
- , —, —, —, *Franklin, (Mrs.) C. L.* [1892-98] J. H. Un. Cir. [12 (1892-93)] 108-; Science 22 (1893) 80-; Nt. 49 (1893-94) 394; Am. As. P. (1898) 473-.
- Light and colour sensations, theory. *Lechallas, G.* Rv. Quest. Sc. 45 (1899) 476-.
- , —, —, unnoticed phenomena. *Gilbert, L. W.* Gilbert A. 30 (1868) 242-.
- , —, shadow, nature. *Reude, J.* Ph. Mg. 5 (1829) 109-.
- Mean colour of many-coloured surface, determination. *Petrushevskii, T. T.* (XII) Rs. Ps.-C. S. J. 15 (Ps., Pt. 1) (1883) 118-; J. de Ps. 3 (1884) 460-.
- Mutual action of both eyes. *Gazzaniga, C. L.* Bb. It. 62 (1831) 349-.
- Optics of trichromatic photography. *Ives, F. E.* [1900] Phot. J. 25 (1902) 99-.
- Phenomena. *Charpentier, A.* Nancy S. Sc. Bll. (1884) xxix-, xxxii-.
- Quantity of light necessary. *Charpentier, A.* C. R. 92 (1881) 92-.
- Red and grey luminosity. *Lummer, O. A.* Ps. C. 62 (1897) 14-.
- Retardation in perception of different colours. *Charpentier, A.* C. R. 114 (1892) 1423-.

ROTATING DISCS, EXPERIMENTS.

- Gorham, J.* J. Mer. Sc. 7 (1859) 69-.
- Rood, O. N.* Silliman J. 35 (1863) 357-.
- Rosenstiehl, A.* Par. S. Ps. Sé. (1877) 120-; C. R. 84 (1877) 1133-; 86 (1878) 343-.
- Aitken, J. (of Darroch).* [1878] Edinb. R. S. P. 10 (1880) 40-.
- Rosenstiehl, A.* C. R. 92 (1881) 244-, 357-.
- Black and white disc, application to tachymetry and ophthalmology. *Henry, C.* C. R. 122 (1896) 406-.
- Occasional distinct vision. *Stevell, J. B. A.* Rp. (1850) (pt. 2) 21-.
- Production of white. *Lüdicke, M. A. F.* Gilbert A. 5 (1800) 272-.
- , —, —, *Dove, H. W.* Pogg. A. 71 (1847) 97-.
- , —, —, *Oppel, J. J.* Frkf. Jbr. Ps. Vr. (1858-59) 57-.
- , —, —, *Govi, G.* Rm. R. Ac. Linc. T. 7 (1883) 164-.
- Rotating prism, production of white by. *Duboscq, J.* Par. S. Ps. Sé. (1884) 65-.

SPECTRUM TOP.

- Benham, C. E.* [1894] Nt. 51 (1894-95) 113-.
- (Benham.) *Liveing, G. D.* [1894] Camb. Ph. S. P. 8 (1895) 249-.
- (Liveing.) *Benham, C. E.* [1894] Nt. 51 (1894-95) 200.
- (Benham.) *Liveing, G. D.* [1894] Nt. 51 (1894-95) 200.
- Abney, (Capt.) W. de W.* Nt. 51 (1894-95) 292.
- (Benham.) *Finnegan, J. M., & Moore, B.* Nt. 51 (1894-95) 292-.
- (Finnegan & Moore.) *Benham, C. E.* Nt. 51 (1894-95) 321.
- Edridge-Green, F. W.* Nt. 51 (1894-95) 321.
- Hurst, C. H.* Nt. 51 (1894-95) 510.
- (Benham.) *Snellen, —.* [1895] A. d'Ocul. 115 (1896) 51-.
- Turner, D.* [1895] Sc. S. Arts T. 14 (1898) 50-.
- (Benham.) *Vogel, H. W.* Berl. Ps. Gs. Vh. (1895) 45-.

- (Benham.) *Snellen, H.* Ndl. Gast. Oogl. Vs. 37 (1896) (Ndl. Ooghk. Bijdr.) 35-.
- Bidwell, S.* [1897] R. I. P. 15 (1899) 354-.
- (Benham & Bidwell.) *Hess, —.* [1899] Danzig Schr. 10 (1899-1902) (*Hft.* 2 & 3) xxxvi-.
- Stereoscopy by disparate colour discrimination.
- Einhoven, W.* Arch. f. Oph. 31 (1885) (*Ab.* 3) 211-; Ndl. Gast. Oogl. Vs. 27 (1886) 1-; Arch. Néerl. 20 (1886) 361-.

THEORY.

- Crum, W.* Mulhouse S. In. Bl. 4 (1831) 544-.
- Betzehart, —.* Grunert Arch. 8 (1846) 318-.
- Müller, J. J.* Arch. f. Oph. 15 (1869) (*Ab.* 2) 208-.
- Grosse, W.* Cztg. Opt. 9 (1888) 256-.
- Preobraženskij, P.* [1889] Rs. Ps.-C. S. J. 21 (*Ps.*) (1889) 249-; J. de Ps. 9 (1890) 538-; Mosc. S. Sc. Bl. 65 (No. 1) (1890) 17.
- Ebbinghaus, H.* [1892-93] Z. Psychol. 5 (1893) 145-.
- Dufton, A.* [1893] S. Dyers Col. J. 10 (1894) 3-, 22-.
- Koster, W.* Arch. f. Oph. 41 (1895) (*Ab.* 4) 1-.
- Kries, J. von.* Z. Psychol. 19 (1899) 175-.
- application to colour photography. *Abney, (Capt.) W. de W.* [1898] R. I. P. 15 (1899) 802-.
- industries. *Rosenthal, I.* Rv. Sc. 17 (1879) 316-.
- Crum's, Marx, C. M.* Schweigger J. 63 (=Jb. 3) (1831) 54-.
- Goethe's, Anon.* (vi 43) A. C. 79 (1811) 199-.
- *Hantzsch, C. A.* (vii) Dresden Sb. Isis (1862) 164-.
- *Aderholt, —.* (vii) Dresden Sb. Isis (1862) 168-, 265-.
- *Hantzsch, R.* (vii) Dresden Sb. Isis (1862) 244-.
- *Fyndall, J.* [1880] R. I. P. 9 (1882) 340-.
- , and colour of atmosphere. *Wiener, C.* Karlsruhe Nt. Vr. Vh. 13 (1900) (*Ab.*) 215-.
- Newton's, modification. *Hellweg, —.* Kastner Arch. C. 4 (1831) 51-.
- physical. *Darzens, G.* C. R. 121 (1895) 133-.
- Readers' (anti-Newtonian). *Biot, J. B. J.* Sav. (1817) 202-.
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- Young's. *Mayer, A. M.* Am. J. Sc. 9 (1875) 251-.
- and Hering's. *Tennant, J.* B. A. Rp. (1886) 526.
- , modern developments. *König, A.* B. A. Rp. (1886) 431-.
- Young-Helmholtz and Hering's. *Hilbert, R.* (xii) Humb. 2 (1883) 289-.
- Tint perception, testing instrument. *Galton, F.* [1889] Ap. I. J. 19 (1890) 27-.
- Transparency of eye for actinic rays. *Char-donnet, E. de.* C. R. 96 (1883) 441-, 509-.
- — — dark rays. *Aschkinass, E. Z.* Psychol. 11 (1896) 44-.

- Transparency of eye for dark rays. *Pettinelli, P.* Rv. Sc.-Ind. 28 (1896) 61-.
- Trichromatic theory of optic nerve. *Durand (de Gros), J. P.* C. R. 121 (1895) 1165-.
- Ultra-violet rays, invisibility, experiments to ascertain cause. *Widmark, J.* Stockh. Öfv. (1897) 287-; Fschr. Ps. (1899) (*Ab.* 2) 56-.
- , visibility. *Mascart, É.* C. R. 68 (1869) 402-.
- , —. *Sekulić, M.* A. Ps. C. 146 (1872) 157-.
- , —. *Sauer, L.* A. Ps. C. 155 (1875) 602-.
- , —. *Herschel, A. S.* Nt. 16 (1877) 22-.
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- , — (Chardonnet). *Mascart, É. É. N.* C. R. 96 (1883) 571.
- Visual purple of human eye. *König, A.* Berl. Ps. Gs. Vh. (1894) 82-.
- White light from black pigments. *Ludicke, M. A. F.* Gilbert A. 20 (1805) 299-.
- , decomposition by moving reflectors. *Prevost, B.* Gen. Mm. S. Ps. 3 (1826) (*pte.* 2) 121-.
- , —, double grey of which it consists. *Pfaff, C. H.* Schweigger J. 6 (1812) 205-.
- , —, standard. *Brit. Ass. Comm. B. A. Rp.* (1880) 119.
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- Whiteness. *Prevost, B.* A. C. 37 (1828) 105-.

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- Plateau, J. A. F.* A. C. 53 (1833) 386-.
- Brewster, (Sir) D.* Ph. Mg. 4 (1834) 353-.
- Gherardi, S.* Bologna N. Cm. 1 (1834) 349-.
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- Tomlinson, C.* Thomson Rc. 2 (1835) 21-.
- Cooper, P.* Thomson Rc. 4 (1836) 427-.
- Plateau, J. A. F.* Pogg. A. 38 (1836) 626-; Quetelet Cor. Mth. 9 (1837) 97-.
- Fechner, G. T.* Pogg. A. 44 (1838) 221-, 513-.
- Dove, H. W.* Pogg. A. 45 (1838) 158-.
- S., P. Q.* (vi *Adds.*) Silliman J. 33 (1838) 258-.
- Minich, S. R.* Ven. At. 1 (1850) 47-.
- Séguin, J. M.* C. R. 33 (1851) 642-; 34 (1852) 767-; A. C. 41 (1854) 413-.
- Marianini, S.* Mod. S. It. Mm. 25 (1855) 342-.
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- Séguin, J. M.* C. R. 47 (1858) 198-.
- Ladame, H.* Neuch. Bl. 7 (*pt.* 1) (1865) 84-.
- Moigno, F.* Smiths. Rp. (1866) 211-.
- Oliver, C. A.* Am. Ph. S. P. 23 (1886) 500-.
- Bidwell, S.* Nt. 55 (1896-97) 367-; 56 (1897) 128.
- Allen, F. J.* Nt. 56 (1897) 174.
- apparatus. *Schaffgotsch, F. von.* Pogg. A. 54 (1841) 193-.
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- and binocular vision. *Dove, H. W.* Berl. Mb. (1861) 521-.

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- Hassenfratz, J. H.* Par. Éc. Pol. J. 11° cah. (1801) 272-.
- Petrini, P.* [1805] Mod. S. It. Mm. 13 (1807) 37-.
- Muncke, G. W.* Schweigger J. 30 (1820) 74-.
- Trechsel, F.* Bb. Un. 32 (1826) 3-.
- Bourgeois, C. G. A.* Férussac Bll. Sc. Mth. 9 (1828) 179-.
- Cooper, P.* Thomson Re. 4 (1836) 427-.
- Bizio, B.* Ven. Mm. I. 7 (1857) 393-.
- Fournet, J.* C. R. 43 (1859) 1105-; 49 (1859) 24-, 121-.
- Magrini, L.* Mil. At. I. Lomb. 2 (1860) 318-, 343-.
- Audouard, P.* Brest S. Ac. Bll. 20 (1895) 161-.
- blue shadows. *Schrank, F. von P. von.* [1810] Münch. D. (1811-12) 293-; (1813) 51-.
- caused by white light. *Oppel, J. J.* Frkf. Jbr. Ps. Vr. (1859-60) 65-.
- — — lights. *Nardo, G. D.* Ven. At. (1858-59) 5-.
- and Newton's colour theory. *Grotthus, T. (Frhr.) von.* Schweigger J. 3 (1811) 148-.
- theory. *Pohlmann, C.* Pogg. A. 37 (1836) 319-.

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- Rollett, A.* Wien Sb. 55 (1867) (Ab. 2) 424-, 741-.
- Hering, E.* Pflüg. Arch. Pl. 41 (1887) 29-, 397. (Hering.) *Kries, J. von.* Pflüg. Arch. Pl. 41 (1887) 389-.
- Rood, O. N.* Sch. Mines Q. N. Y. 8 (1887) 307-.
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- Lane, W. B.* [1897] Cn. I. T. 5 (1898) 225-.
- Klemenčić, —.* Innsb. Nt. Md. B. 24 (1899) vi-.
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- change of colour due to. *Rollett, A.* Wien Sb. 55 (1867) (Ab. 2) 344-.
- experiments with rotating discs. *Schmerler, B.* Ph. Stud. 1 (*1883) 379-.
- measurement of colour produced by. *Abney, (Capt.) W. de W.* R. S. P. 56 (1894) 221-.
- optically produced colour contrast between object and background. *Rheinberg, J.* Mer. S. J. (1896) 373-.
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- (Chevreur.) *Plateau, J. A. F.* C. R. 57 (1863) 1029-.
- (Plateau.) *Chevreur, M. E.* C. R. 58 (1864) 100-.
- *Szilágyi, E.* (xii) Cb. Md. Ws. 19 (1881) 849-.
- *Burch, G. J.* B. A. Rp. (1900) 629-.

- simultaneous, Helmholtz's theory. *Hering, E.* Pflüg. Arch. Pl. 40 (1887) 172-; 41 (1887) 1-, 358-; 43 (1888) 1-.
- , metrical researches. *Pretori, H., & Sachs, M.* Pflüg. Arch. Pl. 60 (1895) 71-.
- , phenomena. *Mayer, A. M.* Am. J. Sc. 46 (1893) 1-.
- , produced by reflection of moon in sea. *Martins, C. C. R.* 43 (1856) 763-.
- , quantitative relations. *Kirschmann, A.* Ph. Stud. 6 (1891) 417-.
- successive, laws. *Vallhonest, J.* [1892] Barcel. Ac. Mm. 1 (1892-1900) 27-.

- disc for production. *Fechner, G. T.* Pogg. A. 45 (1838) 227-.
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- — — *Sinsteden, —.* Pogg. A. 84 (1851) 45-.
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- due to sound. *Berthold, E.* [1883] Königsb. Schr. 24 (*1884) (Sb.) 33-.
- in electric light. *Dove, H. W.* Berl. Mb. (1867) 80-.
- experiments. *Rollett, A.* Pflüg. Arch. Pl. 49 (1891) 1-.
- green colour of setting sun. *Hornstein, —.* Kassel Vr. Nt. B. 34 & 35 (1889) lxii.
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- and lustre. *Paalzow, A.* Berl. B. (1857) 390-.
- method of producing. *Splittgerber, D. C.* Pogg. A. 49 (1840) 587-.
- mixture. *Aars, K. Birch-Reichenwald.* Christiania Skr. (Mth.-Nt. Kl.) (1895) No. 3, 34 pp.
- produced by light traversing eyelids. *Riccò, A.* Mod. S. Nt. At. (Rd.) 2 (1884) 70-.
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- of water. *Haldat du Lys, C. N. A. de.* Nancy Mm. S. Sc. (1847) 451-.
- white light, apparent coloration observed with quick flashes. *Charpentier, A.* C. R. 113 (1891) 278-.
- — and coloured, effects of mixing. *Rood, O. N.* Am. J. Sc. 20 (1880) 81-.

COLOUR BLINDNESS.

- Dalton, J.* [1794] Manch. Ph. S. Mm. 5 (1798) 28-.
- Prevost, P.* Bb. Un. 35 (1827) 320-.
- Herschel, (Sir) J. F. W.* Edinb. J. Sc. 10 (1829) 153-.
- Wartmann, É.* [1840-48] Gen. Mm. S. Ps. 10 (1843) 273-; 12 (1849) 183-.
- Henry, J.* [1845] Smiths. Misc. Col. 30 (1887) (1) 233-.

4450 Colour Blindness

- Maxwell, J. C.* [1855-56] Edinb. R. S. T. 21 (1857) 275-; Edinb. T. Sc. S. Arts 4 (1856) 394-.
- Tyndall, J.* Ph. Mg. 11 (1856) 329-.
- Herschel, (Sir) J. F. W.* [1859] R. S. P. 10 (1859-60) 72-.
- Oppel, J. J.* (xii) Frkf. a. M. Ps. Vr. Jbr. (1861-62) 43-.
- Dove, H. W.* Berl. Mb. (1864) 667-.
- Motigno, F.* Smiths. Rp. (1866) 211-.
- Holmgren, A. F.* [1880] R. S. P. 31 (1881) 302-.
- König, Ar.* [1884] Arch. An. Pl. (Pl. Ab.) (1885) 160-.
- Knies, M.* [1887-88] Arch. Augenh. 17 (1887) 379-; 18 (1888) 50-; 19 (1889) 253-.
- Breese, C. M.* [1888] Kan. Ac. Sc. T. 11 (1889) 106-.
- Harlow, W. B.* Science 11 (1888) 57-.
- Carter, R. B.* [1890] R. I. P. 13 (1893) 116-.
- Rayleigh, (Lord).* B. A. Rp. (1890) 728-.
- Carter, R. B.* Ün. Serv. I. J. 36 (1892) 983-.
- Pole, W.* Ph. Mg. 34 (1892) 100-, 439-; 35 (1893) 52-; 36 (1893) 188-.
- Kirschmann, A.* Ph. Stud. 8 (1893) 173-, 407-.
- Peddie, W.* [1895] Edinb. R. S. T. 38 (1897) 501-.
- artificial production. *Beck, A.* Pflüg. Arch. Pl. 76 (1899) 634-.
- colour blind, colour system in. *Weijde, A. J. van der.* Utr. Oz. 7 (1882) 1-.
- , distance between eyes. *Holmgren, A. F.* Arch. f. Oph. 25 (1879) (Ab. 1) 135-.
- , neutral point in spectrum. *König, Ar.* [1893] (xii) Berl. Ps. Gs. Vh. 2 (1884) 20-, 63-, 72-.
- , system. *Weijde, A. J. van der.* Arch. f. Oph. 28 (1882) (Ab. 2) 1-.
- and colour weakness. *Scripture, E. W.* Science 9 (1899) 771-.
- congenital. *König, Ar.* Z. Psychol. 7 (1894) 161-.
- diagnosis. *Hering, E.* Arch. f. Oph. 36 (1890) (Ab. 1) 217-.
- in French navy. *Maréchal, —.* [1888] Arch. Augenh. 20 (1889) 189.
- hemi-lateral, of left eye. *Hess, C.* Arch. f. Oph. 36 (1890) (Ab. 3) 24-.
- of Indians. *Blake, L. I., & Franklin, W. S.* [1888] Kan. Ac. Sc. T. 11 (1889) 105-.
- peripheral, hypotheses. *Hering, E.* Arch. f. Oph. 35 (1889) (Ab. 4) 63-; 36 (1890) (Ab. 1) 264.
- sensitiveness of green blind and normal eye. *Brodhun, E.* Z. Psychol. 2 (1892) 97-.
- testing. *Thomson, W.* Am. As. P. (1884) 120-.
- , *Oliver, C. A.* Am. Oph. S. T. (1886) 250-; (1888) 86-.
- , *Sachs, M.* Arch. f. Oph. 39 (1893) (Ab. 3) 108-.
- , *Williams, C. H.* Am. Oph. S. T. (1897) 227-; (1899) 547-.
- by flicker photometer. *Rood, O. N.* Am. J. Sc. 8 (1899) 258-.
- , Holmgren's method. *Nichols, E. L.* [1884] Kan. Ac. Sc. T. 9 (1885) 95-.
- theory. *Fick, A.* Pflüg. Arch. Pl. 64 (1896) 313-.
- total. *Hering, E.* Pflüg. Arch. Pl. 49 (1891) 563-.

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- total. *Dufour, M.* Cg. Md. Int. At. (1894) (Vol. 6, Oft.) 16-.
- , congenital. *Uthoff, W.* Z. Psychol. 20 (1899) 326-.
- , —, *König, Ar.* Z. Psychol. 20 (1899) 425-.
- unilateral, investigation by means of binocular colour comparisons. *Hering, E.* Arch. f. Oph. 36 (1890) (Ab. 3) 1-.
- violet. *König, A.* Berl. Ps. Gs. Vh. (1885) 65-.
- and Young's theory of colours. *Raehmann, E.* Arch. f. Oph. 19 (1873) (Ab. 3) 88-.

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- Rayleigh, (Lord).* Nt. 31 (1885) 340, 458.
- Capron, J. R.* Nt. 31 (1885) 359-.
- Carter, R. B.* Nt. 31 (1885) 386-.
- Berry, G. A.* Nt. 31 (1885) 387-.
- Buckton, G. B.* Nt. 31 (1885) 407-.
- G., W. H.* Nt. 31 (1885) 408.
- Clark, J. W.* Nt. 31 (1885) 433.
- Tennant, J. F.* Nt. 31 (1885) 457-.
- Cunningham, A.* Nt. 31 (1885) 458.
- Guppy, H. B.* Nt. 31 (1885) 503-.
- Roberts, C.* Nt. 31 (1885) 552-.
- Bordier, H.* Bordeaux S. Sc. Mm. 4 (1894) 1-.
- Stratton, G. M.* [1900] Nt. 63 (1900-01) 12.
- Percival, A. S.* [1900] Nt. 63 (1900-01) 82-, 114.
- Twyman, F.* [1900] Nt. 63 (1900-01) 157.
- Intensity fluctuations of just perceptible optic and acoustic impressions. *Heinrich, W.* [1898] Krk. Ak. (Mt.-Prz.) Rz. 16 (1899) 214-; Crc. Ac. Sc. Bil. (1898) 363-.
- Invisibility of small objects in bad light. *Rayleigh, (Lord).* Camb. Ph. S. P. 4 (1883) 324.
- "Lag" in microscopic vision. *Nelson, E. M.* Mcr. S. J. (1900) 413-.
- Legibility, comparative, of type, and sensitiveness to colour, experiments. *Cattell, J. McK.* Ph. Stud. 3 (1886) 94-.
- Light, minimum perceptible. *Henry, C. C. R.* 116 (1893) 96-.
- perception, influence of duration and intensity of stimulus. *Breguet, A., & Richet, C. C. R.* 88 (1879) 239-; Arch. de Pl. 7 (1880) 689-.
- Limits. *Charpentier, A.* Nancy S. Sc. Bil. 4 (12^e Ann.) (1879) 27-.
- , *Anon.* Mcr. S. J. (1887) 827-.
- , *Hering, E.* Leip. Mth. Ps. B. 51 (1899) (Nw.) 16-.
- Oscillations. *Marbe, K.* Ph. Stud. 8 (1893) 615-.
- Rapidity of perception of feeble stars. *Riccd, A.* Spt. It. Mm. 22 (1894) 206-.
- Relation to electric light. *Happe, L.* (xii) Braunsch. Vr. Nt. Jbr. (1880-81) 78-.
- intensity of illumination. *Uthoff, W.* Arch. An. Pl. (Pl. Ab.) (1885) 331-; Arch. f. Oph. 32 (1886) (Ab. 1) 171-.
- — — — —, *König, A., & Uthoff, W.* Berl. Ps. Gs. Vh. (1889) 9-.
- — — — —, *König, Ar.* Berl. Ps. Gs. Vh. (1897) 128.

- Relation to intensity of illumination and wave-length of spectrum. *Uthoff, W.* Arch. f. Oph. 36 (1890) (Ab. 1) 33-.
- refraction. *Seggel, —.* Arch. f. Oph. 30 (1884) (Ab. 2) 69-.
- Scale. *Nicati, W.* C. R. 114 (1892) 1107-.
- , decimal, for measurement. *Bordier, H.* As. Fr. C. R. (1897) (Pt. 2) 273-.
- Sensitiveness of eye. *Love, E. F. J.* Aust. As. Rp. (1893) 664-.
- — — to changes of illumination. *Charpentier, A.* C. R. 91 (1880) 49-; Nancy S. Sc. Bl. 5 (13^e Ann. 1880) (1881) 4-.
- — — coloured light. *Charpentier, A.* C. R. 88 (1879) 299-.
- — — light and colour. *Charpentier, A.* C. R. 91 (1880) 1075-.
- — — —. *Abney, (Capt.) W. de W.* [1892] R. I. P. 13 (1893) 601-.
- — — —, effect of successive flashes. *Henry, C.* C. R. 120 (1895) 147-.
- — — — most refrangible rays. *Helmholtz, H.* Pogg. A. 94 (1855) 205-.
- — — — small objects. *Charpentier, A.* Nancy S. Sc. Bl. 5 (13^e Ann. 1880) (1881) 32-.
- — — — sources of light. *Charpentier, A.* C. R. 91 (1880) 240-.
- — — —, variations. *Charpentier, A.* C. R. 91 (1880) 995-.
- — — — for wave-length differences. *König, Ar., & Dieterici, C.* Berl. Ps. Gs. Vh. (1884) 7-, 15-; A. Ps. C. 22 (1884) 579-.
- Separating power of eye. *Weiss, G.* Par. S. Ps. Sé. (1889) 96.
- Sight of soldiers. *Whitehead, (Surg.-Maj.) H. R.* Un. Serv. I. J. 40 (1896) 135-.
- Zulu Kafirs. *König, A.* Berl. Ps. Gs. Vh. (1885) 15-.
- Testing. *Thomson, W.* Am. As. P. (1884) 120-.
- *Carter, R. B.* [1885] Ap. I. J. 15 (1886) 121-.
- *Roberts, C.* [1885] Ap. I. J. 15 (1886) 127-.
- Visual sensations and photometry, theoretical and experimental study. *Broca, A.* Par. S. Ps. Sé. (1894) 81-.
- Weber's law, validity for light sensations. *Kraepelin, E.* Ph. Stud. 2 (1885) 306-, 651-.
- — — —. *Lehmann, A.* Ph. Stud. 3 (1886) 497-.
- — — —. *Neiglick, H.* Ph. Stud. 4 (1888) 28-.
- — — — (Neiglick). *Wundt, W.* Ph. Stud. 4 (1888) 112-.

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- Plateau, J. A. F.* Brux. Ac. Bl. 2 (1835) 84-.
- Chevreul, M. E.* C. R. 84 (1877) 895-.
- Stl.* Humb. 3 (1884) 306.

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- Knochenhauer, K. W.* Pogg. A. 53 (1841) 346-.
- Helmholtz, H.* Rheinl. Westphal. Sb. 15 (1858) xviii-.

- Young, C. A.* Ph. Mg. 43 (1872) 343-.
- Davis, A. S.* Ph. Mg. 44 (1872) 526-.
- Newall, H. F.* Nt. 32 (1885) 77-.
- Laurin, W. M.* Nt. 32 (1885) 197.
- Bidwell, S.* R. S. P. 56 (1894) 132-.
- Hess, C.* Arch. f. Oph. 40 (1894) (Ab. 2) 259-.
- F., R. A.* Nt. 52 (1895) 508.
- in binocular vision, and binocular colour-phenomena in general. *Ebbinghaus, H.* Pflüg. Arch. Pl. 46 (1890) 498-.
- chessboard pattern on driving past row of trees. *Smeaton, T. D.* Nt. 59 (1898-99) 487.
- of coloured objects, influence of white light. *Séguin, J. M.* Presse Sc. 1 (1863) 543-; (xii) Isère S. Bl. 7 (Livr. 3 & 4) (1867) 332-.
- development. *Marangoni, C.* Mil. I. Lomb. Rd. 3 (1870) 189-; (x) N. Cim. 3 (1870) 132-.
- of instantaneous flashes. *Charpentier, A.* C. R. 124 (1897) 412-.
- and lightning. *Bidwell, S.* Nt. 32 (1885) 101-.
- of moving objects. *Zehfuss, G.* A. Ps. C. 9 (1880) 672-.
- — —. *Szili, A.* Mth. Termt. Ét. 15 (1897) 185-; Mth. Nt. B. Ung. 15 (1899) 122-.
- white objects. *Seguin, J. M.* C. R. 70 (1870) 322-; (xii) Isère S. Bl. 2 (1870) 205-; (xi) A. C. 19 (1880) 450-.

- Béquetin's phenomenon. (Red coloration of print, etc.) *Szili, A.* Mth. Nt. B. Ung. 4 (1885-86) 251-.
- Cerebral light. *Scripture, E. W.* Science 6 (1897) 138-.
- — —. *Le Conte, J.* Science 6 (1897) 257-; 10 (1899) 58.
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- Coloured rings seen round objects in certain diseased conditions of eyes. *Wallmark, L. J.* Stockh. Öfv. 6 (1849) 41-; Pogg. A. 82 (1851) 129-.
- Contrast phenomena. *Helmholtz, H.* Heidl. Vh. Nt. Md. (1859-60) 32-.
- Coronæ produced by peculiar structure of eye. *McConnel, J. C.* Nt. 40 (1889) 342-.
- Curves of apparent intersection of 2 lines swinging rapidly about 2 fixed points. *Le François, (Prof.) —.* Quetelet Cor. Mth. 5 (1829) 120-.
- Diffraction phenomena. *Meyer, M. H.* Pogg. A. 96 (1855) 603-.
- Dispersion. *Mollweide, C.* Gilbert A. 17 (1804) 328-; 30 (1808) 220-.
- *Wolf, M.* A. Ps. C. 33 (1888) 548-.
- images on retina. *Bezold, W. von.* Arch. f. Oph. 14 (1868) (Ab. 2) 1-.
- Double refraction and polarisation of light in eye. *Stellwag von Carion, C.* [1851] Wien Z. Gs. Aerzte 9 (1853) (Heft 2) 318-.
- — — — — (Stellwag). *Kunzek, A.* Wien SB. 8 (1852) 82-.
- “Dust drift” illusion. *Pierce, A. H.* Science 12 (1900) 208-.

- Galvanic experiments on the blind. *Grave*, —. *J. de Ps.* 56 (1802) 159-.
- light-figures. *Purkyně, J. E.* *Froriep. Not.* 9 (1825) 273-; *Kastner Arch. Ntl.* 5 (1825) 434-.
- Haidinger's Brushes.*
- (Direct recognition of polarised light by naked eye, and position of polarisation plane.)
- Haidinger, W.* *Pogg. A.* 63 (1844) 29-.
- Haidinger, W.* *Pogg. A.* 67 (1846) 435-; 68 (1846) 73-, 305-.
- Silbermann, J. T.* *C. R.* 23 (1846) 629-; 24 (1847) 114-.
- Botzenhart*, —. *C. R.* 24 (1847) 43-.
- Jamin, J.* *C. R.* 26 (1848) 197-.
- Stokes, G. G. B.* *A. Rp.* (1850) (pt. 2) 20-.
- Brewster, (Sir) D.* *Ph. Mg.* 17 (1859) 323-; *C. R.* 48 (1859) 614-.
- Lang, V. von.* *A. Ps.* C. 123 (1864) 140-.
- cause. *Haidinger, W.* *Wien SB.* (1848) 485-; *Pogg. A.* 91 (1854) 591-.
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- duration of impressions on retina. *Haidinger, W.* *Wien SB.* 12 (1854) 678-.
- nature. [*Brewster, (Sir) D.* non] *Haidinger, W.* *Wien SB.* (1850) (Ab. 2) 442-.
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- , modification. *Haldat du Lys, C. N. A. de Nancy Mm. S. Sc.* (1850) 209-.
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- , retinal, experiment showing reality. *Rogers, W. I.* [1895] *Nt.* 53 (1895-96) 108.
- , primary, secondary, and tertiary, with instantaneous light stimuli. *Bosscha, H. P.* *Arch. f. Oph.* 40 (1894) (Ab. 1) 22-.
- , —, —, —, —, —, — (Bosscha). *Hess, C.* *Arch. f. Oph.* 40 (1894) (Ab. 1) 337-.
- , spectral, of rotating vacuum tube. *Bidwell, S.* *Nt.* 32 (1885) 30-.
- , successive, physical theory. *Warlomont, L.* *A. d'Ocul.* 1 (1869) 281-.
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- Inversions on continued observation of perspective designs and transparent bodies. *Dove, H. W.* *Berl. Mb.* (1867) 84-.
- Light perception, duration. *Charpentier, A.* *C. R.* 95 (1882) 96-.
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- Light phenomenon. *Willigen, V. S. M. van der.* *Pogg. A.* 102 (1857) 175-.
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- sensation, intensity. *Henry, C. C. R.* 122 (1896) 1139-, 1232.
- Optical estimation of reflections from spectacle glasses. *Szili, A.* *Arch. f. Oph.* 38 (1892) (Ab. 4) 12-.
- Penetrating power of eye, and size of retinal elements. *Meslin, G. J. de Ps.* 1 (1892) 74-.
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- , pseudo-entoptic. *Laqueur, L.* *Arch. f. Oph.* 36 (1890) (Ab. 1) 62-.
- Persistence of vision. *Montigny, C.* *Brux. Mm. Cour.* 4^e, 24 (1850-51) 30 pp.
- (Montigny). *Plateau, J. A. F.* [1852] *Moigno Cosmos* 2 (1852-53) 18-.
- *Moigno, F.* *Smiths. Rp.* (1866) 211-.
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- , experiments. *Gariel, C. M.* *Par. S. Ps. Sé.* (1876) 201-.
- *Marbe, K.* *Ph. Stud.* 9 (1894) 384-.
- , —, — with alternating current machine. *Ritter, W.* *Z. Psychol.* 11 (1896) 310-.
- , —, principle of thaumatrope. *Jeffries, B. J.* *Am. Oph. S. T.* 5 (1869) 98-.
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- Polarising structure of eye. *Brewster, (Sir) D.* *B. A. Rp.* (1850) (pt. 2) 5-.
- Prismatic colour-phenomena without a prism. *Mollweide, C.* *Gilbert A.* 17 (1804) 328-.
- Pupil, reaction time on stimulation of sympathetic. *Langendorff*, —. *Meckl. Vr. Nt. Arch.* (1896) xvi-.
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- Quantity of light necessary to distinguish several sources. *Charpentier, A.* *Nancy S. Sc. Bl.* 6 (14^e Ann. 1881) (1882) 5-.
- — — produce light sensation. *Charpentier, A.* *C. R.* 88 (1879) 189-.
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- Rays proceeding from light seen with half-closed eyes. *Meyer, M. H. Pogg. A.* 89 (1853) 429-; 97 (1856) 233-.
- — — — — *Thomson, J.* [1892] R. S. P. 52 (1893) 70-.
- Reflex vision. *Holmes, (Dr.)* —. *Am. Ac. P.* 4 (1857-60) 373-.
- Refraction, phenomena. *Claudet, A. F. J.* (vii) *Ph. Mg.* 26 (1863) 324-; *C. R.* 58 (1864) 89.
- Retina, luminosity. *Helmholtz, H. von. Berl. Ps. Gs. Vh.* (1888) 85-.
- , property. *Brewster, (Sir) D.* [1866] *Edinb. R. S. T.* 24 (1867) 327-.
- , —. *Rood, O. N. Am. J. Sc.* 13 (1877) 32-.
- , unequal fatigue of central and peripheral part. *Erdmann, E. O. Berl. Ps. Gs. Vh.* (1884) 11.
- , violet illumination, due to light waves. *Charpentier, A. C. R.* 92 (1881) 355-.
- Retinal impressions, mode of reviving dormant. *Grove, W. R. Ph. Mg.* 3 (1852) 435-.
- , time-lag. *Mascart, M. C. R.* 113 (1891) 180-.
- oscillations. *Charpentier, A. C. R.* 113 (1891) 217-; 122 (1896) 87-.
- , transverse. *Charpentier, A. C. R.* 122 (1896) 535-.
- Skiascopy and luminosity of eye. *Plaats, J. D. van der. Utr. Prv. Gn. Aant.* (1899) 24-.
- Spot in field of view, related to Mariotte's spot. *Prevost, P. Bb. Un.* 52 (1833) 337-.
- Star rays. *Le Conte, J. Science* 9 (1887) 14.
- and sun corona. *Randolph, R. Science* 8 (1886) 566.
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- Contra-reflectors. *Reich, —.* [1885] *Arch. Augenh.* 16 (1886) 437.
- Corneal microscope. *Nacht, —.* *Mer. S. J.* 6 (1886) 676.
- — — — —. *Schanz, F. Arch. Augenh.* 31 (1895) 265-; *Arch. Oph.* 27 (1898) 634-.
- —, binocular. *Czapski, S. Arch. f. Oph.* 48 (1899) 229-.
- —, Schieck's. *Anon. Mer. S. J.* 4 (1884) 954.
- Diascope. *Gorham, J. J. Mer. Sc.* 2 (1854) 218-; 3 (1855) 1-; 4 (1856) 27-.
- , Gorham's, and vision through small apertures. *Oppel, J. J. (vi Addis.) Frkf. Jbr. Ps. Vr.* (1856-57) 37-.
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- Focal length of eye, measurement. *Hirschberg, —.* *D. Nf. Tbl.* (*1874) 105.
- Interior of eye seen by reflection in telescope. *Hussey, A. M. (vi Addis.) Ph. Mg.* 1 (1832) 318-.
- Ophthalmoleucoscope, simple. *König, Ar. Berl. Ps. Gs. Vh.* (1884) 41-.
- Ophthalmological apparatus. *Dimmer, F.* [1896] *Arch. Augenh.* 34 (1897) 1-; *Arch. Oph.* 28 (1899) 494-.
- Ophthalmometer. *Leroy, C. J. A., & Dubois, R. Par. S. Ps. Sé.* (1888) 203-; *Par. S. Bl. Mm.* 40 (1888) (C. R.) 429-.
- — — — —. *Kayser, E.* [1890] *Danzig Schr.* 7 (1888-91) (Heft 4) xiii-.
- , construction and theory. *König, Ar.* (xii) *Z. Instk.* 3 (1883) 153-.
- , Helmholtz's. *Meyerstein, M. Pogg. A.* 111 (1860) 415-.
- , —, graduation. *Albertotti, G. Tor. Ac. Sc. At.* 17 (1881) 596-.
- , Javal's. *Schneller, —.* [1890] *Danzig Schr.* 7 (1888-91) (Heft 4) xii-.
- , —. *Speakman, H. D. Arch. Oph.* 19 (1890) 76-.
- , —, modification. *Weiland, C. Arch. Oph.* 24 (1895) 340-; *Arch. Augenh.* 32 (1896) 128-.
- , Kagenaar's. *Holth, S. Arch. Augenh.* 41 (1900) 175-.
- , portable. *Reid, T. R. S. P.* 53 (1893) 1-.
- Ophthalmometry. *Blix, M. G.* [1881] (xii) *Ups. Läk. F.* 17 (1882) 98-.
- , Javal, —. *Wien Md. Wschr.* 38 (1888) 1250-.
- Ophthalmoscope. *Meyerstein, M. Henle u. Pfeufer Z.* 4 (1854) 310-, 311-.
- , *Schlaefke, —.* *Kassel Vr. Nt. B.* 31 (1884) 39-.
- , *Baas, J. H. Humb.* 4 (1885) 180-.
- , binocular. *Giraud-Teulon, —.* *C. R.* 52 (1861) 646-.
- , electric. *Schweigger, —.* *Arch. An. Pl. (Pl. Ab.)* (1889) 365-.
- , fixed. *Thorner, W. Arch. An. Pl. (Pl. Ab.)* (1899) (Suppl.) 564-; *Z. Psychol.* 20 (1899) 294-.
- , Helmholtz-Wecker. *Masselon, J. A. d'Ocul.* 98 (1887) 24-.

- Ophthalmoscope, micrometer for. *Szilágyi, E.* Mth. Term. Éts. 4 (1886) 84-; Mth. Nt. B. Ung. 4 (1885-86) 62-.
- , modified form, with cylinders. *Risley, S. D.* Am. Oph. S. T. (1887) 587-.
- optometer. *Parent, H. A.* d'Ocul. 107 (1892) 195-.
- , refraction-. *Berger, E.* Z. Instk. 5 (1885) 77-.
- , —. *Borthen, L.* Int. Md. Cg. Vh. (1890) (Bd. 4, Ab. 10) 66.
- , —, with cylindrical lenses. *Burnett, S. M.* Am. Oph. S. T. (1887) 589-.
- , —, lens series for. *Jackson, E.* Am. Oph. S. T. (1886) 361-.
- , stereoscopic. *Thorner, W.* [1900] Arch. Augenh. 42 (1901) 78-.
- Ophthalmoscopy. *Dimmer, F.* Arch. f. Oph. 38 (1892) (Ab. 4) 19-; 44 (1897) 1-.
- , binocular. *Giraud-Teulon, —.* A. d'Ocul. 45 (1861) 233-.
- Ophthalmotonometric studies. *Ostwald, F.* Arch. f. Oph. 40 (1894) (Ab. 5) 22-.
- Optical bench. *Sandoz, A.* Par. S. Ps. Sé. (1894) 228-.
- type. *Albertotti, G.* Mod. Ac. Sc. Mm. 10 (1894) 449-.
- Optometer. *Hoh, T.* (xii) Bamb. Nf. Gs. B. (12) (1882) (No. 7) 2 pp.
- , *Laurenty, K.* St. Pet. Md. Wschr. 17 (1892) 191-.
- , direct-reading, precision in. *Guébbard, —.* As. Fr. C. R. (1892) (Pt. 1) 178.
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- , shadow-. *Douglas, J. C.* Ph. Mg. 37 (1869) 340-.
- , — (Douglas). *Templeton, R.* Ph. Mg. 39 (1870) 9-.
- , — (Templeton). *Douglas, J. C.* Ph. Mg. 40 (1870) 340-.
- , skiascope-. *Sureau, H.* C. R. 118 (1894) 1253-.
- Optometry. *Nimier, H.* Arch. Md. Phm. Mil. 18 (1891) 47-.
- , keratotomy or skiascopy. *Bertelé, —.* Arch. Md. Phm. Mil. 23 (1894) 165-.
- , objective. *Kramsztyk, Z.* Par. T. Nauk. Sc. Pam. 11 (*1879) Art. 2, 46 pp.
- , —. *Parent, —.* A. d'Ocul. 113 (1895) 321-.
- , practical application. *Leonhardt, G.* Lplidna. 18 (1882) 170-.
- Perimeter. *Dyer, E.* Am. Oph. S. T. (1884) 686-.
- , *Braunschweig, P.* Z. Instk. 11 (1891) 58-.
- , *Epstein, S. S.* Z. Instk. 15 (1895) 400-.
- Photography, use in eye disease. *Cohn, H.* Bresl. Schl. Gs. Jbr. (1890) (Al. B.) 30.
- Photometer, Weber's. *Cohn, —.* [1886] Arch. Augenh. 17 (1887) 57-.
- Photometry. *Charpentier, A.* Nancy S. Sc. Bl. 6 (16^e Ann. 1883) (1884) xxvi-.
- Photometric apparatus. *Kirschmann, A.* Ph. Stud. 5 (1889) 292-.
- Prismometer, perfected. *Prentice, C. F.* Arch. Oph. 20 (1891) 109-.
- Prisms, numbering. *Dennett, W. S.* Am. Oph. S. T. (1889) 422-.
- , —. *Landolt, E.* [1890] Arch. Augenh. 22 (1891) 235-; Arch. Oph. 19 (1890) 497-.
- , —. *Duane, A.* Arch. Oph. 20 (1891) 321-, 586.
- , — by degree of refractive power. *Jackson, E., Burnett, S. M., & Noyes, H. D.* Am. Oph. S. T. (1888) 150-.
- , — and measuring. *Prentice, C. F.* A. d'Ocul. 108 (1892) 5-.
- , — — by metric system. *Prentice, C. F.* Arch. Oph. 19 (1890) 64-, 128-; Arch. Augenh. 22 (1891) 215-.
- , refractive value, etc. *Weiland, C.* Arch. Oph. 22 (1893) 435-; 23 (1894) 28-.
- , triple rotatory variable. *Jackson, E.* Arch. Oph. 23 (1894) 116-; Arch. Augenh. 30 (1895) 68-.
- Projections for clinical teaching, simple mode of procuring. *Eversbusch, O.* Arch. f. Oph. 50 (1900) 161-.
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- Refraction by crossed cylinders, models to illustrate. *Burnett, S. M.* Am. Oph. S. T. (1888) 112-.
- Retina, observation by Galileian telescope. *Lami, —.* Rv. Sc.-Ind. 32 (1900) 212.
- , photography. *Guinkoff, V. C. R.* 122 (1896) 1017-.
- Retinal telescope-. *Schanz, F.* Arch. Augenh. 31 (1895) 265-; Arch. Oph. 27 (1898) 634-.
- , —. *Czapski, —.* D. Nf. Vh. (1895) (Th. 2, Hälfte 2) 196-.
- Schematic apparatus for demonstration of static refraction. *Pedrazzoli, —.* [1888] Arch. Augenh. 19 (1889) 482-.
- Scotometer. *Antonelli, —.* Arch. Augenh. 27 (1893) (Ber. 1893, 11).
- Sideroscope. *Asmus, E.* Arch. f. Oph. 40 (1894) (Ab. 1) 280-.
- , Asmus's, modification. *Bjerke, K.* Arch. f. Oph. 51 (1900) 461-.
- Sight testing apparatus. *Oliver, C. A.* Am. Oph. S. T. (1885) 130-.
- , —. *Dennett, W. S.* Am. Oph. S. T. (1885) 133-; (1886) 245-.
- , —. *Plehn, F.* Z. Instk. 5 (1885) 53-.
- , —. *Carl, A.* [1891] Arch. Augenh. 24 (1892) 41-.
- Stereophotochromoscope. *Harris, D. F.* [1895-96] Glasg. Ph. S. P. 27 (1896) 14-; J. An. Pl. 30 (1896) 118-.
- Tachistoscopic measurements. *Wundt, W.* Ph. Stud. 15 (1900) 287-; 16 (1900) 61-.
- Tonometer. *Gradenigo, P.* [1899] Ven. I. At. (1899-1900) (Pt. 2) 203-.
- Tonometry and manometry. *Koster, W.* Arch. f. Oph. 41 (1895) (Ab. 2) 113-, (Ab. 4) 274-.
- , — (Koster). *Ostwald, F.* Arch. f. Oph. 41 (1895) (Ab. 3) 264-.
- , — (—). *Ischreyt, G.* Arch. f. Oph. 48 (1899) 694-.

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- Girou de Buzareingues, C.* Par. Mm. S. L. 5 (1827) 191-.
- Röber, A.* Rpm. Ps. 3 (1839) 1-.
- Seebeck, A.* Rpm. Ps. 6 (1842) 1-; 8 (1849) (pte. 2) 1-.
- Dove, H. W.* (vi *Adds.*) Berl. Pol. Gs. Vh. 15 (1854) 66-.
- György, S.* [1858] Évk. 9 (1860) No. 3, 1-.
- Volpicelli, P.* Rm. At. 11 (1857-58) 168.
- Stricker, W.* A. Ps. C. 121 (1864) 335-.
- Newall, H. F.* [1875] Rugby NH. S. Rp. (1876) 33-.
- Apparatus. *Appun, —.* D. Nf. Tbl. (*1872) 206.
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- Earthquakes, phenomena. *Milne, J.* [1887] Jap. Seism. S. T. 12 (1888) 53-, 107-.
- Experiments. *Loesche, (Dr.) —.* Dresden Sb. Nt. Heilk. (1868-69) 114-.
- Instrument. *Uttini, G.* [1806] Bologna Mm. I. It. 2 (1808) 227-.
- Modern problems. *Wead, C. K.* [1900] Wash. Ph. S. Bl. 14 (1906) 129-.
- Phenomena, explanation of certain. *Rayleigh, (Lord).* [1878] R. I. P. 8 (1879) 536-.
- Sound and light, analogy. *Barrett, W. F.* QJ. Sc. 7 (1870) 1-.
- — —, experiments, etc. *Young, (Dr.) T.* Phil. Trans. (1800) 106-; *Nicholson J. 5* (1802) 161-.
- — —, vibrations. *Markiewicz, R.* Krk. Roczn. Uniwers. 14 (1831) 293-.
- Sources of sound. *Gleue, —.* [1895] Lüneb. Nt. Vr. Jh. 14 (1898) vii-.
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- Elastic media, classification, and laws of plane waves in them. *Haughton, S.* [1849] Ir. Ac. T. 22 (1855) 97-.
- Mechanical theory of sound. *Grinwis, C. H. C.* Amst. Ak. Vs. M. 8 (1874) 133-; Arch. Néerl. 10 (1875) 135-.
- Motion of piston and of air in cylinder. *Stokes, G. G.* Camb. Mth. J. 4 (1845) 28-.
- , propagation in elastic fluids. *Poisson, S. D.* A. C. 22 (1823) 246-.
- , — — media. *Challis, J.* Ph. Mg. 7 (1830) 325-.
- , — — —. *Poisson, S. D.* [1830] Par. Mm. Ac. Sc. 10 (1831) 549-.
- , — — —. *Cellérier, C.* Gen. S. Ps. Mm. 27 (1881) 12-.

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- Motion, propagation in fluid. *Hugoniot, H.* C. R. 101 (1885) 1118-, 1229-; Liouv. J. Mth. 3 (1887) 477-; 4 (1888) 153-.
- , — — —, Hugoniot's and analogous theorems. *Duhem, P.* C. R. 131 (1900) 1171-.
- , — — — solids and gases. *Hugoniot, H.* C. R. 101 (1885) 794-; Par. Éc. Pol. J. 57 (1887) 3-; 58 (1889) 1-.
- , — — — liquids. *Wertheim, G.* C. R. 29 (1849) 697-; A. C. 31 (1851) 19-.
- of superposed elastic fluids. *Poisson, S. D.* [1823] Par. Mm. Ac. Sc. 10 (1831) 317-.
- Motions, progressive, produced by vibrations. *Puschl, K.* Wien SB. 9 (1852) 173-.
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- Running water, sound of, physical cause. *Wintrich, (Prof.) —.* Erlang. Sb. Ps. Md. S. 4 (1872) 74-.
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- in elastic fluid, theory. *Challis, J.* Ph. Mg. 24 (1862) 135-, 291-.
- — — medium, laws. *Umov, N. A.* (xii) Rec. Mth. (Moscou) 5 (1870) (Pt. 1) 189-, 252-.
- — — —, small, integration of equations. *Popoff, A.* Mosc. S. Nt. Bl. 26 (1853) 342-.
- — — extended media. *Robinson, S. W.* Franklin I. J. 81 (1881) 201-.
- — — isotropic medium. *Clavenad, —.* Lum. Élect. 47 (1893) 272-.
- , theorems, general. *Rayleigh, (Lord).* L. Mth. S. P. 4 (1871-73) 357-.
- , theory. *Ménabréa, L. F.* [1853] Tor. Mm. Ac. 15 (1855) 205-.
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- , theory. *Blanchet, P. H.* C. R. 13 (1841) 958-.
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- , — — —. *Tumlirz, O. A. A.* (xii) Lotos 29 (1880) 29-; Wien Ak. Sb. 95 (1887) (Ab. 2) 367-.
- , — waves. *Haughton, S.* Camb. and Dubl. Mth. J. 8 (1853) 159-; 9 (1854) 129-.
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- Waves, elastic, in rocks, form. *Rudzki, M. P.* [1897-99] *Krk. Ak. (Mt.-Prz.)* Rz. 13 (1898) 377-; 19 [20] (1902) 143-; *Btr. Geops.* 3 (1898) 519-; *Crc. Ac. Sc. Bll.* (1899) 373-.
- in elastic tubes containing incompressible liquids, theory. *Weber, W.* *Leip. B.* 18 (1866) 353-.
- — — — liquid. *Mach, E.* *Moleschott Us.* 10 (1866) 71-.
- , explosion, of gunotton. *Munroe, C. E.* *Am. J. Sc.* 36 (1888) 48-.
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- , molecules and atoms. *Taylor, W. B.* [1872] (xi) *Smiths. Misc. Col.* 20 (1881) *Art.* 1, 66- (*Wash. Ph. S. Bll.* 1 (1874).)

- Interference of liquid waves. *Lissajous, J.* *C. R.* 67 (1868) 1187.
- Kaleidophone. *Wheatstone, (Sir) C.* *QJ. Sc.* (1827) (Pt. 1) 344-.
- , universal (for exhibiting vibration curves). *Melde, F.* *Pogg. A.* 115 (1862) 117-; 141 (1870) 320.
- , —, *Melde's.* *Hennekeler, A. van.* [1876] (xii) *Mbl. Nt.* 7 (1877) 60-.

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- Absolute pitch. *Rayleigh, (Lord).* [1877] *Nt.* 17 (1878) 12-.
- Composition and analysis of vibration. *Sluginov, N.* *Kazan Un. Mm.* (1891) (*App.*); (1892) (*App.*); (1893) (*App.*); (1894) (*App.*) 176 pp.
- , optical, of rectangular vibrations. *Mercadier, E.* *Par. S. Ps. Sé.* (1876) 57-.
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- — — —, apparatus for. *Pfaundler, L.* *Wien Sb.* 68 (1873) (*Ab.* 2) 424-.
- — — —, —. *Stöhrer, E. (jun.).* *A. Ps.* C. 158 (1876) 615-.
- — — —, —, modification of Lissajous's. *Izarn, —.* *As. Fr. C. R.* (1892) (Pt. 2) 242-.
- — vibrations. *Johannsen, F.* (xii) *Ts. Mth.* 5 (1875) 137-.
- — — —, with perpendicular translation. *Thompson, S. P.* *Ph. Mg.* 9 (1880) 75.
- — — —, and sounds of free reeds. *Wolf, C.* *L'I.* 30 (1862) 393-.
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- , —, theory. *Strzelecki, F. von.* *Wien Sb.* 65 (1872) (*Ab.* 2) 169-.
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- Elements of vibratory motion, determination. *Mercadier, E.* *C. R.* 89 (1879) 736-, 1071-, 1110-; *J. de Ps.* 9 (1880) 41-, 217-, 282-.
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- Experimental illustration of secular perturbation. *Parragh, G.* *Termt. Közl.* 20 (1888) (*Suppl.*) 137-; *Mth. Nt. B. Ung.* 6 (1889) 410-.
- — — — simple vibrations. *Bergmann, J.* *N.-Vorp. Mt.* 18 (1887) 1-; *Bresl. Schl. Gs. Jbr.* (1889) 134-.
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— (Kundt's). *Trusevič, A. A.* Vars. S. Nt. Tr.
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— *Svedelius, G. E.* N. Ts. Fs. K. 3 (1898)
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photography. *Hallock, W.* Am. As. P. (1894)
112-.

— *Merritt, E.* Ps. Rv. 1 (1894) 166-.

— *Marage, —.* C. R. 124 (1897) 811-.

— *Nichols, E. L., & Merritt, E.* Am. As.
P. (1897) 124; Ps. Rv. 7 (1898) 93-.

— *Nichols, E. L.* Nt. 59 (1898-99) 320-.

—, study of hearing trumpet by. *Marage, —.*
Par. S. Ps. Sé. (1897) 74-.

—, — overtones by. *Doumer, E.* C. R. 105
(1887) 222-.

—, — vowels by. *Marage, —.* Par. S. Ps.
Sé. (1897) 187-.

singing. *Martini, T.* (xii) Rv. Sc.-Ind. 11
(1879) 71-.

—, projection. *Valérius, H.* Les Mondes 9
(1866) 14.

9050 Interference and Diffraction of Waves Vibrations, General 9100

with and without change of phase, method of exhibiting. *Violle, J.* C. R. 103 (1886) 1255-.

at confines of 2 media between which transition is gradual. *Rayleigh, (Lord).* L. Mth. S. P. 11 (1879-80) 51-.

dispersion in heterogeneous medium. *Kasterin, N.* Rs. Ps.-C. S. J. 30 (*Ps.*) (1898) 61-; *Amst. Ak. Vs.* 6 (1898) 460-, 532.

of longitudinal waves by a plane. *Schütz, O. E.* Christiania F. (1893) No. 15, 37 pp.

by paraboloid. *Sharpe, (Rev.) H. J.* QJ. Mth. 15 (1878) 1-; *Camb. Ph. S. P.* 10 (1900) 101-.

of sound or light from corrugated surface. *Rayleigh, (Lord).* B. A. Rp. (1893) 690-.

— transverse waves. *Braun, —.* [1873] (ix) Würzb. Ps. Md. Vh. 6 (1874) xv-.

— — (smallest) in liquids. *Matthiessen, L.* A. Ps. C. 134 (1868) 107-.

— waves in liquids excited by vibrating plates. *Kundt, A.* Berl. Mb. (1868) 125-.

Reflection and refraction of elastic waves. *Knott, C. G.* Ph. Mg. 48 (1899) 567-.

— — — — — *Gray, T.* Ph. Mg. 48 (1899) 568-.

— — — — — plane and longitudinal waves, theory. *Sluginov, N. P.* Kazan S. Ps.-Mth. Bll. 3 (1893) (*Prot.*) 20-.

— — — — — transverse waves, theory. *Sluginov, N. P.* Kazan S. Ps.-Mth. Bll. 3 (1893) (*Prot.*) 24-.

— — — — — waves at viscous media. *Drude, P.* A. Ps. C. 41 (1890) 759-.

— — — — — waves in medium having periodic discontinuity of structure. *Lamb, H.* Manch. Lt. Ph. S. Mm. & P. 42 (1898) No. 3, 20 pp.

analytical representation. *Kolářek, F.* Prag Sb. (1894) (*Mth.-Nt.*) No. 19, 12 pp.

application to acoustical problems. *Kool, C. J.* Laus. S. Vd. Bll. 31 (1895) 123-.

and characteristics of partial differential equations. *Coulon, J.* C. R. 130 (1900) 1064-.

deduction of Descartes' laws from. *Pilčikov, N.* Rs. Ps.-C. S. J. 19 (*Ps.*) (1887) 27-; *J. de Ps.* 7 (1888) 274-.

demonstration. *Tedone, O.* Rm. R. Ac. Linc. Rd. 5 (1896) (*Sen.* 1) 357-, 483.

in isotropic bodies. *Carvalho, E.* C. R. 120 (1895) 88-.

modification. *Aldis, W. S.* QJ. Mth. 15 (1878) 326-.

refutation. *Kraevič, K.* Rs. Ps.-C. S. J. 19 (*Ps.*) (1887) 49-, 181-.

— (Kraevič). *Stolětov, A. G.* Rs. Ps.-C. S. J. 19 (*Ps.*) (1887) 180-.

— (—). *Schüller, N.* Rs. Ps.-C. S. J. 19 (*Ps.*) (1887) 184-.

residual integral. *Hadarnard, —.* Par. S. Mth. Bll. 28 (1900) 69-.

Interference phenomenon on dunes, Heligoland. *Hallier, E.* Pogg. A. 114 (1861) 657-.

— of plane waves, apparatus to illustrate. *Woodward, C. J.* L. Ps. S. P. 2 (1879) 182-; *Ph. Mg.* 4 (1877) 184-.

— sound rays in air surrounding vibrating forks, etc. *Weber, W. E.* Schweigger J. 48 (= *Jb.* 18) (1826) 385-.

— 2 vibrating strings. *Puluj, J.* Wien Ak. Sb. 96 (1888) (*Ab.* 2) 947-.

— waves on surface of liquid, projection. *Lommel, E.* Erlang. Ps. Md. S. Sb. 17 (1885) 36-.

— — — — — mercury. *Decharme, C.* (xii) M.-et-L. S. Ac. Mm. 32 (1875) 1-.

9050 Interference, Diffraction, and Scattering of Waves. Huygens's Principle.

Aperture, circular, and ellipsoidal obstacles in path of waves. *Rayleigh, (Lord).* Ph. Mg. 44 (1897) 28-.

Apertures in plane screens in path of waves, etc. *Rayleigh, (Lord).* Ph. Mg. 43 (1897) 259-.

Diffraction phenomenon. *Franklin, W. S.* Ps. Rv. 2 (1895) 469-.

Disturbance by an element of plane wave of sound or light. *Basset, A. B.* L. Mth. S. P. 22 (1891) 317-.

— spherical obstacle. *Rayleigh, (Lord).* [1872] L. Mth. S. P. 4 (1871-73) 253-.

HUYGENS'S PRINCIPLE.

Vliet, P. P. van der. Rs. Ps.-C. S. J. 18 (*Ps.*) (1886) 365.

Potier, A. C. R. 112 (1891) 220-.

Volterra, V. N. Cim. 31 (1892) 244-; 32 (1892) 59-; 33 (1893) 32-, 71-.

VIBRATIONS.

9100 General.

(See also **Mechanics 3220.**)

Neesen, F. A. Ps. C. 30 (1887) 432-.

(Neesen.) *Dvořák, V.* A. Ps. C. 31 (1887) 536-.

(Dvořák.) *Neesen, F.* A. Ps. C. 32 (1887) 310-.

Acoustic figure, liquid. *Pflaum, H.* Riga Cor.-Bl. 41 (1898) 115-.

— figures due to aerial vibrations, various methods. *Melde, F.* A. Ps. C. 139 (1870) 485-.

Elasticity of heterophonous bodies (vibrating plates and rods). *Baudrimont, A.* A. C. 32 (1851) 288-.

Emission of sound. *Gilbault, H.* C. R. 118 (1894) 135-, 1037-, 1244-.

Experiments. *Fuchs, F.* A. Ps. C. 21 (1884) 513-.

— *Baur, C.* A. Ps. C. 23 (1884) 150-.

Flames, impinging, tones. *Noack, K.* Giessen Oberh. Gs. B. 22 (1888) 194-.

Iron, clang of. *Blesson, L.* Hermbstädt Ms. 5 (1815) 286-.
 Iso-periodic systems. *Rayleigh, (Lord).* Ph. Mg. 46 (1898) 567-.

MUSICAL SAND.

(Cabl.) *Burnes, A.* Beng. As. S. J. 7 (1838) 324.
 (Sinai.) *Palmer, H. S.* B. A. Rp. 41 (1871) (Sect.) 188-.
 (Hawaii.) *Frink, W. R.* (ix) Calif. Ac. P. 5 (1873-74) 338-.
 (Microscopic examination.) *Frink, W. R.* M. Mer. J. 16 (1876) 96-.
Bolton, H. C., & Julien, A. A. [1883] Am. As. P. 32 (1884) 251-; Science 2 (*1883) 713.
Tarr, R. S. Science 2 (*1883) 764.
Bolton, H. C. [1884] N. Y. Ac. T. 3 (1885) 72-, 97-, 98-.
Bolton, H. C., & Julien, A. A. Am. As. P. (1884) 408-.
 (Dorsetshire.) *Carus-Wilson, C.* Nt. 38 (1888) 415.
Bolton, H. C., & Julien, A. A. Nt. 38 (1888) 515.
K. Nt. 38 (1888) 515.
Hunt, A. R. Nt. 38 (1888) 540.
Pidgeon, D. Nt. 38 (1888) 590.
 (True cause.) *Julien, A. A., & Bolton, H. C.* [1888] N. Y. Ac. T. 8 (1888-89) 9-.
Bolton, H. C. N. Y. Ac. T. 8 (1888-89) 182-.
 (Sinai.) *Bolton, H. C.* [1889] N. Y. Ac. T. 9 (1889-90) 21-, 123-.
Olliff, A. S. Nt. 39 (1889) 224.
 (Hawaii and California.) *Bolton, H. C.* [1890] N. Y. Ac. T. 10 (1890-91) 28-.
Carus-Wilson, C. Nt. 42 (1890) 568.
Bolton, H. C. Nt. 43 (1891) 30.
Carus-Wilson, C. Nt. 46 (1892) 316.
 (Hawaii.) *Woolman, L.* Am. Mer. J. 18 (1897) 234-.

Musical stones (phonoliths from near Leipzig).
Sauer, G. A. [1882] Leip. Nf. Gs. Sb. 9 (1883) 2-.
 ——. *Mullen, B. H.* Dubl. S. Sc. P. 4 (1885) 432-.
 ——. *Mancini, E.* N. Antol. Sc. 122 (1892) 533-.

Non-musical sand, production of musical notes from. *Carus-Wilson, C.* Nt. 44 (1891) 322-.

PRODUCTION OF SOUND.

Blanc, —. Schweigger J. 28 (1820) 88-.
Kane, (Sir) R. J. [1840] Ir. Ac. P. 2 (1840-44) 13-.
Fermond, C. C. R. 17 (1843) 800-; 18 (1844) 171-.
 (Vibrations producing sound.) *Ward, W. S.* [1845] W. Yorks. P. Gl. S. 2 (1842-48) 230-.
Baudrimont, A. C. R. 33 (1851) 428-.
Blaserna, P. Palermo G. Sc. Nt. 2 (1866) 66-.
 (Vibrations producing musical sounds.) *Purser, F.* [1869] Dubl. S. J. 5 (1870) 429-.

by blowing into mercury. *Decharme, C. J.* (xii) M.-et-L. S. Ac. Mm. 32 (1875) 1-.
 — bullroarers of Australian aborigines. *Mathews, R. H.* Ap. I. J. 27 (1898) 52-.
 — carbon (musical sounds). *Phipson, T. L.* C. N. 8 (1863) 163.
 — collision. *Lecoute, F.* Arch. Sc. Ps. Nt. 25 (1891) 295-.
 — efflux of liquids. *Martini, T.* [1882-83] Ven. I. At. 8 (1881-82) 961-; (*1883-84) 109-.
 — — water. *Sondhauss, C.* [1864] A. Ps. C. 124 (1865) 1-, 235-.
 electrical methods, and telephonic transmission. *Kallmann, M.* Exner Rpm. 25 (1889) 426-.
 by intermittent current, apparatus. *Yvon, P.* Par. S. Ps. Sé. (1878) 42-.
 — magnetisation. *Delezenne, —.* Lille Mm. S. (1838) 49-.
 — —. *Matteucci, C.* Arch. de l'Électr. 5 (1845) 389-.
 — —. *Bachmetjev, P.* Rs. Ps.-C. S. J. 17 (Ps.) (1885) 65-; Fsch. Ps. (1885) (Ab. 2) 743-; Exner Rpm. 26 (1890) 137-.
 on railways. *Oppel, J. J.* (xii) Frkf. a. M. Ps. Vr. Jbr. (1863-64) 66-.
 by rotating bodies. *Cagniard-Latour, C.* Par. S. Phlm. PV. (1842) 58-.
 — silicic acid jelly. *Wagner, J. P.* (xi) D. Nf. Tbl. (1867) 35-.
 sounding systems. *Warburg, E.* A. Ps. C. 136 (1869) 89-.
 by tapping. *Chladni, E. F. F.* Pogg. A. 8 (1826) 453-.
 theory. *Stern, S.* Wien Ak. Sb. 69 (1874) (Ab. 2) 15-.

Sonorous phenomenon on Etna (whistling sound in atmosphere). *Galvagni, G. A.* Catania At. Ac. Gioen. 12 (1837) 325-.
 Sonorousness, cause. *Haldat du Lys, C. N. A.* Nancy Mm. S. Sc. (1848) 362-.
 Theory of sound. *Chladni, E. F. F.* Berl. Gs. Nt. Fr. N. Schr. 1 (1795) 102-.
 — — (Chladni's work). *Prony, R. de. J.* de Ps. 68 (1809) 311-.
 — —. *Oppel, J. J.* Pogg. A. 94 (1855) 357-, 530-.
 — — and tone, Savart's experiments. *Weber, W. E.* Schweigger J. 44 (=Jb. 14) (1825) 385-; 45 (=Jb. 15) (1825) 257-; 51 (=Jb. 21) (1827) 291-.

VIBRATIONS.

of air. *Savart, F. A. C.* 24 (1823) 56-; 29 (1825) 404-.
 — —, nature. *Challis, J.* Ph. Mg. 33 (1848) 462-.
 — — periodically heated. *Margules, M.* Wien Ak. Sb. 99 (1891) (Ab. 2a) 204-.
 communication, experiment. *Klementič, A. D.* Nf. Vb. (1899) (Th. 2, Hälfte 1) 57-.
 — by liquids. *Savart, F. A. C.* 31 (1826) 283-.
 — among solids. *Savart, F.* [1819] A. C. 14 (1820) 113-.
 — — (Savart). *Chladni, E. F. F.* Gilbert A. 68 (1821) 160-; A. C. 20 (1822) 74-.

- communication from vibrating body to a gas. *Stokes, G. G.* Phil. Trans. 158 (1868) 447-.
- — — — — *Brillouin, M.* A. C. 2 (1894) 417-.
- damping in perfectly elastic media. *Podlaski, L.* Prace Mt.-Fiz. 9 (1898) 46-.
- due to condensation of vapour. *Wanka, J.* Wien Ak. Sb. 102 (1893) (Ab. 2a) 1105-.
- effect on suspended disc. *Rayleigh, (Lord).* Camb. Ph. S. P. 4 (1888) 18.
- elastic. *Müller, J. J.* Leip. B. 22 (1870) 1-.
- of elastic fluid. *Challis, J.* Ph. Mg. 33 (1848) 360-.
- electro-magnetic, of air, telephonic reproduction of sounds by. *Larroque, F.* Lum. Élect. 14 (1884) 259-.
- elliptical, in fluids. *Crémieu, V.* C. R. 125 (1897) 935-.
- of flame of Argand-burner. *Reusch, E.* A. Ps. C. 139 (1870) 493-.
- fluids or solids, Savart's law, demonstration. *Cauchy, A. L.* [1829] Par. Mm. Ac. Sc. 9 (1830) 117.
- frequency of vibration of system in its gravest mode, with example from hydrodynamics. *Rayleigh, (Lord).* Ph. Mg. 47 (1899) 566-.
- of gas within rigid spherical envelope. *Rayleigh, (Lord).* [1872] L. Mth. S. P. 4 (1871-73) 93-.
- heat accompanying certain. *Leroux, F. P. C.* R. 50 (1860) 656-, 729-.
- linear, theory. *Sang, E.* Edinb. N. Ph. J. 6 (1857) 259-; 7 (1858) 237-; 8 (1858) 41-, 193-; 9 (1859) 82-.
- at liquid surface. *Lechat, F. H.* C. R. 89 (1879) 299-; 90 (1880) 1545-; A. C. 19 (1880) 289-.
- — — in circular vessel, forms. *Decharme, C.* C. R. 92 (1881) 1500-; A. C. 25 (1882) 112-.
- — — rectangular vessel. *Lechat, F. H.* Par. S. Ps. Sé. (1880) 83-.
- longitudinal. *Savart, F.* A. C. 65 (1837) 337-.
- *Burg, P. van der.* Pogg. A. 103 (1858) 620-.
- metal bridges, vibrations and fall. *Bellet, D.* Rv. Sc. 52 (1893) 272-.
- nature. *Mayer, A. M.* Nt. 18 (1878) 571-, 594-, 648-.
- normal. *Savart, F.* A. C. 36 (1827) 187-.
- phenomena explained by. *Landur, N.* Presse Sc. 1 (1863) 157-.
- of plates and other solids, air in organ pipes, etc. *Chladni, E. F. F.* J. de Ps. 68 (1809) 246-.
- produced by heat. *Resti-Farrari, G.* A. Sc. Lomb. Ven. 4 (1834) 147-.
- small, of gases, theory. *Challis, J.* [1829] Camb. Ph. S. T. 3 (1830) 269-.
- of solids. *Savart, F.* A. C. 25 (1824) 12-, 133-, 225-.
- *Navier, C. L. M. H.* Par. S. Phlm. Bil. (1825) 178-.
- *Röhrs, J. H.* [1864] Camb. Ph. S. T. 11 (1871) 324-.
- *Guthrie, Fred.* Ph. Mg. 9 (1880) 15-.
- of solids (homogeneous and isotropic). *Tedone, O.* Tor. Ac. Sc. Mm. 47 (1897) 181-.
- — — effect of internal friction. *Hopkinson, J.* Mess. Mth. 5 (1871) 208-.
- — — various media on frequency. *Savart, F.* A. C. 30 (1825) 264-.
- — — in fluids. *Koláček, F.* Wien Ak. Sb. 87 (1883) (Ab. 2) 1147-.
- — — and liquids, forms. *Decharme, C. [J.]* C. R. 86 (1878) 453-; 87 (1878) 251-, 354-, 551; 88 (1879) 553-; (xii) M.-et-L. S. Ac. Mm. 36 (1881) 1-, 275-.
- sonorous, of air. *Wertheim, G. C. R.* 32 (1851) 14-; A. C. 31 (1851) 385-.
- of sonorous bodies. *Poisson, S. D.* A. C. 36 (1827) 86-.
- — —, damping by air. *Bourget, J.* C. R. 72 (1871) 560-.
- sonorous, of liquids. *Cagniard-Latour, C.* [1833-39] A. C. 56 (1834) 252-, 280-; Par. S. Phlm. PV. (1836) 46-; (1839) 95-.
- — — solids. *Cagniard-Latour, C.* Par. S. Phlm. PV. (1839) 113-.
- theory, simplification. *Cellérier, C.* Arch. Sc. Ps. Nt. 3 (1880) 549-.
- transverse, in liquids. *Dubois, P.* C. R. 86 (1878) 295-.
- , of sounding liquids and gases. *Matthiessen, L.* A. Ps. C. 141 (1870) 375-.
- in water drops. *Strehlke, F.* Pogg. A. 40 (1837) 146-.
- of water in tubes. *Dvořák, V.* Wien Ak. Sb. 71 (1875) (Ab. 2) 315-.
- Water-pipes, singing. *Croft, W. B.* [1894] Nt. 51 (1894-95) 107.
- Waves of finite amplitude, plane and spherical. *Burton, C. V.* L. Ps. S. P. 12 (1894) 161-; Ph. Mg. 35 (1893) 317-.
- , stationary (theory). *Bezold, W. von.* Münch. Ak. Sb. 7 (1877) 188-.
- , —, Bernoulli effect. *Davis, B.* [1900] N. Y. Ac. A. 13 (1900-01) 487-; Am. J. Sc. 10 (1900) 231-.
- , —, wire-helix models. *Bongiovanni, G.* Rv. Sc. [Ind.] 30 (1898) 123-.

9105 Mechanical Action of Vibrations (Acoustic Attraction).

Boehm, E. E., & Schellbach, K. H. A. Ps. C. 7 (1879) 1-.

ACOUSTIC ATTRACTION.

- Guthrie, Fred.* [1869] R. S. P. 18 (1870) 93-; 19 (1871) 35-.
- Thomson, (Sir) W.* Ph. Mg. 41 (1871) 423-.
- caused by velocity, and resulting in vibration. *Smith, Herm.* Nt. 8 (1873) 25-.
- and repulsion. *Guyot, J.* [1834-61] L'I. 2 (*1834) 93; (vii) Cosmos 7 (1870) 145-.
- *Schellbach, C. H.* A. Ps. C. 139 (1870) 670-; 140 (1870) 325-, 495-.

and repulsion. *Moutier, J.* Par. S. Phlm. Bll. 11 (1874) 32-.

—, *Dvořák, V.* [1875] Wien Ak. Sb. 72 (1876) (Ab. 2) 213-.

—, *Martini, T.* (xii) Rv. Sc.-Ind. 11 (1879) 306-.

—, *Provenzali, F. S.* [1882] Rm. N. Linc. At. 36 (1883) 9-.

— of bodies vibrating in fluid media. *Berson, G.* Toul. Ac. Sc. Mm. 5 (1893) 406-.

—, and magnetic analogies. *Stroh, A.* Tel. E. J. 11 (1882) 192-, 293-.

Acoustic repulsion. *Dvořák, V.* A. Ps. C. 3 (1878) 328-.

— (Dvořák). *Mayer, A. M.* Am. J. Sc. 16 (1878) 27-.

—, *Rayleigh, (Lord).* Ph. Mg. 6 (1878) 270-.

Explosives, effect. *Tait, —.* Edinb. R. S. P. 14 (1888) 110-.

Hydrodynamic-acoustic researches. *König, W.* A. Ps. C. 42 (1891) 353-, 549-; 43 (1891) 43-; 50 (1893) 639-.

Instrument for measuring intensity of aerial vibrations. *Rayleigh, (Lord).* Ph. Mg. 14 (1882) 186-.

Longitudinal aerial vibrations excited by transversal. *Stefan, J.* Wien Sb. 61 (1870) (Ab. 2) 491-.

Quartz fibres. *Boys, C. V.* Nt. 42 (1890) 604-.

Rotation, acoustic, continuous. *Haberditzl, A.* Wien Ak. Sb. 77 (1878) (Ab. 2) 641-.

— due to vibration. *Savart, F.* A. C. 36 (1827) 257-.

—, —, —, *Cagniard-Latour, C.* Par. S. Phlm. P.V. (1839) 87-.

Sound radiometer and sound waves. *Dvořák, V.* [1881] Wien Ak. Sb. 84 (1882) (Ab. 2) 702-.

Vibration and theory of action at a distance. *Eötvös, (bárá) L.* (xii) Mag. Tud. Ak. Éts. 5 (No. 12) (1871) 207-.

after-strain effects. *Šebuev, G. N.* Kazan S. Nt. (Ps.-Mth.) P. 7 (1899) 374-.

apparatus for production of stationary waves in. *Lehnebach, A.* A. Ps. C. 23 (1884) 157-.

— for studying. *Schwedoff, T.* Par. S. Ps. Sé. (1878) 144.

beats in. *Maltézos, C. C. R.* 129 (1899) 438-.

bowed. *Mach, E.* A. Ps. C. 134 (1868) 311-.

—, *Neumann, Clem.* Wien Sb. 61 (1870) (Ab. 2) 89-.

—, harmonics. *Melde, F.* Pogg. A. 114 (1861) 609-.

—, theory. *Voigt, W.* Gött. Nr. (1890) 502-.

— carrying cursors. *Duhamel, J. M. C.* C. R. 11 (1840) 15-, 810-; Par. Éc. Pol. J. 29^e cah. (1843) 1-.

circular vibrations. *Neyreneuf, —.* As. Fr. C. R. (1895) (Pt. 2) 377-; Caen Ac. Mm. (1896) (Pt. 1) 26-.

compound harmonic vibrations. *Hallock, —.* [1899] N. Y. Ac. A. 12 (1899-1900) 665-.

elastic, with one end vibrating, motion. *Mercadier, E. C. R.* 77 (1873) 639-, 671-, 1292-, 1366-.

—, —, —, —, — (Mercadier). *Valérius, H.* C. R. 77 (1873) 1184-.

—, hung at one end and cut, wave-motion in. *Niven, C.* [1878] Mess. Mth. 8 (1879) 75-.

energy. *Grinwis, C. H. C.* As. Fr. C. R. 6 (1877) 317-.

equation, construction. *Monge, G.* Par. Éc. Pol. J. 8 (1809) 118-.

experiment. *Mach, E.* [1888] Humb. 9 (1890) 347.

experiments. *Tyndall, J.* R. I. P. 4 (1866) 685-.

—, *Melde, F.* A. Ps. C. 21 (1884) 452-; 24 (1885) 497-; 30 (1887) 161-.

— (Melde). *Eisas, A.* A. Ps. C. 25 (1885) 676-.

flexible and inextensible, integration of differential equations. *Maggi, G. A.* Mil. I. Lomb. Rd. 19 (1886) 682-.

—, motion. *M.* QJ. Mth. 4 (1861) 178-.

formula for. *Delezenne, —.* Lille Mm. S. (1850) 12-.

harmonics. *Zantedeschi, F.* Wien Sb. 27 (1857) 271-.

heterogeneous. *Bourget, J.* C. R. 63 (1866) 328-; Par. Éc. Norm. A. 4 (1867) 37-; (rx) Par. Obs. A. 9 (1868) 151-.

—, *Stefan, J.* Wien Sb. 57 (1868) (Ab. 2) 517-.

india-rubber, longitudinal vibrations. *Lang, V. von.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 692-.

—, transverse vibrations. *Lang, V. von.* Wien Ak. Sb. 107 (1898) (Ab. 2a) 1041-.

—, —, frequency. *Baker, T. J. L.* Ps. S. P. 17 (1901) 107-; Ph. Mg. 49 (1900) 347-.

influence of elasticity. *Savart, N.* A. C. 6 (1842) 5-; C. R. 14 (1842) 915-.

—, —, — (Savart). *Duhamel, J. M. C.* C. R. 14 (1842) 953-.

law of tensions. *Williams, H. G.* Nt. 44 (1891) 591-.

— vibrations, method of demonstrating. *Bazzi, E.* N. Cim. 22 (1887) 155-.

9110 Vibrations of Strings and Rods. Curved Rods.

STRINGS.

Young, (Dr.) T. Phil. Trans. (1800) 106-.

Thomson, W. (vi *Adds.*) Camb. Mth. J. 3 (1843) 257-.

Seebeck, A. Leip. Ab. Jablon. Gs. (1846) 129-.

Behrens, T. H. [1873] (xii) Schl.-Holst. Nt. Vr. Sehr. 1 (1875) 153.

Krigar-Menzel, O., & Raps, A. Berl. Ak. Sb. (1891) 613-.

Æolian harp. *Strouhal, V.* Würzb. Ps. Md. Vh. 12 (1878) 199-.

—, —, *Rayleigh, (Lord).* Ph. Mg. 7 (1879) 161-.

—, —, *Kohtrausch, W. F.* A. Ps. C. 13 (1881) 545-.

- low tones. *Maurat*, —. C. R. 49 (1859) 512-.
- machine for tracing curves described by points. *Williams-Ellis*, (Rev.) *J. C.* [1872] (xi) Camb. Ph. S. P. 2 (1876) 256-.
- Melde's experiment (vibrations of cord attached to tuning fork). *Gripon*, *E.* C. R. 78 (1874) 186-.
- —. *Lowery*, *W.* Am. J. Sc. 7 (1874) 493-.
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—, —, theory. *Love, A. E. H.* R. S. P. 49 (1891) 100-.

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- Plates. *Elsas, A. A.* Ps. C. 19 (1883) 474-; 20 (1883) 468-.
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- — — pipes of various forms. *Sondhauss, C.* A. Ps. C. 140 (1870) 53-, 219-.
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- Velocity of sound in air in tubes. *Kundt, A.* Berl. Mb. (1867) 858-; A. Ps. C. 135 (1868) 337-, 527-.
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- Helmholtz, H. von.* Berl. Ps. Gs. Vh. (1886) 69-.
- Preyer, W.* Berl. Ps. Gs. Vh. (1889) 15-.
- Voigt, W.* Gött. Nr. (1890) 159-.
- (Theory.) *Hermann, L.* Pflüg. Arch. Pl. 49 (1891) 499-.
- Melde, F.* Pflüg. Arch. Pl. 60 (1895) 623-.
- Everett, J. D. L.* Ps. S. P. 14 (1896) 93-; Ph. Mg. 41 (1896) 199-.
- Meyer, M. Z.* Psychol. 11 (1896) 177-.
- Ménonog, A., & Witasek, S.* Z. Psychol. 15 (1897) 189-.
- Meyer, M. Z.* Psychol. 20 (1899) 13-.
- Apparatus. *Stumpf, C.* Z. Psychol. 6 (1894) 33-.
- Beat tones, production from 2 vibrating bodies of high frequency which are separately inaudible. *Mayer, A. M. B. A.* Rp. (1894) 573.
- Beats of consonances of form $h:1$. *Bosanquet, R. H. M.* L. Ps. S. P. 4 (1881) 221-; Ph. Mg. 11 (1881) 420-, 492-.
- imperfect harmonies. *Thomson, (Sir) W.* Edinb. R. S. P. 9 (1878) 602-.
- , variation of pitch in. *Taylor, S.* Ph. Mg. 44 (1872) 56-.
- Difference tones. *Meyer, M. Z.* Psychol. 16 (1898) 1-.
- (Meyer). *Ebbinghaus, H.* Z. Psychol. 16 (1898) 152-.
- (Ebbinghaus). *Meyer, M. Z.* Psychol. 16 (1898) 196-.
- Fusion of tones. *Faist, A.* Z. Psychol. 15 (1897) 102-.
- — — — — *Stumpf, C.* Z. Psychol. 15 (1897) 280-, 354.
- — — — — *Lipps, T.* Z. Psychol. 19 (1899) 1-.

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- Fusion of tones and consonance. *Meyer, M. Z.* Psychol. 17 (1898) 401-; 18 (1898) 274-.
- — — — — (Meyer). *Stumpf, C.* Z. Psychol. 18 (1898) 294-.
- — — — — with the unmusical. *Stumpf, C.* Z. Psychol. 17 (1898) 422-.
- Intensity of components. *Meyer, M. Z.* Psychol. 17 (1898) 1-.
- Intermittent tones, physical conditions. *Zwaardemaker, H.* Arch. An. Pl. (Pl. Ab.) (1900) (Suppl.) 60-.
- Interrupted tones, blending, apparatus showing. *Mayer, A. M.* Am. J. Sc. 47 (1894) 283-.
- Kirchhoff's principle, model to illustrate. *Hallock, W.* [1899] N. Y. Ac. A. 12 (1899-1900) 620.
- Objective demonstration. *Burton, C. V. L.* Ps. S. P. 13 (1895) 436-; Ph. Mg. 39 (1895) 452-.
- existence of tones. *Rücker, A. W.* B. A. Rp. (1895) 626-.
- — — — — *Rücker, A. W., & Edser, E. L.* Ps. S. P. 13 (1895) 412-; Ph. Mg. 39 (1895) 341-.
- — — — —, photographic evidence. *Forsyth, R. W., & Soutter, R. J.* R. S. P. 63 (1898) 396-.
- Obliteration of sensation of one sound by simultaneous action on ear of another more intense and lower sound. *Mayer, A. M.* Am. J. Sc. 12 (1876) 329-.
- Origin and perception. *Dennert, H.* [1886] Arch. Ohrh. 24 (1887) 171-.
- Perception of tones, with special reference to phase-differences. *Hermann, L.* Pflüg. Arch. Pl. 56 (1894) 467-.
- Siren and organ-pipe. *Barus, C.* Am. J. Sc. 5 (1898) 88-.
- Solution of problem by law of interference. *Poggendorff, J. C.* Pogg. A. 32 (1834) 520-.
- Subjective combination-tones in light of resonance theory of hearing. *Schaefer, K. L.* Pflüg. Arch. Pl. 78 (1899) 505-.
- — — — — — — — — — (Schaefer). *Meyer, M.* Pflüg. Arch. Pl. 81 (1900) 49-.
- — — — — — — — — — (Meyer). *Schaefer, K. L.* [1900] Pflüg. Arch. Pl. 83 (1901) 73-.
- Summation and combination-tones. *Appunn, A.* Ps. C. 42 (1891) 338-.
- Timbre. *König, R. A.* Ps. C. 14 (1881) 369-.
- Variation tones. *Dvořák, V.* Wien Ak. Sb. 70 (1874) (Ab. 2) 645-.
- — (Dvořák). *Haberditzl, A.* Wien Ak. Sb. 77 (1878) (Ab. 2) 204-.

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- Biot, J. B.* Par. S. Phlm. Bil. 3 (1802) 116-.
- Gilbert, L. W.* Gilbert A. 21 (1805) 437-.
- Hassenfratz, J. H.* A. C. 53 (1805) 64-.
- Haldat du Lys, C. N. A. de.* Nancy Tr. S. Sc. (1813-15) 15-.
- Fröhlich, C. W.* Gilbert A. 58 (1818) 401-.

- Armi, G. dall'.* G. Arcad. 12 (1821) 164-, 321-; 13 (1822) 48-, 221-.
- Laurent, P. A.* C. R. 22 (1846) 80-.
- Strantz, F. von.* Bresl. Schl. Gs. Übs. (1852) 24-.
- Grinwis, C. H. C.* [1874] Amst. Ak. Vs. M. 9 (1876) 75-; Arch. Néerl. 10 (1875) 151-.
- Rayleigh, (Lord).* Ph. Mg. 3 (1877) 456-; 7 (1879) 149-; 9 (1880) 278-; 13 (1882) 340-.
- Rink, H. J.* Arch. Néerl. 12 (1877) 262-.
- Decharme, C.* C. R. 88 (1879) 1082-.
- Waals, J. D. van der.* [1879] (xii) Amst. Ak. Wet. P. (1879-80) No. 6, 8-; (xi) A. Ps. C. Beibl. 4 (1880) 531-.
- Allard, É.* C. R. 95 (1882) 1062-.
- Acoustic reversibility. *Tyndall, J. R. S. P.* 23 (1875) 159-.
- Action of accelerating force. *Alencar Silva, O. d'.* G. Teix. J. Sc. 14 (1900) 17-, 97-.
- Agency of sound. *Shand, —.* B. A. Rp. (1840) (pt. 2) 52-; Sturgeon A. Electr. 6 (1841) 245-.
- Anomalous propagation. *Gouy, —.* C. R. 111 (1890) 910-.
- — — — — *Ventosa, V.* [1898] Ciel et Terre 19 (1898-99) 1-.
- Apparatus to show non-propagation of sound in vacuum (bell-machine). *Castell, H.* [1838] Sturgeon A. Electr. 3 (1838-39) 66-.
- — — — — *Gellio, G.* Rv. Sc.-Ind. [24 (1892)] 106-.
- Barometer, effect of sound on. *Englefield, H. C. R. I. J. I.* 1 (1802) 157-.
- — — — — *Benzenberg, J. F.* Gilbert A. 39 (1811) 129-.
- Bell, electromagnetic, application to experiments. *Wilson, G.* [1846] Edinb. T. Sc. S. Arts 3 (1851) 120-.
- Bells, sounds in different gases (Chladni's experiments on sounds of organ-pipe in different gases). [*Perrolle non*] *Perolle, É.* Tilloch Ph. Mg. 4 (1799) 283-.
- Density of atmosphere, effect of small variation on amplitude of sound-waves. *Holmes, R.* Manch. Lt. Ph. S. Mm. & P. 1 (1888) 18-.
- — — — — *Holmes, R.* Manch. Lt. Ph. S. Mm. & P. 2 (1889) 221-.
- Direction of sound, experiments in judging. *Ikenberry, L. D., & Shutt, C. E.* [1897] Kan. Un. Q. 7 (1898) 9-.
- — — — — and the topophone. *Johnson, A. B.* Smiths. Misc. Col. 33 (1888) Art. 3, 12- (Wash. Ph. S. Bl. 8 (1885).)
- Discontinuities in propagation of explosive phenomena. *Vieille, P.* C. R. 129 (1899) 1228-; 131 (1900) 413-.
- — — — — phenomena. *Vieille, —.* Par. S. Ps. Sé. (1900) 61-.
- Distance of sound, experiments in judging. *Shutt, C. E.* [1897] Kan. Un. Q. 7 (1898) 1-.
- travelled rectilinearly by sound. *Leroux, F. P.* A. C. 12 (1867) 406-.
- Distant cannonade. *Sinclair, W. F.* Nt. 56 (1897) 223.
- — — — — *Mostyn, C.* Nt. 56 (1897) 248.
- Distant cannonade. *Davison, C.* Nt. 62 (1900) 377-.
- — — — — *Mallet, J. W.* Nt. 62 (1900) 523.
- explosions, feeling and hearing. *Davison, C.* [1899] Nt. 61 (1899-1900) 91-.
- Ear trumpet for use in war. *Prätorius, C. F. A.* Gilbert A. 39 (1811) 150-.
- trumpets and stethoscopes, efficiency. *Geigel, R.* Virch. Arch. 140 (1895) 165-, 535.
- — — — — theory. *Gough, J.* Nicholson J. 18 (1807) 310-.
- Equations, general, of small motions of molecules of gases, application. *Duhamel, J. M. C.* C. R. 55 (1862) 223-.
- — — — — integration. *Parseval, M. A.* [1801] Par. Mm. Sav. Étr. 1 (1806) 379-.
- — — — — *Liouville, J. C. R.* 7 (1838) 247-.
- — — — — *Moon, R.* Ph. Mg. 46 (1873) 122-.
- Experiments. *Perrolle, É.* Turin Mm. Ac. (1790-91) 195-.
- (Perrolle). *Nicholson, W.* Nicholson J. 1 (1797) 416-.
- during siege of Paris. *Lucas, F.* C. R. 75 (1872) 204-.
- Explosions. *Sbert, (le col.) —.* Par. S. Ps. Sé. (1888) 35-.
- — — — — *Wolff, W.* A. Ps. C. 69 (1899) 329-.
- Influence of light. *Paroletti, M.* [1805] Turin Mm. Ac. (1805-08) 141-.
- — — — — unequal temperature distribution. *Gromeka, I. S.* Rec. Mth. (Moscou) 14 (1890) 283-; Fsehr. Ps. (1889) (Ab. 1) 563-.
- “The invisible lady.” *Pfaff, C. H.* Gilbert A. 28 (1808) 244-.
- — — — — *Schmidt, — (Apoth. in Sonderburg).* Gilbert A. 29 (1808) 470-.

KINETIC THEORY.

- (Physics of media composed of free and perfectly elastic molecules.) [With introduction by Lord Rayleigh.] *Waterston, J. J.* [1846] Phil. Trans. (A) 183 (*1893) 1-.
- Hoorweg, J. L.* Arch. Néerl. 11 (1876) 131-.
- Preston, S. T.* Ph. Mg. 3 (1877) 441-; 4 (1877) 77; Nt. 18 (1878) 253-.
- Lorentz, H. A.* Amst. Ak. Vs. M. 15 (1880) 350-; Arch. Néerl. 16 (1881) 1-.
- Mees, R. A.* Amst. Ak. Vs. M. 15 (1880) 394-; A. Ps. C. Beibl. 5 (1881) 244-.
- Watson, (Rev.) H. W.* [1884] Birm. Ph. S. P. 4 (1883-85) 242-.
- Hirn, G. A.* Brux. Ac. Bil. 11 (1886) 131 (*bis*)-.
- Kruseman, J. Nieuwenhuijzen.* Haarl. Ms. Teyl. Arch. 5 (1898) 207-.

- Meteorite, falling, phenomenon. *Mach, E., & Doss, B.* Wien Ak. Sb. 102 (1893) (Ab. 2a) 248-.
- Motions of atmosphere. *Helmholtz, — von.* D. Nf. Tbl. (1889) 199.
- Petroleum wells, sound propagation at bottom. *Ishiwara, —.* Tok. Gl. S. J. 5 (1898) [265]-. [*Jap.*]
- Phenomenon of Monte Tomatico, near Feltre. *Haidinger, W.* Wien Gl. Jb. 4 (1853) 559-.

- Pitch of sound, alteration by conduction through different media. *Ringer, S. R. S. P. 10* (1859-60) 276-.
- Potential with 4 variables, application to theory of sound; proof of Poisson's formula. *Bous-sinesq, J. C. R. 94* (1882) 1465-.
- Pressures of air during propagation. *Clausius, R. C. R. 55* (1862) 367-.
- Production and propagation. *Williams, C. J. B. Ph. Mg. 6* (1835) 25-.
- — —. *Mackenzie, (Sir) G. S. Edinb. N. Ph. J. 42* (1847) 197-.
- of sound of great intensity. *Tait, P. G. Edinb. R. S. P. 9* (1878) 737-.
- Projectiles, rapid. *Durand-Gréville, E. Rv. Sc. 41* (1888) 494-.
- , phenomenon. *Réveille, (le lt.) V. Rv. Mar. et Col. 123* (1894) 241-; 126 (1895) 243-.
- Propagation in long pipes. *Biot, J. B. Par. S. Phlm. Bll. 1* (1808) 269-.
- pipes. *Neyreneuf, V. C. R. 95* (1882) 218-.
- — —. *Violle, —, & Vautier, —. C. R. 102* (1886) 103-; 110 (1890) 230-; *A. C. 19* (1890) 306-.
- — —. *Neyreneuf, V. C. R. 111* (1890) 28-; *A. C. 22* (1891) 368-.
- — —. *Violle, J., & Vautier, T. C. R. 120* (1895) 1402-; 121 (1895) 51-.
- — — to great distance. *Schale, —. Z. Berg- H.-Salw. 45* (1897) (Ab.) 271-.
- Liquids. *Ellis, F. Nicholson J. 25* (1810) 188-.
- Moving air. *Jüger, G. Wien Ak. Sb. 105* (1896) (Ab. 2a) 1040-.
- Solids. *Chladni, E. F. F. Voigt Mg. 1* (1797) 7-.
- , *La Place, P. S. (marquis) de. Par. S. Phlm. Bll. (1816) 190-*.
- , *Gezechus [Hesehus], N. A. Rs. Ps.-C. S. J. 26* (Ps.) (1894) 322-; *J. de Ps. 4* (1895) 586-.
- and liquids. *Arnim, L. A. von. Gilbert A. 4* (1800) 112-.
- Water. *Nollet, —. Gilbert A. 44* (1813) 346-.
- , *Muncke, G. W. Gilbert A. 48* (1814) 66-.
- , *Colladon, D. C. R. 13* (1841) 439-.
- , sound shadows in. *Le Conte, (Prof.) J. [1881] Am. J. Sc. 23* (1882) 27-.
- Wires, etc., transmission of musical sounds by. *Wheatstone, (Sir) C. R. I. J. 2* (1831) 223-.
- , transmission by; and simple microphone receivers. *Millar, W. J. [1879] Glasg. Ph. S. P. 12* (1880) 20-.
- , of speech by. *Weinhold, A. Carl Rpm. 6* (1870) 168-.
- , — — —, etc. by. *Millar, W. J. L. Ps. S. P. 2* (1879) 292-; *Ph. Mg. 6* (1878) 115-.
- Wood. *Walker, Ez. Nicholson J. 4* (1803) 69-.
- Reciprocity, principle of, applied to acoustics. *Rayleigh, (Lord). [1876] R. S. P. 25* (1877) 118-.
- Rectilinear diffusion of sound. *Kalischer, S. Berl. Ps. Gs. Vh. (1890) 111-*.
- transmission of sound and light. *Challis, J. Ph. Mg. 11* (1881) 249-.
- Signals, anomalies. *Welling, J. C. [1881] Wash. Ph. S. Bll. 5* (1883) 39-.
- and audibility. *Allard, É. A. Pon. Chauss. 5* (1883) 567-.
- , cannon-. *Delauaney, —. Rv. Mar. et Col. 81* (1884) 229-.
- , Lacoine's system. *Guarienti, A. [1899] Rv. Mar. et Col. 146* (1900) 604-.
- , marine danger-. *Brodie, J. [1866] Edinb. Sc. S. Arts P. 7* (1868) 102-.
- , —, use of siren and resonators as. *Gen-glaire, —. Rv. Mar. et Col. 94* (1887) 346-.
- , submarine. *Brillouin, —. C. R. 104* (1887) 1821-.
- , —, *Hardy, E. C. R. 126* (1898) 1496-.
- , — (acoustic triangulation). *Barter, S. Nt. 62* (1900) 422-.
- Siren fog-horn, electric, Trudeau's. *Keeley, D. H. Sc. Abs. 2* (1899) 638.
- Soundless zones, Duane's. *Tyndall, J. [1882] R. S. P. 34* (1883) 18-.
- Speaking trumpets. *Hassenfratz, J. H. [1804] Par. Mm. Sav. Étr. 2* (1811) 101-.
- and bells of wind instruments. *Neyreneuf, —. Caen Ac. Mm. (1891) (Pt. 1) 3-*.
- ear trumpets, theory. *Daguin, P. A. Toul. Mm. Ac. 2* (1864) 410-.
- , mathematical theory. *Gough, J. Nicholson J. 10* (1805) 160-.

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- The Earth. *Jannettaz, É. Par. S. Gl. Bll. 1* (1873) 117-.
- — —. *Forel, F. A. Nt. 31* (1885) 483-.
- Elastic media. *Blake, E. W. Silliman J. 5* (1848) 373-.
- Gases. *Chladni, E. F. F. J. de Ps. 69* (1809) 138-.
- , *Kerby, F., & Merrick, A. Nicholson J. 27* (1810) 269-; 33 (1812) 161-.
- , *Terquem, A. [1873] A. Ps. C. 151* (1874) 620-.
- , *Dvořák, V. Wien Ak. Sb. 69* (1874) (Ab. 2) 151-.
- , *Neyreneuf, V. C. R. 96* (1883) 1312-; *A. C. 2* (1894) 251-.
- , integral of fundamental equation for propagation in. *Poisson, S. D. [1807-19] Par. Éc. Pol. J. 14^e cah. (1808) 319-; Par. Mm. Ac. Sc. 3* (1818) 121-.
- , — — — — — — — (Poisson). *Liouville, J. C. R. 42* (1856) 465-.
- , mixed. *Brillouin, M. A. C. 18* (1899) 433-.
- , propagation of condensation impulses in. *Curry, C. E. A. Ps. C. 51* (1894) 460-.
- Heterogeneous medium. *Bertrand, J. C. R. 22* (1846) 1136-.
- of lamellar structure. *Kasterin, N. Arch. Néerl. 5* (1900) 506-.
- Homogeneous unlimited medium in equilibrium. *Dieu, T. Liouv. J. Mth. 14* (1849) 345-.

- Speaking trumpets, theory. *Riboldi, A.* Mil. At. S. It. 14 (1871) 82-.
- tube. *Jobard, —*. Fr. *Cg. Sc.* (1835) 60-.
- Telephone "buzz" and weather conditions. *Struck, —*. *Wetter* 8 (1891) 96.
- and telegraph wires as weather prophets. *Eydam, —*. *Wetter* 17 (1900) 19-.
- Theory. *Biot, J. B. J.* de Ps. 55 (1802) 173-.
- *Fischer, E. G.* Berl. Ab. (1824) 75-.
- *Cooper, P. R. S. P.* 3 (1835) 342.
- *Popov, A. T.* (xii) Kazan Un. Mm. (1848) (Bk. 4) 15-; (iv) *Liouv. J. Mth.* 15 (1850) 78-.
- *Stokes, G. G.* Ph. Mg. 34 (1849) 52-.
- *Moon, R.* Ph. Mg. 37 (1869) 189-.
- *Roiti, A.* Rm. R. Ac. Linc. Mm. 1 (1877) 762-.
- Newton's, Laplace's, etc. *Winter, R.* *Tilloch Ph. Mg.* 43 (1814) 201-.
- and modern. *Plana, G.* [1857] *Tor. Mm. Ac.* 18 (1859) 319-.
- of sound, and motion of fluids. *Trembley, J.* Berl. Mm. Ac. (1801) 33-.
- Tuning fork, application. *Montigny, C.* *Brunx. Ac. Bll.* 50 (1880) 300-.
- , intensity in different directions. *Chladni, E. F. F.* *Kastner Arch. Ntl.* 7 (1826) 92-.
- , —, —, —, —, *Chladni, E. F. F., & Sömmerring, W.* *Kastner Arch. Ntl.* 8 (1826) 91-.
- Wave boundary. *Blanchet, P. H.* [1841] *C. R.* 13 (1841) 339-; *Liouv. J. Mth.* 7 (1842) 13-.
- in compressible fluid under gravity. *Holmes, R.* *Mess. Mth.* 18 (1889) 108-.
- propagation, theorem. *Stoney, G. J.* *Ph. Mg.* 43 (1897) 273-.
- surfaces, forms, and the topophone. *Mayer, A. M.* *Am. J. Ot.* 1 (1879) 282-.
- theory of gases. *Bäcklund, A. V.* *Stockh. Öfv.* (1886) 3-, 327-; (1887) 115-, 351-, 549-; (1888) 103-, 305-; *Mth. A.* 34 (1889) 371-.
- Waves (nature). *Russell, J. S. B. A.* *Rp.* (1844) (pt. 2) 11.
- *Laurent, P. A. C. R.* 22 (1846) 251-.
- , cylindrical. *Grinwis, C. H. C.* [1875] *Amst. Ak. Vs. M.* 9 (1876) 229-; *Arch. Néerl.* 11 (1876) 458-.
- , and spherical. *Tumlirz, O.* [1880] *Wien Ak. Sb.* 82 (1881) (Ab. 2) 779-.
- , deformation. *Vieille, P.* *C. R.* 128 (1899) 1437-.
- of finite longitudinal disturbance, thermodynamic theory. *Rankine, W. J. M.* [1869] *Phil. Trans.* 160 (1870) 277-.
- , successive. *Blanchet, P. H.* *Liouv. J. Mth.* 9 (1844) 73-.

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- Young, (Dr.) T. R. I. J.* 1 (1802) 214-.
- (Lecture by Olbers.) *Benzenberg, J. F.* *Gilbert A.* 49 (1815) 154-.
- Poisson, S. D. A. C.* 23 (1823) 5-; *Con. des Temps* (1826) 257-.

- Farey, J.* *Tilloch Ph. Mg.* 64 (1824) 178-.
- Ivory, J.* *Tilloch Ph. Mg.* 66 (1825) 3-.
- Galbraith, W.* *Tilloch Ph. Mg.* 66 (1825) 109-; 68 (1826) 214-; *Ph. Mg.* 4 (1828) 179-.
- (Ivory.) *Meikle, H.* *QJ. Sc.* (1828) (Pt. 2) 124-.
- Moll, G.* *Edinb. N. Ph. J.* 5 (1828) 154-.
- (Meikle.) *Ivory, J.* *Ph. Mg.* 5 (1829) 104-.
- Meikle, H.* *Edinb. N. Ph. J.* 6 (1829) 26-.
- Riccati, G.* *G. Arcad.* 48 (1830) 16-.
- Miller, W. H.* *Ph. Mg.* 15 (1839) 1.
- Sadebeck, M.* *Bresl. Schl. Gs. Übs.* (1844) 171-.
- Mossotti, O. F.* (vi *Adds.*) *Il Cim.* 4 (1846) 97-.
- Bravais, A. A. C.* 34 (1852) 82-.
- Barré de Saint-Venant, —*. *LII.* 24 (1856) 212-.
- Duhamel, J. M. C.* *C. R.* 55 (1862) 6-.
- (Duhamel's formula.) *Clausius, K.* *C. R.* 55 (1862) 204-.
- Kolk, H. W. Schroeder van der.* *A. Ps. C.* 124 (1865) 453-; *Ph. Mg.* 30 (1865) 391-.
- Kurz, A.* *Z. Mth. Ps.* 14 (1869) 440-.
- (Historical review.) *Cherbuliez, —*. *Bern Mt.* (1870) 141-; (1871) 1-.
- Luca, G. de.* (xii) *Rv. Sc.-Ind.* 9 (1877) 186-.
- (Work of Kraevič.) *Avenarius, M. P.* [1886] *Kiev S. Nt. Mm.* 8 (2) (1887) v-.
- Violle, J., & Vautier, T. C. R.* 106 (1888) 1003-.
- Goodenow, (Rev.) S.* *Sid. Mess.* 8 (1889) 307-, 382-.
- Sluginov, N. P.* *Kazan S. Nt. (Ps.-Mth.) P.* 7 (1889) 360-.
- Gezechus [Heschus], N.* *Rs. Ps.-C. S. J.* 27 (Ps.) (1895) 269-; *Fschr. Ps.* (1896) (Ab. 1) 465-.
- Violle, J.* *C. R.* 127 (1898) 904-.
- Leduc, A.* *C. R.* 127 (1898) 1201-.
- Analytical considerations. *Challis, J.* *Ph. Mg.* 33 (1848) 98-.
- Calculation of experiments. *Moll, G.* *Hall Bij.* 2 (1826) 375-.
- Circular waves. *Caligny, A. de.* (ix) *Par. S. Phlm. Bll.* 4 (1867) 98-.
- Dalton's theory, and velocity of sound. *Benzenberg, J. F.* *Gilbert A.* 42 (1812) 155-; *Bb. Brit.* 52 (1813) 388-.
- Depth of wells by velocity of sound. *Muncke, G. W.* *Gilbert A.* 42 (1812) 387-.

DOPPLER'S PRINCIPLE.

- (Theory of coloured light of double stars.) *Doppler, C.* *Böhm. Gs. Ab.* 2 (1841-42) 465-.
- (Deviation of rays of light and sound by rotation of medium of propagation.) *Doppler, C.* [1843] *Böhm. Gs. Ab.* 3 (1843-44) 417-.
- (Acoustic experiments on railways, and Doppler's theory.) *Buys-Ballot, C. H. D.* *Pogg. A.* 66 (1845) 321-.
- (Motion of sounding body producing change of note.) *Fizeau, H. I.* [1848] *Par. S. Phlm. PV.* (1848) 81-; (vii) *A. C.* 19 (1870) 211-.
- Russell, J. S. B. A.* *Rp.* (1848) (pt. 2) 37-.
- (Influence of motion on intensity of sounds.) *Doppler, C.* *Wien Sb.* (1851) (Ab. 2) 162-.

- (Alteration of tone and colour by motion.)
Mach, E. Wien SB. 41 (1860) 543-.
Beetz, W. A. Ps. C. 130 (1867) 587-.
Volpicelli, P. Rm. At. N. Linc. 23 (1869) 232-.
Mayer, A. M. Am. J. Sc. 3 (1872) 267-; 4 (1872) 264-; C. R. 74 (1872) 747-.
Radau, R. Carl Rpm. 8 (1872) 46-.
 (Radau.) *Mayer, A. M.* Am. J. Sc. 4 (1872) 198-.
Schümgel, —. A. Ps. C. 150 (1873) 356-.
 [Eötvös non] *Eötvös, (Baron) R.* A. Ps. C. 152 (1874) 513-.
Hoorweg, J. L. Arch. Néerl. 9 (1874) 1-.
 (Eötvös.) *Ketteler, E.* A. Ps. C. 154 (1875) 260-.
 (Ketteler.) *Eötvös, (báros) L. (xn)* Mag. Tud. Ak. Ets. 9 (No. 9) (1875) 157-.
 (Railway-whistles, variation of pitch on trains meeting.) *Pole, W.* Nt. 11 (1875) 232-.
Vogel, H. C. A. Ps. C. 158 (1876) 287-.
Bichat, E. Nancy S. Sc. Bll. 4 (11^e Ann.) (1878) 5-.
Dufour, C. Arch. Sc. Ps. Nt. 24 (1890) 242-.
Wyatt, G. H. Nt. 42 (1890) 7-.
Perman, E. P. Nt. 42 (1890) 54.
Everett, J. D. Nt. 42 (1890) 81.
Stewart, R. W. [1890] Nt. 43 (1891) 80.
 (Displacement of sonorous bodies.) *Galopin, C.* Arch. Sc. Ps. Nt. 30 (1893) 320-.
Walter, A. Mh. Mth. Ps. 5 (1894) 151-.
Michelson, V. A. Rs. Ps.-C. S. J. 31 (Ps.) (1899) 119-; Fschr. Ps. (1899) (Ab. 1) 662.
 Echo and moving sound-source, difference of pitch. *Richarz, F.* N.-Vorp. Mt. 31 (1900) 205-.

- Earth waves. *Abbot, H. L.* Am. J. Sc. 15 (1878) 178-.
 Equilibrium, general law, and motion of solid and liquid bodies. *Wertheim, G.* Wien SB. 5 (1850) (Ab. 2) 19-.

EXPERIMENTS.

- (Solids.) *Biot, J. B.* [1808] Arcueil Mm. Ps. 2 (1809) 405-.
Benzenberg, J. F. Gilbert A. 35 (1810) 383-; 37 (1811) 221-.
Gilbert, L. W. (vi Add.) Gilbert A. 44 (1813) 177-.
 (French Academy.) *Benzenberg, J. F.* Gilbert A. 46 (1814) 325-.
Bauza, F., & Espinosa, J. A. C. 7 (1817) 93-.
Arago, D. F. J. A. C. 20 (1822) 210-.
Goldingham, J. Phil. Trans. (1823) 96-.
Gregory, O. [1823] Camb. Ph. S. T. 2 (1827) 119-.
Beek, A. van, & Moll, G. Phil. Trans. (1824) 424-.
Moll, G. Thomson A. Ph. 10 (1825) 268-; Hall Bij. 1 (1826) 191-.
Stampfer, S. Wien Jb. Pol. I. 7 (1825) 23-.
Foster, H., & Parry, W. E. Ph. Mg. 1 (1827) 12-.
 (Observations of Bauza and Espinosa.) *Oltmanns, J.* Crelle J. 2 (1827) 307-.
 (Foster and Parry.) *Moll, G.* Phil. Trans. (1828) 97-.

- (Van Beek and Moll.) *Simons, G.* Phil. Trans. (1830) 209-; Amst. N. Vh. 3 (1831) 95-.
Bravais, A., & Martins, —. C. R. 19 (1844) 1164-; A. C. 13 (1845) 5-.
Stone, E. J. [1871] Phil. Trans. 162 (1872) 1-.
Blaikley, D. J. L. Ps. S. P. 5 (1884) 319-; Ph. Mg. 16 (1883) 447-; L. Ps. S. P. 6 (1885) 228-; Ph. Mg. 18 (1884) 328-.
 lecture-. *Rücker, A. W.* L. Ps. S. P. 9 (1888) 259-.
 —. *Aignan, —, & Chabot, —.* J. de Ps. 4 (1895) 321-.
-
- Explosion waves. *Mach, E.* Wien Az. 13 (1876) 193-.
 —. *Mach, E., & Sommer, J.* Wien Ak. Sb. 75 (1877) (Ab. 2) 101-.
 —. *Fonseca Benevides, F. da.* Lisb. J. Sc. Mth. 7 (1880) 166-.
 —. *Berthelot, M.* C. R. 93 (1881) 18-; 94 (1882) 149-; 96 (1883) 672-.
 —. effect of co-volumes of gases on. *Vieille, —.* C. R. 112 (1891) 43-.
 —. in solids and liquids. *Berthelot, M.* C. R. 100 (1885) 314-; A. C. 6 (1885) 556-; 23 (1891) 485-; Par. S. C. Bll. 5 (1891) 558-.
 Formula. *Moutier, J. C.* R. 71 (1870) 846-.
 Guns. *Strantz, F. von.* Bresl. Schl. Gs. Übs. (1839) 54-.
 —. *Journée, —.* C. R. 106 (1888) 244-.
 —. *Labouret, — de.* C. R. 106 (1888) 934-; 107 (1888) 85-.
 Heat, mechanical theory applied to velocity of sound. *Dupré, A.* C. R. 64 (1867) 350-.
 — radiation, effect on velocity of sound. *Stokes, G. G.* Ph. Mg. 1 (1851) 305-.
 Intensity, effect on velocity. *T., M. F.* QJ. Sc. (1828) (Pt. 1) 216-.
 —. —. —. *Kayser, H.* A. Ps. C. 6 (1879) 465-.
 Longitudinal and transverse waves, velocity calculated by rate of transfer of energy. *Poynting, J. H.* [1883] Birrn. Ph. S. P. 4 (1885) 55-.
 Loud sounds. *Jacques, W. W.* Am. J. Sc. 17 (1879) 116-.
 Media at rest. *Vieille, P.* C. R. 126 (1898) 31-.
 —. —. propagation of discontinuities in. *Vieille, P.* C. R. 127 (1898) 41-.
 Modulus of elasticity of air, and velocity of sound. *Tredgold, T.* Tilloch Ph. Mg. 52 (1818) 214-.
 —. —. —. rod from musical note. *Bell, A.* Camb. and Dubl. Mth. J. 3 (1848) 63-.
 Molecular velocity of gases and velocity of sound. *Roiti, A.* [1876] Rm. R. Ac. Linc. Mm. 1 (1877) 39-.
 —. —. —. —. —. (Roiti). *Brusotti, F.* Mil. I. Lomb. Rd. 10 (1877) 209-.
 —. —. —. —. —. (Brusotti). *Roiti, A.* Rm. R. Ac. Linc. T. 1 (1877) 171-.
 Percussion. *Mach, E.* Wien Ak. Sb. 97 (1889) (Ab. 2a) 1045-; 98 (1890) (Ab. 2a) 1257-.
 —. *Oekinghaus, E.* Wien Ak. Sb. 105 (1896) (Ab. 2a) 437-.

- Plane air waves of finite velocity. *Riemann, B.* Gött. Ab. 8 (*Mth.*) (1858-59) 43-.
- and spherical waves of finite amplitude. *Burton, C. V.* L. Ps. S. P. 12 (1894) 161-; Ph. Mg. 35 (1893) 317-.
- Rankine's investigation. *Everett, J. D.* [1888] Nt. 39 (1889) 31.
- (Everett). *Lodge, O. J.* [1888] Nt. 39 (1889) 79-.
- Simple deduction. *Weyrauch, J. J.* A. Ps. C. 23 (1884) 147-.
- Sound and other vibrations. *Tillmann, S. D.* Les Mondes 8 (1865) 256-.
- Temperature effects, and Bianconi's experiments (1740). *Govi, G.* Rm. R. Ac. Linc. T. 7 (1883) 91-.
- and pressure, variation effects. *Herapath, J.* Gleanings Sc. 2 (1830) 307-.
- table (-10° to $+30^{\circ}$ R). *Benzenberg, J. F.* Gilbert A. 39 (1811) 186-.
- , variation effects. *Ivory, J.* Ph. Mg. 1 (1827) 249-.
- Temperatures, high, velocity at. *Benzenberg, J. F.* Gilbert A. 42 (1812) 1-, 12-, 30-.

THEORY.

- (Is heat set free in sound?) *Wrede, E. F.* Gilbert A. 18 (1804) 401-.
- (Theory and experiment compared.) *Precht, J. J.* Gilbert A. 21 (1805) 449-.
- Poisson, S. D.* [1807] Par. Éc. Pol. J. 14^e cah. (1808) 319-.
- Araldi, M.* Bologna Mm. I. It. 2 (1808) 311-, 431-.
- (Correction.) *La Place, P. S. (marquis) de.* A. C. 3 (1816) 238-.
- (Theory and experiment compared.) *Fischer, E. G.* Berl. Ab. (1816-17) (*Ps.*) 63-.
- (La Place's theorem.) *Tralles, J. G.* Gilbert A. 65 (1820) 43-.
- (Application of theory of elastic fluids.) *La Place, P. S. (marquis) de.* Par. S. Phlm. Bll. (1821) 161-.
- La Place, P. S. (marquis) de.* A. C. 20 (1822) 266-.
- (Specific heat of elastic fluids.) *Dulong, P. L.* [1828] Par. Mm. Ac. Sc. 10 (1831) 147-.
- (— — — — —) (*Dulong.*) *Simons, G.* Phil. Trans. (1830) 209-; Amst. N. Vh. 3 (1831) 95-.
- (Theory and experiment compared.) *Ritchie, W.* R. S. P. 3 (1837) 458.
- Joule, J. P.* Ph. Mg. 31 (1847) 114-.
- Challis, J.* Ph. Mg. 32 (1848) 276-.
- (*Challis.*) *Airy, G. B.* Ph. Mg. 32 (1848) 339-.
- (*Airy.*) *Challis, J.* Ph. Mg. 32 (1848) 494-.
- (*Challis.*) *Moon, R.* [1848] (viii) Camb. Ph. S. P. 1 (1866) 75.
- Stokes, G. G.* Ph. Mg. 33 (1848) 349-.
- Challis, J.* Ph. Mg. 34 (1849) 88-.
- (*Challis.*) *Stokes, G. G.* Ph. Mg. 34 (1849) 203-.
- (*Stokes.*) *Challis, J.* Ph. Mg. 34 (1849) 284-.
- (*Challis.*) *Stokes, G. G.* Ph. Mg. 34 (1849) 348-.

- Airy, G. B.* Ph. Mg. 34 (1849) 401-.
- (*Stokes.*) *Challis, J.* Ph. Mg. 34 (1849) 449-.
- (*Challis.*) *Stokes, G. G.* Ph. Mg. 34 (1849) 501-.
- (Solution of problem founded on atomic constitution of fluids.) *Potter, R.* Ph. Mg. 1 (1851) 101-.
- (*La Place's theory.*) *Rankine, W. J. M.* Ph. Mg. 1 (1851) 225-.
- (— — —) (*Rankine.*) *Potter, R.* Ph. Mg. 1 (*1851) 317-.
- (*Potter.*) *Haughton, S.* Ph. Mg. 1 (1851) 332-.
- Challis, J.* Ph. Mg. 1 (1851) 405-.
- (*Poisson's* investigation, *Potter's* criticism.) *Rankine, W. J. M.* Ph. Mg. 1 (1851) 410-.
- (*La Place's theory.*) *Waterston, J. J.* Ph. Mg. 16 (1858) 481-.
- (*Mathematical theory.*) *Earnshaw, S.* [1858-59] B. A. Rp. (1858) (*pt.* 2) 34-; Phil. Trans. (1860) 133-.
- Earnshaw, S.* Ph. Mg. 19 (1860) 449-; 20 (1860) 186-.
- (*La Place's correction.*) *Le Conte, (Prof.) J.* [1861] (viii) Ph. Mg. 27 (1864) 1-.
- (— — —) *Tyndall, J.* (viii) Ph. Mg. 26 (1863) 384-; 27 (1864) 41.
- Challis, J.* Ph. Mg. 27 (1864) 92-.
- (*La Place's correction.*) (*Le Conte.*) *Earnshaw, S.* Ph. Mg. 27 (1864) 98-.
- (— — —) (—) *Potter, R.* Ph. Mg. 27 (1864) 104-.
- Bosanquet, R. H. M.* Ph. Mg. 3 (1877) 271-, 343-, 418-; 4 (1877) 25-, 125-, 216-.

- Thunder. *Earnshaw, S.* B. A. Rp. (1860) (*pt.* 2) 58.
- *Montigny, C.* Brux. Ac. Bll. 9 (1860) 36-.
- , intensity and velocity. *Laurent, Albert.* Moigno Cosmos 17 (1860) 7-.

VELOCITY OF SOUND IN AIR
IN TUBES.

- Kundt, A.* Berl. Mb. (1867) 858-; A. Ps. C. 135 (1868) 337-, 527-.
- Schneebeil, H.* A. Ps. C. 136 (1869) 296-.
- Seebeck, A.* A. Ps. C. 139 (1870) 104-.
- Bourget, J.* C. R. 73 (1871) 1203-.
- Tumlirz, O.* [1879] Wien Ak. Sb. 80 (1880) (*Ab.* 2) 439-.
- Baille, J. B.* As. Fr. C. R. (1885) (*Pt.* 1) 104-; J. de Ps. 6 (1887) 493-.
- Cylindrical tubes. *Leroux, F. P.* C. R. 55 (1862) 662-; 64 (1867) 392-; A. C. 12 (1867) 345-.
- *Violle, —.* As. Fr. C. R. (1890) (*Pt.* 1) 169-.
- —, bend, acoustic value. *Leroux, F. P.* A. C. 12 (1867) 409-.
- Elastic tubes. *Korteweg, D. J.* A. Ps. C. 5 (1878) 525-.

9210 Velocities of Sound

Elastic tubes. *Lamb, H. Manch.* Lt. Ph. S. Mm. & P. 42 (1898) No. 9, 16 pp.
Narrow tubes. *Blaikley, D. J.* Ph. Mg. 7 (1879) 339-.

VELOCITY OF SOUND IN VARIOUS MEDIA.

Air, compressed. *Witkowski, A. W.* [1899] *Krk. Ak. (Mt.-Prz.) Rz.* 19 [20] (1902) 1-; *Crc. Ac. Sc. Bl.* (1899) 138-.
—, gases and vapours, for pure notes of different pitch. *Low, J. W.* Ph. Mg. 38 (1894) 249-.
—, rarefied, in tubes. *Stořetov, A. G.* Rs. Ps.-C. S. J. 18 (Ps.) (1886) 65-; *J. de Ps.* 6 (1887) 203.
Alloys. *Gerosa, G. G.* Rm. R. Ac. Linc. Rd. 4 (1888) (Sem. 1) 127-.
Bar, prismatic, elastic. *Saint Venant, Barré de.* C. R. 64 (1867) 1192-.
Chlorine. *Martini, T.* Ven. I. At. 7 (1880-81) 491-, 639-.
Ebonite. *Campanile, F.* Nap. Rd. 33 (1894) 63-.
Gases. *Stefan, J.* Pogg. A. 118 (1863) 494-.
—, *Regnault, V.* C. R. 66 (1868) 209-; *Par. Ac. Sc. Mm.* 37 (1868) 3-.
— (Regnault). *Breton, P.* Les Mondes 16 (1866) 351-.
— (—). *Radau, R.* Carl Rpm. 4 (1868) 133-.
— (—). *Rink, H. J.* [1872] *Arch. Néerl.* 8 (1873) 25-.
—, *Martini, T.* Ph. Mg. 39 (1895) 142-.
—, differences of velocity in, illustration. *Gibbes, L. R.* Am. As. P. (1850) 115-.
—, hot, velocity of waves of compression in. *Le Chatelier, H.* C. R. 131 (1900) 30-.
— and metals. *Pazienti, A.* Ven. Mm. I. 12 (1864) 447-.
—, mixed. *Dvořák, V.* (ix) *Wien Az.* 10 (1873) 186-.
— and solids, difference of velocity in, experiment. *Griveaux, F. J.* de Ps. 2 (1883) 228-.
— — — and liquids. *Masson, A.* C. R. 44 (1857) 464-; *A. C.* 53 (1858) 257-.
—, velocity of sound and molecular motion in. *Mulder, E. A.* Ps. C. 140 (1870) 288-.
—, — — in, and their molecular weight, relations. *Bender, Carl.* D. C. Gs. B. 6 (1873) 665-.
Hydrogen gas. *Leslie, John.* [1821] *Camb. Ph. S. T.* 1 (1822) 267-.
Iron. *Breguet, L., & Wertheim,* —. C. R. 32 (1851) 293-.
Liquid and solid bodies of limited dimensions. *Rankine, W. J. M.* *Camb. and Dubl. Mth. J.* 6 (1851) 238-.
Liquids. *Wertheim, G.* C. R. 27 (1848) 150-; *A. C.* 23 (1848) 434-.
—, *Potter, R.* Ph. Mg. 1 (1851) 319-.
—, *Martini, T.* Ven. I. At. (1885-86) *App.* 87 pp.
Metals, specific heat and sound velocity. *Poulsen, V. N.* Ts. Fs. K. 2 (1897) 374-; *C. Ztg.* 21 (1897) (Rpm.) 305.
Rods. *Wertheim, G.* A. C. 31 (1851) 36-.

Reflection of Sound 9220

Solids (lecture experiments). *Gezechus [Hesehus], N.* Rs. Ps.-C. S. J. 17 (Ps.) (1885) 326-; *Exner Rpm.* 23 (1887) 242-.
Vapours. *Neyreneuf, V.* A. C. 9 (1886) 535-.
—, *Gerosa, G. G., & Mai, E.* Rm. R. Ac. Linc. Rd. 4 (1888) (Sem. 1) 728-, 800-.
Water. *Langlois, M.* C. R. 102 (1886) 1451-.
— in pipes. *André, F.* C. R. 70 (1870) 568-.
— — —. *Dvořák, V.* *Wien Ak. Sb.* 70 (1874) (Ab. 2) 522-.
—, sea, velocity of vibrations of large amplitude in. *Threlfall, R., & Adair, J. F.* R. S. P. 46 (1890) 496-.
Wires, stretched, velocity of mechanical impulse in. *Meyer, S.* *Wien Ak. Sb.* 105 (1896) (Ab. 2a) 1015-.
Wood. *Kayser, H.* *Am. J. Sc.* 23 (1882) 415-.

9220 Reflection and Refraction of Sound. (See also 9040.)

(Motion of 2 elastic superposed fluids.) *Poisson, S. D.* [1823] *Par. Mm. Ac. Sc.* 10 (1831) 317-.
Green, G. [1837] *Camb. Ph. S. T.* 6 (1838) 403-.
Fischer, A., & Mach, E. *Wien Sb.* 67 (1873) (Ab. 2) 81-.
(Reflection and refraction by heated gas.) *Cottrell, J.* R. S. P. 22 (1874) 190-.

REFLECTION.

Vionnois, —. C. R. 60 (1865) 458.
Sharpe, H. J. *Mess. Mth.* 2 (1873) 159-.
Rayleigh, (Lord). Ph. Mg. 3 (1877) 458-.
and absorption by porous and pervious materials. *Tufts, F. L.* [1899] *N. Y. Ac. A.* 12 (1899-1900) 621.
— diffraction. *Seebeck, A.* *Pogg. A.* 59 (1843) 177-.
echo in church, *Girgenti, Actis, (l'abbé)* —. *Turin Mm. Ac.* 4 (1788-89) 43-.
—, depth of sea determined by. *Bonnycastle, C.* *Franklin I. J.* 24 (1839) 351-.
— and moving sound source, difference of pitch. *Richardz, F.* *N.-Vorp. Mt.* 31 (1900) 205-.
— at Muiderberg. *Buys, J. [d Dijk, P. W. L. van].* *Haarl. Vh.* 6 (1812) 123-.
— — —. *Marum, M. van.* *Haarl. Vh.* 6 (1812) 154-.
— and thunder roll. *Reis, Paul.* (xii) *Humb.* 2 (1883) 215-.
echoes, mountain, and Kent bugle. *Scoresby, (Rev.) W.* *Edinb. N. Ph. J.* 6 (1829) 371-.
by flames and heated gases. *Mayer, A. M.* *Am. J. Sc.* 8 (1874) 362-.
harmonic overtones produced by. *Oppel, J. J.* (xii) *Frkf. a. M. Ps. Vr. Jbr.* (1863-64) 70-.
method of studying. *Rood, O. N.* *Am. J. Sc.* 19 (1880) 133-.

9220 Reflection and Refraction of Sound Interference of Sound 9230

of motion of elastic fluids in pipes, and theory of wind instruments. *Poisson, S. D.* [1818-19] *Par. Ac. Sc. Mm.* 2 (1819) 305-.

multiple. *Fabri, R.* *Rm. At.* 13 (1859-60) 293-.

—, tone due to. *Baumgarten, A.* [1876] *Innsb. Nt. Md. B.* 7 (1877) (*Heft 1*) 116-.

phenomenon. *Oppel, J. J.* *Frkf. Jbr. Ps. Vr.* (1858-59) 39-.

—, *French, A.* *Nt.* 12 (1875) 46-.

—, *Högyes, E.* *Termt. Közl.* 18 (1886) 179-.

— in church at *Bex. Dufour, C.* *Laus. S. Vd. Bll.* 15 (1878) 333-.

pitch alteration in. *Oppel, J. J.* (*vi Add.*) *Frkf. Jbr. Ps. Vr.* (1853-54) 40-.

by a plane. *Abt, A.* *Exner Rpm.* 21 (1885) 503-.

polarisation by. *Wheatstone, (Sir) C. Thomson A. Ph.* 6 (1823) 87-.

—, *Kämtz, L. F.* *Schweigger J.* 42 (= *Jb.* 12) (1824) 197-.

—, *Weber, W. E.* *Schweigger J.* 46 (= *Jb.* 16) (1826) 108-.

—, *Robinson, S. W.* *Franklin I. J.* 81 (1881) 201-.

—, analogous to optical polarisation. *Macé de Lépinay, J.* *Par. S. Ps. Sé.* (1888) 327-.

reflection tones. *Oppel, J. J.* *Pogg. A.* 101 (1857) 105-; 147 (1872) 369-.

—, *Reuleaux, H.* *Bonn NH. Vr. Vh.* 41 (1884) 278-.

—, and tuning fork test. *Oppel, J. J.* (xii) *Frkf. a. M. Ps. Vr. Jbr.* (1862-63) 14-.

—, use in estimating dimensions. *Oppel, J. J.* (xii) *Frkf. a. M. Ps. Vr. Jbr.* (1860-61) 53-.

reverberant mountains, Thuringia. *Jacobs, —.* *Zach M. Cor.* 27 (1813) 418-.

sound shadow. *Lungo, C. del.* *Rv. Sc. Ind.* 29 (1897) 268.

—, visibility. *Boys, C. V.* *Nt.* 56 (1897) 173-.

— velocity by Fizeau's method for light. *Nardroff, E. R. von.* [1900] *N. Y. Ac. A.* 13 (1900-01) 494-.

sounding-board in Attercliffe Church. *Blackburn, J.* *Phil. Trans.* (1828) 361-.

in tubes. *Halsch, F.* [1886] *Wien Ak. Sb.* 94 (1887) (*Ab. 2*) 763-.

velocity of sound produced by percussion. *Mach, E.* *Wien Ak. Sb.* 97 (1889) (*Ab. 2a*) 1045-; 98 (1890) (*Ab. 2a*) 1257-.

REFRACTION.

Sondhaus, C. *Bresl. Schl. Gs. Übs.* (1851) 27-; *Pogg. A.* 85 (1852) 378-.

Hajech, C. *Mil. G. I. Lomb.* 8 (1856) 406-; *Mil. At. I. Lomb.* 1 (1858) 448-.

Taylor, W. B. *Smiths. Rp.* (1875) 205-.

Boehm, E. E., & Schellbach, K. H. *A. Ps. C.* 8 (1879) 645-.

Reis, Paul. (xii) *Humb. 2* (1883) 138-.

Neyreneuf, —. *As. Fr. C. R.* (1894) (*Pt. 2*) 352-.

by air-strata of unequal temperature. *Fizeau, H.* *C. R.* 104 (1887) 1347-.

atmospheric. *Reynolds, O.* *R. S. P.* 22 (1874) 295-, 531-.

—, *Schuster, A.* [1875] *Nt.* 13 (1876) 67.

—, *Reynolds, O.* [1876] *Phil. Trans.* 166 (1877) 315-.

—, *Kneser, A.* *A. Ps. C.* 11 (1880) 516-.

—, and total reflection, theory; and importance for navigation. *Matthiessen, L.* *Ac. Nt. C. N. Acta* 74 (1899) 457-.

audibility of sounds, and wind-refraction. *Reis, Paul.* (xii) *Humb. 2* (1883) 53-.

deflection. *Fuchs, —.* *Humb. 9* (1890) 63-.

dispersion in heterogeneous medium. *Kasterin, N.* *Rs. Ps.-C. S. J.* 30 (*Ps.*) (1898) 61-; *Amst. Ak. Vs.* 6 (1898) 460-, 532.

experiments. *Perrot, F. L., & Dussaud, F.* *Arch. Sc. Ps. Nt.* 34 (1895) 57-.

formula for. *Young, (Dr.) T.* *Bb. Brit.* 18 (1801) 354-.

method of showing and measuring. *Doppler, C.* *Wien SB.* (1849) 322-.

optics of mirage similar to. *Everett, J. D.* *Ph. Mg.* 45 (1873) 161-, 248-.

rainbow, acoustic. *Strehlike, F.* *Pogg. A.* 18 (1830) 475-.

by sensitive flames. *Gezechus [Hesehus], N. A.* *Rs. Ps.-C. S. J.* 17 (*Ps.*) (1885) 332.

and velocity of sound in sound-transparent bodies. *Gezechus [Hesehus], N.* *Rs. Ps.-C. S. J.* 22 (*Ps.*) (1890) 233-; *Exner Rpm.* 27 (1891) 471-.

by wind. *Delaroché, F.* [1813] *A. C.* 1 (1816) 176-.

—, *Haldat du Lys, C. N. A. de.* *J. de Ps.* 79 (1814) 285-.

—, *Rees, R. van.* *Quetelet Cor. Mth.* 2 (1826) 22-.

—, *Stokes, G. G.* *B. A. Rp.* (1857) (*pt. 2*) 22-.

—, *Vargiu, G. I.* *Les Mondes* 9 (1866) 95-.

—, *Barton, E. H.* [1900] *L. Ps. S. P.* 17 (1901) 534-.

9230 Interference and Diffraction of Sound. Beats.

INTERFERENCE.

Addams, R. *B. A. Rp.* (1834) (*pt. 2*) 557.

Kane, (Sir) R. J. *B. A. Rp.* (1835) (*pt. 2*) 13-.

Dove, H. W. *Pogg. A.* 44 (1838) 272; *Berl. Mb.* (1857) 291-.

Fabri, R. *Rm. At.* 12 (1858-59) 297-.

Deneke, F. [1864] *Danzig Schr.* 1 (*Heft 2*) (1865) 4 pp.

Kahl, E. *Z. Mth. Ps.* 11 (1866) 170-.

Mees, R. A. (xii) *Mbl. Nt.* 4 (1874) 77-.

Mach, E., & Mach, L. *Wien Ak. Sb.* 98 (1890) (*Ab. 2a*) 1333-.

apparatus. *Lissajous, J.* *C. R.* 40 (1855) 133-.

—, *Quincke, G.* *A. Ps. C.* 128 (1866) 177-.

—, *Stefan, J.* *Wien Sb.* 56 (1867) (*Ab. 2*) 561-.

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—, logograph. *Barlow, W. H.* *Pop. Sc. Rv.* 13 (1874) 278-; *Par. S. Ps. Sé.* (1878) 172-.

—, stenograph. *Blake, C. J.* *Am. J. Ot.* 4 (1882) 190-.

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— or telephonograph, *Poulsen's.* *Simon, H. T.* *Frk. a. M. Ps. V. Jbr.* (1899-1900) 79-.

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—, —. *Blake, C. J.* *Tel. E. J.* 7 (1878) 247-.

— and phonograph. *Bouillaud, C.* *C. R.* 87 (1878) 473-.

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- , —. *Lloyd, R. J.* Edinb. R. S. P. 22 (1900) 97-.
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- — —, lower, based on telephonic determinations. *Kovács, L., & Kertész, J. (xii) Orv. Term. Éts.* 5 (1880) (*Orv. Szak*) 125-, 169-.
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- — — (—). *Schaefer, K. L. Z. Psychol.* 21 (1899) 161-.
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- Mayer, A. M. Ph. Mg.* 48 (1874) 266-, 371-, 445-, 513-; *Am. J. Sc.* 8 (1874) 241-; 9 (1875) 267-; 12 (1876) 329-; 47 (1894) 1-, 134.
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- Brass wind instruments as resonators. *Blaikley, D. J. L. Ps. S. P.* 2 (1879) 261-; *Ph. Mg.* 6 (1878) 119-.
- Chordometer and tonometer. *Luca, P. A. de. [1827] Mod. S. It. Mm.* 20 (1828) (*Mat.*) 468-.
- Chords, constitution and relations. *Ellis, A. J. R. S. P.* 13 (1864) 392-.
- Consonance and dissonance, combination tones, etc., experiments. *Krueger, F. Ph. Stud.* 16 (1900) 307-, 568-.
- fusion of tones. *Meyer, M. Z. Psychol.* 17 (1898) 401-; 18 (1898) 274-.
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- , theory. *Preyer, W. T. Jena. Sb.* (1878) lxxvii-.
- , —, Helmholtz's. *Cross, C. R., & Goodwin, H. M. Am. Ac. P.* 27 (1893) 1-.
- , —, Tyndall's exposition. *Taylor, S. Nt.* 1 (1870) 457-.
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- — — and production of tones by separate impressions. *Seebeck, A. Pogg. A.* 63 (1844) 368-.
- — —, —, theory of siren. *Ohm, G. S. Pogg. A.* 59 (1843) 513-.
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- Harmonic causation and harmonic echoes. *Smith, Herm. Nt.* 8 (1873) 383-.
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- effects, table, etc. *Loquin, A. Bordeaux Mm. S. Sc.* 9 (1873) 297-.
- numbers ($2^a, 3^b, 5^c$), rôle in physics. *Piaron de Mondésir, É. S. Par. Ing. Civ. Mm.* (1881) (1) 276-.
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- , explanation. *Jones*, W. C. Nt. 29 (1884) 6-.
- and fundamental, simultaneous perception. *Greiss*, C. B. A. Ps. C. 138 (1869) 638-.
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- , psychophysiology. *Bonnal*, G. Rv. Sc. 11 (1899) 560-.
- , quantitative applications of laws to fundamental facts. *Mayer*, A. M. Ph. Mg. 49 (1875) 364-.
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- — vocal tones. *Hensen*, V. Z. Bl. 28 (1891) 39-, 227-.
- Intensity of sound, measurement. *Wien*, M. A. Ps. C. 36 (1889) 834-.
- Interrupted tones. *Schaefer*, K. L., & *Abraham*, O. Pflüg. Arch. Pl. 83 (1901) 207-.
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- , Helmholtz's theory, and apparatus bearing on. *Appunn*, G. (xii) Wet. Gs. Nt. B. (1863-67) 73-.
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National standard. *Loudon, J.* [1889] Cn. R. S. P. & T. 7 (1890) (Sect. 3) 11-.

Pitch in Boston, U.S.A. *Cross, C. R., & Miller, W. T.* Am. J. Ot. 2 (1880) 249-.

Vienna conference for uniform pitch. *Blaserna, P.* Rm. R. Ac. Linc. Rd. 1 (1885) 795-; 2 (1886) (Sem. 1) 71-, 307-, 421-; 3 (1887) (Sem. 2) 109-.

— — — — — *Grassi-Landi, B.* Rm. N. Linc. Mm. 2 (1887) 69-.

• TUNING-FORKS.

(See also 9110.)

Meerens, C. [1876] Gen. I. Nt. Bil. 22 (1877) 187-.

Soret, J. L. Arch. Sc. Ps. Nt. 13 (1885) 47-.

adjustment of pitch. *Reichel, C.* (xii) Z. Instk. 3 (1883) 47-.

comparison and standardising. *Grashof, —.* [1889] Karlsruhe Nt. Vr. Vh. 11 (1896) (Sb.) 34-.

French "diapason normal" and König's forks. *Ellis, A. J.* Nt. 16 (1877) 85, 227; 17 (1878) 26.

— — — — — (Ellis). *König, R.* [1877] Am. Ph. S. P. 17 (1878) 80-.

— — —, Scheibler's forks, etc. *Cavaillé-Coll, A.* Nt. 18 (1878) 381-.

— — —, —, — (Cavaillé-Coll). *Ellis, A. J.* Nt. 18 (1878) 381-.

frequency determination. *Clarke, G. S., & McLeod, H.* [1879] Phil. Trans. 171 (1880) 1-.

—, *Michelson, A. A.* Am. J. Sc. 25 (1883) 61-.

—, *Ellis, A. J.* Nt. 33 (1886) 54-.

— — —, absolute. *Oppolzer, T. (Ritter) von.* Wien Az. 23 (1886) 82-.

— — —, ancient. *Govi, G.* C. R. 51 (1860) 450-.

— — —, by Hipp's chronoscope. *Lang, V. von.* [1885] Wien Az. 22 (1885) 221-; *Exner* Rpm. 22 (1886) 129-.

— — —, and simple chronoscope. *Mayer, A. M.* Wash. Nat. Ac. Mm. 3 (Pt. 1) (1885) 45-, (Pt. 2) (1886) 167-.

9460 Absolute Pitch. Standards of Pitch.

ABSOLUTE PITCH.

Rayleigh, (Lord). [1877] Nt. 17 (1878) 12-.

Causes determining pitch. *Savart, F. A. C.* 75 (1840) 205-.

Determination, ancient. *Govi, G.* Nap. Rd. 25 (1886) 106-.

— by harmonium. *Rayleigh, (Lord).* Nt. 19 (1879) 275-.

—, history. *Schubring, —.* Z. Nw. 58 (1885) 292-.

— for note sung. *Hensen, V. von.* Arch. An. Pl. (Pl. Ab.) (1879) 155-.

—, stroboscopic. *Mach, E.* Wien Sb. 66 (1872) (Ab. 2) 267-.

—, —, by electromotor. *Obermayer, A. von.* Wien Sb. 63 (1871) (Ab. 2) 249-.

— by vibroscope. *Terquem, A. C. R.* 78 (1874) 125-.

Experiments, Scheibler's. *Muncke, G. W.* Pogg. A. 29 (1833) 381-.

Frequency, absolute, of tone, and dependence of pitch on amplitude. *Poske, F.* A. Ps. C. 152 (1874) 448-.

—, —, —, measurement. *Svanberg, A. F.* Stockh. Öfv. 6 (1849) 99-; Pogg. A. 82 (1851) 127-.

—, determination, optical, and a standard of pitch. *Chladni, E. F. F.* Gilbert A. 5 (1800) 1-.

History. *Ellis, A. J.* Nt. 21 (1880) 550-.

- frequency, temperature effect. *Clarke, G. S., & McLeod, H.* [1879] *Phil. Trans.* 171 (1880) 11-.
- , —. *Kayser, H.* *A. Ps. C.* 8 (1879) 444-.
- , —. *Mercadier, E.* *C. R.* 90 (1880) 980-.
- , —. *Pierpaoli, N.* *Rm. R. Ac. Linc. Rd.* 4 (1888) (*Sem.* 1) 714-; 5 (1889) (*Sem.* 2) 265-.
- , —, and effect of electric driving. *Shearer, J. S.* *Ps. Rv.* 1 (1894) 291-.
- König's, and electric register. *Cooley, Le R. C.* *Franklin I. J.* 74 (1877) 199-.
- standard. *König, R.* *A. Ps. C.* 9 (1880) 394-.
- , frequency. *Rayleigh, (Lord), & Sidgwick, E. M. (Mrs. H.)* [1882] *Phil. Trans.* 174 (1884) 316-.
- , —, absolute determination. *Leman, A.* *Berl. Ps. Gs. Vh.* (1890) 9-, 57-.
- , Italian. *Pierpaoli, N.* *Rm. R. Ac. Linc. Mm.* 7 (1891) 200-.
- , —, temperature coefficient for. *Pierpaoli, N.* *Rm. R. Ac. Linc. Mm.* 3 (1899) 178-.
- , at Physik.-Techn. Reichsanstalt, and absolute determination of frequency. *Leman, —.* *Z. Instk.* 10 (1890) 77-, 170-, 197-.
- , Russian, frequency. *Wild, H.* [1885] *St. Pét. Ac. Sc. Bll.* 30 (1886) 132-.
- tuning-plate as substitute for, at high pitches. *Melde, F.* *A. Ps. C.* 66 (1898) 767-.
- enharmonic, Greek. *Olio, G. dall'.* *Mod. S. It. Mm.* 10 (1803) 634-.
- , Liston's. *Farey, J.* *Tilloch Ph. Mg.* 49 (1817) 442-.
- evolution. *D., J.* *Rv. Sc.* 13 (1900) 571.
- the gekkin (Chinese musical instrument). *Du Bois, F.* *Jap. As. S. T.* 19 (1891) 369-.
- genesis. *Faa de Bruno, F.* *Les Mondes* 9 (1866) 583-.
- geometrical analogies. *Magrini, L.* *A. Sc. Lomb. Ven.* 10 (1840) 119-.
- , —. *Ritter, E.* *Gen. I. Nt. Mm.* 8 (1861-62) 43 pp.
- graphical representation, used in teaching. *Michalitschke, A.* *Lotos* 40 (1892) 11-.
- Greek music. *Münchow, K. D. von.* *Kastner Arch. Ntl.* 3 (1824) 142-.
- and harmony, mathematical theory. *Pillaut, L.* *Rv. Sc.* 35 (1885) 5-.
- , —, psychophysiological origin. *Bonnal, G.* *Rv. Sc.* 11 (1899) 560-.
- Hindoo. *Bosanquet, R. H. M.* *R. S. P.* 25 (1877) 540-; 26 (1878) 372-.
- history. *Libert, J.* *Finist. S. Sc. Bll.* 9 (1887) 22-.
- , —. *Wead, C. K.* *Smiths. Rp.* (1900) (U. S. Ms. Rp.) 417-.
- , and mediaeval organ pipes. *Wead, C. K.* *Am. As. P.* (1899) 96-.
- Hungarian, acoustically considered. *Molnár, G.* *Mth. Term. Éts.* 18 (1900) 87-.
- Japanese. *Knott, C. G.* *Jap. As. S. T.* 19 (1891) 373-.
- modern. *Goodwin, H.* [1867] *Camb. Ph. S. P.* 2 (1876) 64-.
- musical modes, number. *Delezenne, —.* *Lille Tr.* (1826-27) 57-.
- notation. *Loquin, A.* *Bordeaux Mm. S. Sc.* 8 (1870) lxviii-.
- , —, new. *Patterson, R.* [1788] *Am. Ph. S. T.* 3 (1793) 139-.
- , —. *Baudrimont, A.* *Bordeaux Mm. S. Sc.* 8 (1870) xciv-.
- , —. *Tillmann, S. D.* *Am. As. P.* 19 (1870) 70-.
- natural laws of music. *Ettingshausen, A. von.* *Wien SB.* 12 (1854) 464-.
- and tempered, comparison. *Loeb, M.* *Am. As. P.* (1894) 111.
- new, Antolik's. *Kacsóh, P.* *Orv.-Term. Éts. (Term. Szak)* (1894) 284-.
- non-harmonic, tonometry. *Ellis, A. J., & Hipkins, A. J.* *R. S. P.* 37 (1884) 368-.

9470 Scales. Temperament.

SCALES.

- Munck af Rosenschöld, P. S.* *Stockh. Öfv.* 5 (1848) 207-.
- Delezenne, —.* *Lille Mm. S.* (1855) 180-.
- Herschel, (Sir) J. F. W.* *QJ. Sc.* 5 (1868) 338-.
- Pfaundler, L.* *Steierm. Mt.* (1895) xlvi-.
- accidentals of given. *Lefebvre, P.* *C. R.* 114 (1892) 538-.
- anharmonic. *Polignac, E. de.* *C. R.* 118 (1894) 1412.
- Arabian. *Wead, C. K.* *Am. As. P.* (1899) 96.
- and chords, origin. *D., J.* *Rv. Sc.* 11 (1899) 694-.
- , —, theory. *Vincent, A. J. H.* *C. R.* 41 (1855) 808-, 1116-, 1206-.
- continuous series of tones. *Bezold, F.* [1893] *Z. Ohrh.* 25 (1894) 66-.
- diatonic. *Wildt, F. C. D.* *Oken Isis* (1833) 559-.
- , analysis. *W., C. J. (jun.)* *Franklin I. J.* 43 (1862) 175-, 232-.
- , double, and enharmonic keyboard. *Poole, H. W.* *Am. J. Sc.* 44 (1867) 1-.
- , genesis, etc. *Boutroux, L.* *Rv. Sc.* 13 (1900) 289-, 326-, 359-.
- , theory. *Beltrami, E.* *Mil. I. Lomb. Rd.* 15 (1882) 61-.
- enharmonic. *Bertha, A. de.* *C. R.* 118 (1894) 1137-; 119 (1894) 56.
- Delezenne, —.* *Lille Tr.* (1826-27) 1-.
- Chamousset, —.* (vi *Adds.*) *Majocchi A. Fis. C.* 24 (1846) 106-; (v) *At. Sc. It.* (1847) 264-.
- Györy, S.* (xii) *Mag. Ak. Éts.* (1853) 203-.
- Berthaud, —.* [1867] (xii) *Doubs S. Mm.* 3 (1868) 41-.
- Matzka, W.* *Prag Ab.* 11 (1882) (*Mth.*) (No. 7) 31 pp.
- Thomson, J. H.* *Dubl. S. Sc. P.* 4 (1885) 152-.
- calculation. *Györy, S.* (xii) *Mag. Ak. Éts.* (1856) 217-; (1857) 28-.

- calculation. *Schubring, G.* Halle Z. Nw. 27 (1866) 485-; Z. Mth. Ps. 13 (1868) (Suppl.) 105-.
- *Matzka, W.* Prag Ab. 2 (1888) No. 6, 19 pp.
- *Berdellé, C.* As. Fr. C. R. (1897) (Pt. 2) 198-.
- of chromatic scale. *Delbœuf, J.* Brux. Ac. Bll. 21 (1866) 339-.
- by dividing fundamental by 8 and 9. *Hirzel, H.* Am. As. P. (1850) 376-.
- intervals, chromatic (as sung). *Bidault, —.* C. R. 80 (1875) 1599-.
- , diatonic, and consonances. *Schlegel, V.* Z. Mth. Ps. 18 (1873) 203-.
- , logarithmic. *Munck af Rosenschöld, P. S.* Lund Phys. Sällsk. Ts. 1 (1837) 19-.
- sharps and flats, rule for values. *Girault, —.* Rouen Tr. Ac. (1850-51) 69-.
- origin. *Wallasehek, R.* Wien Ak. Sb. 108 (1899) (Ab. 2a) 905-.
- pentatonic, etc., in Scottish music. *Neaves, —.* [1871] Edinb. R. S. P. 7 (1872) 382-.
- perfect, on fixed-tone instruments. *Ellis, A. J.* R. S. P. 13 (1864) 93-.
- and prismatic spectrum. *Huston, D.* Thomson A. Ph. 4 (1814) 254-.
- Pythagorean Comma. *Zoch, I. B.* Carl Rpm. 18 (1882) 748-.
- Ré. *Delezenne, —.* Lille Mm. S. (1851) 1-.
- *Herlin, T.* (xii) Lille S. Mm. 5 (1868) 385-.
- and teaching of physics. *Mathias, —.* Toul. Ac. Sc. Bll. 1 (1898) 254-.
- tempered, chemical analogies. *Doolittle, M. H.* Smiths. Misc. Col. 33 (1888) Art. 2, 27-.
- (Wash. Ph. S. Bll. 7 (1885).)
- theoretical. *Chicandard, G.* As. Fr. C. R. (1891) (Pt. 2) 301-.
- deduction. *Chicandard, G.* As. Fr. C. R. (1897) (Pt. 2) 248-.
- theory. *Vincent, A. J. H.* Par. S. Phlm. PV. (1838) 89-, 101-.
- *Ritter, Élie.* Arch. Sc. Ps. Nt. 26 (1866) 68-.
- *Rozé, C.* Les Mondes 10 (1866) 705-.
- *Robin, P.* Par. S. Ps. Sé. (1886) 15-.
- and calculation. *Schubring, G.* Halle Z. Nw. 32 (1868) 65-, 415-.
- , geometric. *Michel, C.* Les Mondes 10 (1866) 564-; 11 (1866) 54-.
- tone system, new. *Munck af Rosenschöld, P. S.* Stockh. Ak. Hndl. (1847) 1-.
- transposing dial. *Henry, L. d'.* [1861] (xii) Lille S. Mm. 9 (1863) 183-.
- transposition of music. *Delezenne, —.* Lille Mm. S. (1853) 24-.

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- Fisher, A. M.* Silliman J. 1 (1818) 9-, 176-.
- Hansteen, C.* Mg. Ntvd. 8 (1828) 45-.
- Helmholtz, H.* Heidel. Vh. Nt. Md. (1859-60) 73-.
- Derffel, J.* A. Ps. C. 134 (1868) 298-.
- Bosanquet, R. H. M.* Ph. Mg. 48 (1874) 507-; 50 (1875) 164-.

- Equal temperament. *Farey, J.* Tilloch Ph. Mg. 28 (1807) 65-; 49 (1817) 360-.
- *Clarke, C. B.* Nt. 27 (1883) 240.
- *Cross, C. R.* Am. Ac. P. 21 (1886) 499-.
- , and effect of key. *Stoney, G. J.* Dublin. S. Sc. P. 4 (1885) 59-.
- , major and minor modes in. *Ricard, F.* C. R. 90 (1880) 1547-.
- Instrument for control of tuning other than equitempered. *Bosanquet, R. H. M.* R. S. P. 21 (1873) 131-.
- Instruments with fixed tones. *Ellis, A. J.* R. S. P. 13 (1864) 404-.
- , keyed. *Hawkes, W.* Tilloch Ph. Mg. 28 (1807) 304-.
- Intonation, improvements. *Ellis, A. J.* Nt. 15 (1877) 475-.
- , just. *Bosanquet, R. H. M.* R. S. P. 21 (1873) 131-.
- , —. *Clarke, (Col.) A. R.* Nt. 15 (1877) 159-, 253, 353-.
- , —. *Chappell, W.* Nt. 15 (1877) 196-, 291-, 430.
- , —. *Poole, H. W.* Am. J. Sc. 15 (1878) 359-.
- , —, in instruments with fixed tones. *Ellis, A. J.* [1874] R. S. P. 23 (1875) 3-.
- , perfect. *Poole, H. W.* Silliman J. 9 (1850) 68-, 199-.
- and temperament. *Holton, J. F.* N. Y. A. Lyceum 4 (1840) 505-.
- , true, illustrated by voice-harmonium. *Brown, C. B. A. Rp.* (1876) (Sect.) 46-.
- Monochord with spiral bridges for representation of all intervals. *Michalitschke, A.* Lotos 42 (1894) 33-.
- Musical intervals, measurement on spiral projection. *Tillmann, S. D.* Am. As. P. 16 (1867) 27-.
- Piano system of constant harmony. *Laborde, —.* Par. Bll. S. Encour. 50 (1851) 146-.
- Pitch determination and temperament. *Drobisch, M. W.* [1852] Leip. Ab. Mth. Ps. 2 (1855) 1-; 3 (1857) 1-.
- and temperament. *Schubring, G.* Halle Z. Nw. 38 (1871) 258-.
- —. *Drobisch, M. W.* Leip. Mth. Ps. B. 29 (1877) 1-.
- Scientific determination. *Drobisch, M. W.* Pogg. A. 90 (1853) 353-.
- Sonometer, equable, experiments with. *Astolfi, (Prof.) O.* Rm. At. N. Linc. 24 (1871) 287-.
- , organ pipe. *Stevens, W. Le C.* Franklin I. J. 84 (1882) 34-.
- for tuning instruments with fixed tones. *Magrini, L.* Mil. At. I. Lomb. 1 (1858) 386-.
- Systems. *Bosanquet, R. H. M.* [1874] R. S. P. 23 (1875) 390-.
- Tagliavini's doctrine. *Schiassi, P.* Bologna N. Cm. 2 (1836) 20-.
- Theorems. *Farey, J.* Tilloch Ph. Mg. 36 (1810) 39-, 374-; 38 (1811) 434-.
- Tonometry, new system. *Luca, P. A. de.* [1842] Nap. At. Ac. 5 (1843) (pte. 2) 323-.
- Tuning, Armellino's method. *Györy, S.* (xii) Mag. Ak. Éts. (1859) (Suppl., Mth. Term.) 136-.

- Tuning, experiment, explanation. *Merrick, A.* Tilloch Ph. Mg. 37 (1811) 358-.
- guitar without use of ear. *Bary, É. L'I.* 3 (1835) 167-.
- instruments with fixed tones. *Stanhope, C. (Earl of).* Tilloch Ph. Mg. 25 (1806) 291-.
- — — — — *Farey, J.* Tilloch Ph. Mg. 26 (1806) 171-.
- — — — — (Stanhope). *Farey, J.* Tilloch Ph. Mg. 27 (1807) 191-; 28 (1807) 140-.
- — — — — *Farey, J.* Tilloch Ph. Mg. 27 (1807) 313-.
- — — — — (Farey). *Stanhope, C. (Earl of).* Tilloch Ph. Mg. 28 (1807) 143-.
- — — — — *Farey, J.* Tilloch Ph. Mg. 29 (1807) 345-; 30 (1808) 3-.
- — — — — (Callcott's pamphlet) (Farey). *Stanhope, C. (Earl of).* Tilloch Ph. Mg. 30 (1808) 34-.
- — — — — (Stanhope). *Farey, J.* Tilloch Ph. Mg. 33 (1809) 292-.
- Kirnberger's and isotonic systems, table of beats in. *Smyth, C. J.* Tilloch Ph. Mg. 35 (1810) 448-; 36 (1810) 435-.
- — — — — (Smyth). *Merrick, A.* Tilloch Ph. Mg. 37 (1811) 111-.
- Fluids, acoustic phenomena in. *Kayser, R.* [1899-1900] Z. Ohrh. 37 (1900) 217-.
- Fusion of sounds. *Bolton, T. L.* Am. J. Psychol. 5 (1893) 294-.
- Intensity, recognition of differences in. *Angell, F.* Ph. Stud. 7 (1892) 414-.
- Perception of direction of sound source. *Gough, J.* [1801] Manch. Ph. S. Mm. 5 (1802) 622-.
- — — — — *Purkyně, J. E.* (viii) D. Nf. B. 37 (1862) 222-.
- — — — — *Rayleigh, (Lord).* Nt. 14 (1876) 32-; Ph. Mg. 3 (1877) 456-.
- — — — — *Gray, A. A.* Edinb. R. S. P. 21 (1897) 443-.
- — — — — sounds. *Dowden, R.* NH. Rv. 2 (1855) (P.) 29-.
- — — — — *Brücke, E.* [1884] Wien Ak. Sb. 90 (1885) (Ab. 3) 199-.
- — — — — *Hensen, V.* Arch. Ohrh. 23 (1886) 69-.
- — — — — *Kessel, —.* D. Nf. Tbl. (1887) 330.
- — — — — *Le Conte, J.* Science 10 (1887) 312.
- — — — — (theory). *Hermann, —.* Königsb. Schr. 35 (1895) [3]-.
- — — — — *Dennert, H.* Arch. Ohrh. 41 (1896) 109-.
- — — — — (very short). *Abraham, O., & Brühl, L. J.* Z. Psychol. 18 (1898) 177-.
- — — — — of least intensity, peculiarity. *Urbantschitsch, V.* (xii) Öb. Md. Ws. 13 (1875) 625-.
- Physics and aesthetics, inter-relationships. *Soret, J. L.* Sch. Nf. Gs. Vh. (1885-86) 1-.
- Pitch, influence of intensity on. *Broca, A.* C. R. 124 (1897) 1512-; Par. S. Bl. Mm. 49 (1897) (C. R.) 652-.
- — — — — *Bonnier, P.* Par. S. Bl. Mm. 49 (1897) (C. R.) 678-.
- — — — — variation, least perceptible. *Scripture, E. W.* Am. J. Psychol. 4 (1892) 579-.
- — — — — perception. *Stern, L. W.* Z. Psychol. 11 (1896) 1-; 21 (1899) 360-; 22 (1900) 1-.
- — — — — sensibility to. *Luft, E.* Ph. Stud. 4 (1888) 511-.
- — — — — small. *Meyer, M.* Z. Psychol. 16 (1898) 352-.
- Sensation of musical intervals. *Schischmanow, I.* Ph. Stud. 5 (1889) 558-.
- — — — — *Stumpf, C.* Z. Psychol. 1 (1890) 419-; 2 (1891) 266-, 426, 438-.
- — — — — *Engel, G.* Z. Psychol. 2 (1891) 361-.
- — — — — *Lorenz, C.* Ph. Stud. 6 (1891) 26-.
- — — — — (Stumpf). *Wundt, W.* Ph. Stud. 6 (1891) 605-; 7 (1892) 298-, 633-.
- Sensations of tone. *Müller, J. J.* Leip. Arb. Pl. Anst. (1871) 1-.
- — — — — analysis. *Mach, E.* Wien Ak. Sb. 92 (1886) (Ab. 2) 1283-.
- — — — — fusion. *Buch, E.* Ph. Stud. 15 (1900) 1-, 183-.
- — — — — Helmholtz's theory. *Moos, S.* Virch. Arch. 31 (1864) 125-.
- Similar simultaneous note on various instruments, intensity of sensation. *Kool, C. J.* Laus. S. Vd. Bl. 31 (1895) xxiii-.

PHYSIOLOGICAL ACOUSTICS.

(See also Physiology 2753, 4141, 3500-3590.)

9500 General.

(See also 9430.)

- Mayer, A. M.* Ph. Mg. 48 (1874) 266-, 371-, 445-, 513-; Am. J. Sc. 8 (1874) 241-; 9 (1875) 267-; 12 (1876) 329-; 47 (1894) 1-, 134.
- Audition, experiments. *Wheatstone, (Sir) C.* Q. J. Sc. (1827) (Pt. 2) 67-.
- Auditory acuity. *Levy, —.* D. Nf. Vh. (1893) (Th. 2, Hälfte 2) 251-.
- — — — — *Gellé, —.* Par. S. Bl. Mm. 46 (1894) (C. R.) 70-.
- — — — — instruments to test. *Bezold, —.* [1890] Z. Ohrh. 21 (1891) 121-.
- — — — — measurement. *Knapp, —.* D. Nf. Tbl. (1885) 311-.
- — — — — (Knapp). *Bezold, —.* D. Nf. Tbl. (1885) 312-.
- — — — — testing. *Thomson, W.* Am. As. P. (1884) 120-.
- — — — — tuning fork tests. *Barth, A.* Z. Ohrh. 17 (1887) 105-; Arch. Ot. 16 (1887) 248-.
- — — — — *Schmiegelow, E.* Arch. Ohrh. 47 (1899) 164-.
- — — — — (Schmiegelow). *Bezold, —, & Edelmann, —.* Arch. Ohrh. 49 (1900) 8-.
- — — — — (Bezold & Edelmann). *Schmiegelow, E.* Arch. Ohrh. 50 (1900) 32-.
- Constant blast for acoustic purposes. *Scripture, E. W.* Am. J. Psychol. 4 (1892) 582-.
- Development of physiological acoustics. *Hoh, T.* (xii) Bamb. Nf. Gs. B. (11) (1876) (Pt. 2, No. 1) 109 pp.

9510 Action of the Vocal Organs

- Telephone, acumatic use. *Preyer, W. T.* Jena. Sb. (1879) 45-.
- Train in motion, effect of speed on sound produced within it. *Cauderay, H.* Laus. Bll. S. Vd. 8 (1864-65) 349-.
- (Cauderay).
Dufour, L. [1865] Laus. Bll. S. Vd. 9 (1866-68) 98.
- Tuning fork, apparatus to record vibrations, and to measure hearing. *Bezold, F., & Edelmann, —.* Arch. Ohrh. 45 (1898) 109-; Z. Ohrh. 33 (1898) 174-.

9510 Arrangement and Action of the Vocal Organs.

(See 9420.)

- Articulation and the logograph. *Barlow, W. H.* [1878] *Dubl. S. Sc. P.* 2 (1880) 153-.
- , measurement. *Lloyd, R. J.* Lpool. Lt. Ph. S. P. 45 (1891) 139-.
- Glottis, superior lips, rôle in voice emission. *Cagniard-Latour, C.* Par. S. Phlm. PV. (1837) 86-.
- Larynx, mechanism. *Willis, (Prof.) R.* [1829] Camb. Ph. S. T. 4 (1833) 323-.
- Membranes, vibrating, and vocal organs. *Müller, C.* Marb. Schr. 11 (Ab. 2) (1877) 99-.
- Mouth-cavity, resonance. *Auerbach, F. A.* Ps. C. 3 (1878) 152-.
- Phonetic transcription, Brücke's method. *Preyer, W. T.* (viii) Oestr. Wschr. 2 (1863) 193-.
- Phonetics. *Latham, R. G.* Ph. Mg. 18 (1841) 124-.
- , *Lenz, R.* Santiago de Chile Un. A. 81 (1892) 901-; 82 (1892) 837-; 85 (1893) 231-.
- , Brücke's system. *Kudelka, J.* Wien SB. 28 (1858) 3-.
- , — (Kudelka). *Brücke, E.* Wien SB. 28 (1858) 63-.
- Photography of human organs of speech. *Beregszászy, J.* Wien Pht. Cor. 23 (1886) 364-.
- , —, —, —, —, *Stein, S. T.* Wien Pht. Cor. 23 (1886) 461-.
- Trachea, air pressure in. *Cagniard-Latour, C.* C. R. 4 (1837) 201-.
- Voice, mechanism. *Savart, F. A. C.* 30 (1825) 64-.
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- and photographs of vocal chords in action. *Muckey, F. S., & Hallock, W.* Science 2 (1895) 352.

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- Vowels and hearing. *Hermann, —.* Königsb. Schr. 31 (1891) (Sb.) 27-; 32 (1891) (Sb.) 15-.
- , method of production. *Quanten, E. von.* Helsingb. Öfv. 33 (1891) 1-; Fsehr. Ps. (1891) (Ab. 1) 408-.
- , theory of formation. *Marage, R.* Par. S. Ps. Sé. (1900) 109-.

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- Audibility of single sound waves. *Herroun, E. F., & Yeo, G. F.* R. S. P. 50 (1892) 318-.

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- binaural. *Newton, J.* Lpool. Md. Chir. J. 2 (1858) 54-.
- , *Le Roux, F. P.* C. R. 80 (1875) 1073-.
- , *Thompson, S. P.* Ph. Mg. 4 (1877) 274-; 6 (1878) 383-; 12 (1881) 351-; As. Fr. C. R. (1878) 328-.
- (theory). *Steinhauser, A.* Ph. Mg. 7 (1879) 181-, 261-.
- , *Bell, A. G.* Am. J. Ot. 2 (1880) 169-.
- , *Bloch, E.* Z. Ohrh. 24 (1893) 25-; Arch. Ot. 24 (1895) 166-.
- , and binocular vision. *Dove, H. W.* Berl. B. (1841) 251-.
- , — direction of sound. *Pinto, L.* [1881] (xii) Nap. Ac. Pont. At. 15 (1883) (Pt. 1) 1-.
- mechanism. *Larroque, F.* C. R. 130 (1900) 119-, 359-.
- in pigeons deprived of ear labyrinth. *Wundt, W.* Ph. Stud. 9 (1894) 496-.
- , —, —, —, *Bernstein, J.* Pflüg. Arch. Pl. 61 (1895) 113-.
- , —, —, —, *Wundt, W.* Pflüg. Arch. Pl. 61 (1895) 339-.
- , —, —, —, *Kuttner, A.* Pflüg. Arch. Pl. 64 (1896) 249-.
- theories, criticism. *Bonnier, P.* Par. S. Bl. Mm. 48 (1896) (C. R.) 704-.
- theory (and vibrations of membranes). *Laroque, F.* Toul. Mm. Ac. 2 (1864) 444-.
- , *Beckmann, —.* Arch. Ohrh. 45 (1898) 112-.
- , *Kuile, E. ter.* Pflüg. Arch. Pl. 79 (1900) 146-, 484-.
- , *Helmholtz's.* *Bonnier, P.* Par. S. Bl. Mm. 52 (1900) (C. R.) 302-.
- , —, refutation. *Bonnier, P.* Bll. Sc. Fr. Blg. 25 (1893) 367-.
- , *ter Kuile's.* *Meyer, M.* Pflüg. Arch. Pl. 81 (1900) 61-.
- , new. *Rutherford, W. J.* An. Pl. 21 (1887) 166-.
- , —, *Hurst, C. H.* [1894] Lpool. Bl. S. P. & T. 9 (1895) 321-.
- , —, *Ewald, J. R.* Pflüg. Arch. Pl. 76 (1899) 147-.
- , —, *Ewald's,* physical fundamental principles. *Meyer, M.* Pflüg. Arch. Pl. 78 (1899) 346-.
- uniaural. *Gelle, —.* Par. S. Bl. Mm. 34 (*1882) (C. R.) 667-.

- Auditory nerve, direct excitability by sound. *Wundt, W.* Ph. Stud. 8 (1893) 641-.
- perception, theory. *Exner, S.* Pflüg. Arch. Pl. 13 (1876) 228-.
- Colours and sounds, sight and hearing. *Maggi, P. G.* Verona Mm. Ac. Ag. 23 (1849) 345-.
- Electric excitation of ear. *Wreden, —.* D. Nf. Tbl. (*1873) 173-.
- Functions of ear. *Meyer, M.* Berl. Ps. Gs. Vh. (1898) 49-.
- — — in music. *Fétis, F.* Brux. Ac. Bll. 16 (1849) 396-.
- Intensity fluctuations of just perceptible optic and acoustic impressions. *Heinrich, W.* [1898] Krk. Ak. (Mt.-Prz.) Rz. 16 (1899) 214-; Cre. Ac. Sc. Bll. (1898) 363-.
- Perception of compound tones. *Larroque, F.* C. R. 131 (1900) 33-.
- — musical tone. *McKendrick, J. G.* [1874-99] Edinb. R. S. P. 8 (1875) 342-; Nt. 60 (1899) 163-.
- — sound, fatigue of accommodation. *Gellé, —.* Par. S. Bl. Mm. 38 (1886) (C. R.) 52-.
- Perception of sound, and physiological state of ear. *Tessan, — de.* Par. S. Phlm. PV. (1849) 34-.
- — —, and structure of ear. *Moon, R.* Ph. Mg. 38 (1869) 118-, 369-; 39 (1870) 248-.
- — —, — vowels. *Hermann, —.* Königsb. Schr. 31 (1891) (Sb.) 27-; 32 (1891) (Sb.) 15-.
- Physical investigation of ear. *Lucae, A.* [1867] Berl. Vh. Md. Gs. (1871) 1-.
- Pseudophone. *Thompson, S. P.* Ph. Mg. 8 (1879) 385-.
- “Singing” in ears, tone. *Oppel, J. J.* A. Ps. C. 144 (1872) 476-.
- Sound conducting apparatus in human ear, microphonic studies. *Mader, L.* Wien Ak. Sb. 109 (1900) (Ab. 3) 37-; Cg. Int. Md. C. R. (1900) (Vol. 13, Otol.) 25-.
- Theory of ear. *Mach, E.* Wien SB. 48 (Ab. 2) (1863) 283-.
- Tympanum, effect of exhaustion and inflation in deadening sound. *Moon, R.* [1871] Camb. Ph. S. P. 2 (1876) 217-.
- and external ear, use. *Savart, F.* [1822] A. C. 26 (1824) 5-.

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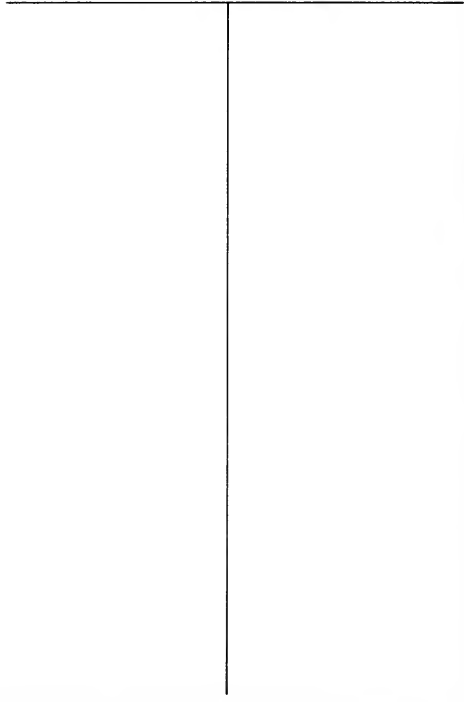
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