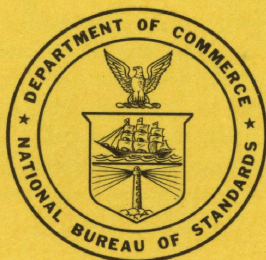


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NBS MONOGRAPH 35

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# Bibliography and Index on Vacuum and Low Pressure Measurement



U.S. DEPARTMENT OF COMMERCE  
NATIONAL BUREAU OF STANDARDS

# THE NATIONAL BUREAU OF STANDARDS

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The functions of the National Bureau of Standards are set forth in the Act of Congress, March 3, 1901, as amended by Congress in Public Law 619, 1950. These include the development and maintenance of the national standards of measurement and the provision of means and methods for making measurements consistent with these standards; the determination of physical constants and properties of materials; the development of methods and instruments for testing materials, devices, and structures; advisory services to government agencies on scientific and technical problems; invention and development of devices to serve special needs of the Government; and the development of standard practices, codes and specifications. The work includes basic and applied research, development, engineering, instrumentation, testing, evaluation, calibration services, and various consultation and information services. Research projects are also performed for other government agencies when the work relates to and supplements the basic program of the Bureau or when the Bureau's unique competence is required. The scope of activities is suggested by the listing of divisions and sections on the inside of the back cover.

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Errata to Accompany National Bureau of Standards Monograph 35,  
Bibliography and Index on Vacuum and Low Pressure Measurements  
By W. G. Brombacher

Page	Column	Line	Now reads in part	Should read
7 ✓	2	3407	(1934)	(1937)
10 ✓	2	4102	Higginbotham	Higinbotham
24 ✓	1	5378	Dobke	Dobbe
26 ✓	2	5484	in vacuum.	in vacuum tubes.
43 ✓	1	5979	K G Muller	K G Mueller
53 ✓	1	-	Dobke	Dobbe
53 ✓	2	-	Ehlbeck 6010	Ehlbeck 6019
54 ✓	2	-	Gote	Goto
55 ✓	2	-	Higginbotham	Higinbotham
56 ✓	2	-	Knutsishvili	Khutsishvili
58 ✓	2	-	Moench	delete
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58 ✓	2	-	Muller	Mueller K G
59 ✓	2	-	Ramaswamy 3312	Ramaswamy 3212
60 ✓	2	-	Schmidt W 50139	Schmidt W 60139
60 ✓	2	-	Schneiderreit 50117	Schneiderreit 60117
64 ✓	1	20	Adsorption	Absorption
66 ✓	2	48-49	Insert	Pump oils, rate of 5754
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<del>67</del>	1	30-31	Insert	Rate 5754
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<del>85</del>	1	8	Design 5448	Design 5121 5448
<del>85</del>	2	28	Flat closure 2801	Flat closure <sup>2801</sup> 4615
<del>85</del>	2	46	(Vacustope)	(Vacustat)
<del>85</del>	2	49	Oil type 5819	Oil type 4301 5819
<del>85</del>	2	64	Capillary pressure	capillary measures pressure
<del>86</del>	1	11	Boyles low	Boyles law
<del>86</del>	1	13	Condensable gases B391	Condensable gases B491
<del>95</del>	1	20	Tritium 5818	Tritium 58118

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 April 28, 1964

UNITED STATES DEPARTMENT OF COMMERCE • Luther H. Hodges, *Secretary*  
NATIONAL BUREAU OF STANDARDS • A. V. Astin, *Director*

# Bibliography and Index on Vacuum and Low Pressure Measurement

W. G. Brombacher



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## Foreword

Preparation of this bibliography and index on vacuum and low pressure was undertaken to fill the need of scientists, engineers, and other users for sources of information. It was originally planned to include a critical review of vacuum and low pressure measurement with the bibliography. In order to avoid undue delay in the publication of the bibliography it was found advisable to omit the review which, however, will be prepared for separate publication.

This bibliography was prepared as part of the work on vacuum standards which is now in progress in the Mechanics Division under the supervision of D. P. Johnson, Chief of the Pressure and Vacuum Section.

A. V. Astin, Director,

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## BIBLIOGRAPHY AND INDEX ON VACUUM AND LOW PRESSURE MEASUREMENT

W. G. Brombacher

The bibliography contains 1538 references, of which 52 are on books. About 550 of the periodical references are specifically on pressure measurement including both vacuum gages and micromanometers. The balance are on vacuum technology, including adsorption, degassing, vacuum pumps, controlled gas leaks, valves, seals and vacuum systems, all of which bear on the technique of vacuum measurement. The indices consist of an author index and an index of the subject matter of the listed references.

### 1. INTRODUCTION

Vacuum technology has been advancing at a rapidly accelerating rate during the past few years in response to the needs of science and industry. To meet the need for means of locating technical information, abstracts of current literature on vacuum technology are available in a number of the publications. Notable among those specifically on vacuum technology are: a) Vacuum (since 1951), The international journal and abstracting service for vacuum science and technology. Pergamon Press, London. b) Le Vide (since 1946), Société Française des Ingénieurs des Techniciens du Vide, Paris, France. Other abstract journals or publications containing a significant number of abstracts on vacuum measurement include c) Physical abstracts, Section A of Science abstracts, Institution of Electrical Engineers, London. d) Chemical abstracts, American Chemical Society, Columbus, Ohio. e) Engineering index, Engineering Societies, New York. f) Physikalische Berichte, Deutsche Gesellschaft für technische Physik, Braunschweig.

Excellent surveys of vacuum measurement are given in Dushman's "Scientific foundations of vacuum technique" (1949) and in Leck's "Pressure measurement in vacuum systems" (1957) but the references are incomplete and do not include the flood of papers published since. The preparation of an up-to-date bibliography, undertaken here, appears to fill a need for a source of readily available information. This paper consists essentially of a) a bibliography, b) an author index, and c) an index of the subject matter of the bibliography. While the primary objective is to focus on vacuum measurement, it was believed essential to include in the bibliography articles on vacuum technology in some measure accessory or essential to vacuum measurement. For maximum usefulness, an index of the subject matter of the references has been prepared. The abstract publications listed in the previous paragraph have been freely drawn upon in preparing the bibliography.

Neither surveys nor bibliographies appear to be available on micromanometers, covering absolute pressure measurements just above the high vacuum range or on sensitive, small differential pressure

measurement. This instrumentation is of interest principally to workers in scientific and industrial laboratories. References to micromanometers are listed in the bibliography and are indexed similarly as described in the preceding paragraph.

It was originally planned to include a critical review of vacuum and low pressure instrumentation with emphasis on possible standard instruments and on calibration methods. Preparing and including this review would delay publication unduly. Since the bibliography and indices will adequately meet the needs of many of those interested in the field, it was decided to issue the bibliography as promptly as possible. The review will be prepared and issued separately.

Standard vacuum terminology has been proposed by the American Vacuum Society [58148] and the British Standards Institution [58104]. In the subject index the American proposed classification of degrees of high vacuum has been adhered to. This is

Condition	Pressure range, Torr
High vacuum	$10^{-3}$ to $10^{-6}$
Very high vacuum	$10^{-6}$ to $10^{-9}$
Ultra-high vacuum	$10^{-9}$ and below

The Torr equals 1/760 of an atmosphere of pressure (1013.250 millibars) or at pressures in the vacuum range, one millimeter of mercury for all practical purposes.

The term micromanometers is rather generally used to designate designs of liquid or mechanical type pressure measuring instruments which are an order more sensitive than designs considered more or less standard. More specifically, micromanometers may be defined as instruments of the liquid or mechanical type used to measure absolute or differential pressure in the range from about  $10^{-4}$  to 10 mm of mercury, with the ability to detect pressure changes of less than about 0.01 mm of mercury. It also includes water or oil manometers used to measure differential pressure, with a pressure change of less than about 0.01 inch of water detectable.

## 2. BIBLIOGRAPHY

The references are divided into a list of books and a list of papers and reports, all listed chronologically, by years. Books are designated by the letter "B" followed by two digits indicating the year of publication and by a single digit identifying the order of listing. For example B592 indicates a book published in 1959, listed second in the book list. Papers and reports are designated by four digits or five, where necessary, the first two indicating the year of publication or issue, and the last two or three the order of listing. Thus 58122 indicates 122d in the list for 1958.

The bibliography contains 1538 references, of which 52 are books. About 550 of the periodical references are specifically on pressure measurement. The period covered is up to January 1, 1961.

A reasonable effort was made to list all significant references on vacuum and low pressure instrumentation, particularly those published since 1949. Extensive, but not necessarily complete,

references to vacuum technology and phenomena were included, since making valid vacuum measurements involve the effect of such phenomena as adsorption, degassing etc. References are therefore included on adsorption, degassing, outgassing, surface reaction, mechanical and diffusion pumps, leak detection, controlled gas leaks, and on hardware such as seals, valves, gaskets and vacuum systems. References on methods of calibrating vacuum gages and on standards of measurement are also listed.

Papers on micromanometers, both liquid and mechanical types, are listed. The criterion for inclusion of those measuring absolute or differential pressure is stated in the Introduction.

With minor exceptions neither catalogs, nor announcements in trade journals of new instruments without technical data, nor patents, are listed. Papers covering applications of vacuum technology are of necessity omitted, unless of some significance in vacuum measurement.

### BOOKS

- |      |   |      |  |
|------|---|------|--|
| B241 | J. R. Panell, Fluid velocity and pressure. Edward Arnold & Co., London, 135 p. (1924).  | B472 | R. M. Barrer, Diffusion in and through solids. Cambridge Univ. Press, London, 464 p. (1947).   |
| B261 | L. Dunoyer, Vacuum practice. Translation by J. H. Smith, D. Van Nostrand Co., New York, 228 p. (1926).                                | B473 | L. H. Martin & R. D. Hill, A manual of vacuum practice. Melbourne Univ. Press, 120 p. (1947).  |
| B321 | J. W. McBain, The sorption of gases and vapors by solids. E. Routledge & Sons, London, 577 p. (1932).                                 | B491 | S. Dushman, Scientific foundations of vacuum technique. John Wiley & Sons, New York, 882 p. (1949).                                  |
| B341 | S. J. Gregg, The absorption of gases by solids. Methuen's Monographs on Chemical Subjects, Van Nostrand Co., New York, 120 p. (1934). | B492 | A. Guthrie & K. R. Wakerling, Vacuum equipment and techniques. McGraw-Hill Book Co., New York, 264 p. (1949).                        |
| B381 | E. H. Kennard, Kinetic theory of gases. McGraw-Hill Book Co., New York, 483 p. (1938).  | B493 | M. Benedick & C. Williams, Engineering developments in the gaseous diffusion process. McGraw-Hill Book Co., New York, 129 p. (1949). |
| B382 | J. Strong, Procedures in experimental physics. (Technique of high vacuum, p. 93-150) Prentice-Hall, 642 p. (1938).                    | B494 | R. S. Burden, Surface tension and the spreading of liquids. Cambridge Univ. Press, 2d ed., 92 p. (1949).                             |
| B391 | A. Farkas & H. W. Melville, Methods in gas reactions. Macmillan & Co., 384 p. (1939).   | B495 | A. R. Miller, Absorption of gases on solids. Cambridge Univ. Press, 128 p. (1949).   |
| B431 | S. Brunauer, The absorption of gases and vapors. VI, Physical absorption. Princeton Univ. Press, 520 p. (1943).                       | B496 | E. Ower, The measurement of air flow. (Chapter on manometers). Chapman & Hall, London, 293 p. (1949).                                |
| B471 | S. Jnanananda, High vacua. Van Nostrand, New York, 310 p. (1947).   | B501 | M. Knudsen, Kinetic theory of gases: some modern aspects. John Wiley & Sons, New York, 3d ed., 64 p. (1950).                         |

- B502 R. Jaeckel, Vacuum, its measurement and production. In German. Springer-Verlag, Berlin, 301 p. (1950).
- B503 G. Moench, High vacuum techniques. In German. R. A. Lang Verlag, Poessneck, 2d ed. of Vakuumtechnik im Laboratorium, 472 p. (1950).
- B504 E. L. Holland-Merten, Handbook of vacuum technique. In German. W. Knapp, Halle-Saale, 2d ed., 636 p. (1950).
- B505 C. E. Normand et al, Vacuum problems and techniques. Tennessee Eastman Corp., 265 p. (1950).
- B506 L. Dunoyer, Vacuum and its applications. In French. Presses Universitaires de France, Paris, 112 p. (1950).
- B511 L. Marton, Editor, Advances in Electronics, v 3, Chapter on field emission microscopy by F. Ashworth, p. 1-42. Academic Press, New York 357 p. (1951).
- B512 M. Leblanc, Vacuum techniques. In French. Colin, Paris, 187 p. (1951).
- B513 J. R. Davy, Industrial high vacuum. Pittman, London, 243 p. (1951).
- B514 S. H. Gregg, Surface chemistry of solids. Reinhold Publ. Corp., 297 p. (1951).
- B515 H. Ebert, Compression vacuum gages. In German. Vieweg & Sohn, Brunswick, 37 p. (1951).
- B521 A. L. Reimann, Vacuum technique. Chapman & Hall, London, 449 p. (1952).
- B522 W. Jost, Diffusion in solids, liquids and gases. Academic Press, New York, 558 p. (1952).
- B523 A. C. Graves & D. K. Frohman, Miscellaneous physical and chemical techniques of the Los Alamos project. McGraw-Hill Book Co., New York, 323 p. (1952).
- B524 H. S. W. Massey & E. H. S. Burhop, Electronic and ionic impact phenomena. Clarendon Press, Oxford, 669 p. (1952).
- B531 G. P. Barnard, Modern mass spectrometry. 400 references. The Institute of Physics, London, 326 p. (1953).
- B532 H. E. Newell, Jr., High altitude rocket research. Academic Press, New York, 298 p. (1953).
- B533 J. Reilly & W. N. Rae, Physico-chemical methods. Vol. 1, (Chapter on Pressure measurement, p. 233-258) D. Van Nostrand, 5th ed., 760 p. (1953).
- B541 T. E. Jordan, Vapor pressure of organic compounds, Interscience, New York, 266 p. (1954).
- B542 T. S. Gray, Applied electronics. John Wiley & Sons, New York, 2d ed., 881 p. (1954).
- B543 G. W. Morey, The properties of glass. Reinhold Publ. Corp., 2d ed., 591 p. (1954).
- B551 J. Yarwood, High-vacuum technique. John Wiley & Sons, New York, 3d ed., 208 p. (1955).
- B561 G. N. Patterson, Molecular flow of gases. John Wiley & Sons, 217 p. (1956).
- B571 J. H. Leck, Pressure measurement in vacuum systems. 192 references. Institute of Physics, London, 144 p. (1957).
- B572 M. Auwaerter, Editor, Vacuum techniques and the physics of evaporated films. In German. Wissenschaftliche Verlagsgesellschaft, Stuttgart, 282 p. (1957).
- B581 K. Diels & R. Jaeckel, Vacuum handbook for laboratory and industry. In German. 52 pages of references. Springer-Verlag, Berlin, 270 p. (1958).
- B582 H. E. Duckworth, Mass Spectroscopy. Cambridge Univ. Press, 206 p. (1958).
- B583 D. H. Everett & F. S. Stone, Editors, The structure and properties of porous materials. Tenth Symposium, Colston Research Soc., Academic Press, 389 p. (1958).
- B591 M. Knoll, Materials and processes of electron devices. 2300 references. Springer-Verlag, Berlin, 484 p. (1959).
- B592 K. S. Lion, Instrumentation in scientific research; electrical input transducers. McGraw-Hill Book Co., New York, 324 p. (1959).
- B593 W. Espe, Materials for high vacuum applications. Vol. 1, Metals and metallic conductors. In German. Deutscher Verlag der Wissenschaften. 916 p. (1959).
- B594 J. D. Waldron, Editor, Advances in mass spectrometry. 2000 references. Pergamon Press, Oxford, 704 p. (1959).
- B601 A. B. Adamson, Physical chemistry of surfaces. Interscience Publishers, 629 p. (1960).
- B602 S. Schwartz, Editor, Selected semiconductor circuits handbook. John Wiley & Sons, 503 p. (1960).
- B603 N. R. Nilsson, Editor, Ionization phenomena in gases. Fourth Intern. Conf. on Ionization Phenomena in gases, Upsala, 1959. North-Holland Publ. Co., 2 vol. 1210 p. (1960).

## PAPERS

- 7401 H. McLeod, Apparatus for measurement of low pressures of a gas. *Phil. Mag.* 48, 110-112 (1874).
- 0501 K. Prytz, Sensitive detector of the position of a reflecting surface. In German. *Ann. Phys.* (4) 16, 735-745 (1905).
- 0601 M. Pirani, Continuously indicating vacuum gage. In German. *Deut. Phys. Ges. Verh.* 8, 686-694 (1906).
- 0602 W. Voegelé, A new vacuum gage. In German. *Phys. Zt.* 7, 498-500 (1906).
- 0901 F. M. G. Johnson & D. McIntosh, Liquid chlorine. *Am. Chem. Soc.*, 31, 1138-1144 (1909).
- 0902 K. Scheel & W. Heuse, On an apparatus for measuring very low pressures. In German. *Zt. Instrumentenk.* 29, 14-20 (1909).
- 0903 K. Scheel & W. Heuse, Two mercury manometers for measuring low pressure. In German. *Zt. Instrumentenk.* 29, 344-349 (1909).
- 1001 M. Knudsen, Thermal molecular pressure of gases in tubes and porous bodies. In German. *Ann. Phys.* 31, 633-640 (1910).
- 1002 M. Knudsen, An absolute manometer. In German. *Ann. Phys.* 32, 809-842 (1910).
- 1101 M. Knudsen, The molecular heat conductivity of gases and the accommodation coefficient. In German. *Ann. Phys.* 34, 593-656 (1911).
- 1102 M. Von Smoluchowski, On the theory of the heat conductivity of gases at low pressure and the resulting pressure. In German. *Ann. Phys.* 35, 983-1004 (1911).
- 1103 C. F. Hale, On the measurement of very small gas pressures. *Trans. Am. Electro. Chem. Soc.* 20, 243-258 (1911).
- 1301 I. Langmuir, Chemical reactions at very low pressures. I. The clean up of oxygen in a tungsten lamp. *J. Am. Chem. Soc.* 35, 105-127 (1913).
- 1302 I. Langmuir, Chemical reactions at very low pressures. II. Chemical clean up of nitrogen in a tungsten lamp. *J. Am. Chem. Soc.* 35, 931-945 (1913).
- 1303 E. Von Angerer, The pressure of cathode rays. In German. *Ann. Phys.* 41, 1-29 (1913).
- 1304 I. Langmuir, The effect of space charges and residual gases on thermionic currents in high vacuum. *Phys. Rev.* 2, 450-486 (1913).
- 1305 W. Gaede, External friction of gases. In German. *Ann. Phys.* 41, 289-336 (1913).
- 1306 C. F. Muendel, Measurement and theory of low pressures at low temperatures. In German. *Zt. phys. Chem.*, 85, 435-465 (1913).
- 1401 I. Langmuir & G. M. J. Mackay, The dissociation of hydrogen into atoms. I. Experimental. *J. Am. Chem. Soc.* 36, 1708-1722 (1914).
- 1402 J. W. Woodrow, Experiments on the production and measurement of high vacua. *Phys. Rev.* 4, 491-497 (1914).
- 1403 M. Knudsen, Determination of the molecular weights of a small quantity of gas. In German. *Ann. Phys.* 44, 525-536 (1914).
- 1404 F. Haber & F. Kerschbaum, Measurement of low pressures with an vibrating quartz fiber. In German. *Zt. Elektrochem.* 20, 296-305 (1914).
- 1405 W. Rohn, A continuously indicating electric vacuum gage. In German. *Zt. Elektrochem.* 20, 539-542 (1914).
- 1406 J. B. Firth, The sorption of hydrogen by charcoal at liquid air temperatures. In German. *Zt. phys. Chem.* 86, 294-308 (1914).
- 1501 I. Langmuir, The dissociation of hydrogen into atoms. II. Calculation of the degree of dissociation and heat of formation. *J. Am. Chem. Soc.* 37, 417-458 (1915).
- 1502 I. Langmuir, Chemical reactions at low pressures. *J. Am. Chem. Soc.* 37, 1139-1167 (1915).
- 1601 O. E. Buckley, An ionization manometer. *Proc. Nat. Acad. Sci.* 2, 683-685 (1916).
- 1701 S. Weber, Experimental research on the heat conductivity of gases. In German. *Ann. Phys.* 54, 325-356, 437-462 (1917).
- 1801 J. E. Shrader & R. G. Sherwood, Production and measurement of high vacua. *Phys. Rev.* 12, 70-80 (1918).
- 1802 I. Langmuir, The absorption of gases on plane surfaces of glass, mica and platinum. *J. Am. Chem. Soc.* 40, 1341-1403 (1918).
- 1901 J. E. Shrader & H. M. Ryder, An optical lever manometer. *Phys. Rev.* 13, 321-326 (1919).
- 1902 Masamichi So, On an ionization manometer. *Proc. Phys. Math. Soc. (Japan)* 1, 76-87 (1919).
- 1903 G. D. West, On the forces acting on heated metal foil surfaces in rarified gases. *Proc. Phys. Soc. London*, 32, 166-189, 222-231 (1919-20).

- 1904 L. F. Richardson, A form of Knudsen's vacuum manometer. *Proc. Phys. Soc., London*, 31, 270-277 (1919).
- 1905 G. W. Todd, A simple theory of the Knudsen vacuum gauge. *Phil. Mag.* 38, 381-382 (1919).
- 1906 J. E. Shrader, Residual gases and vapors in highly exhausted glass bulbs. *Phys. Rev.* 13, 434-437 (1919).
- 1907 I. Langmuir, Chemical reactions at low pressures. IV. The cleanup of nitrogen by a heated molybdenum filament. *J. Am. Chem. Soc.* 41, 167-194 (1919).
- 2101 S. Dushman & C. G. Found, Studies with the ionization gauge. I. Construction and method of calibration. *Phys. Rev.* 17, 7-19 (1921).
- 2102 N. R. Campbell, A method for the micro-analysis of gases by the use of the Pirani pressure gauge. *Proc. Phys. Soc., London*, 33, 287-296 (1921).
- 2103 A. H. Pfund, An extension of the range of the McLeod gauge. *Phys. Rev.* 18, 78-82 (1921).
- 2301 E. K. Carver, An improved optical lever manometer. *J. Am. Chem. Soc.* 45, 59-63 (1923).
- 2302 A. S. Coolidge, The upper range of the quartz-fiber manometer. *J. Am. Chem. Soc.* 45, 1637-1643 (1923).
- 2303 J. E. Harris & E. E. Schumacher, Measurements on the gases evolved from glasses of known chemical composition. *J. Ind. Eng. Chem.* 15, 174-177 (1923).
- 2401 G. Hettner, On the theory of radiometers. In German. *Zt. Phys.* 27, 12-22 (1924).
- 2402 C. G. Found & S. Dushman, Studies with ionization gauge. *Phys. Rev.* 23, 734-743 (1924).
- 2403 H. Simon, Ionization gages. In German. *Zt. tech. Phys.* 5, 221-233 (1924).
- 2404 D. H. Bangham & F. P. Burt, The behavior of gases in contact with glass surfaces. *Proc. Roy. Soc., London*, A105, 481-488 (1924).
- 2405 J. J. Manley, A preliminary measurement of a primary gas-grown skin. *Proc. Phys. Soc., London*, 36, 288-290 (1924).
- 2406 N. R. Campbell & E. G. New, The disappearance of gas in the electrical discharge. *Phil. Mag.* 48, 553-580 (1924).
- 2407 A. Einstein, On the theory of radiometric forces. In German. *Zt. Phys.* 27, 1-6 (1924).
- 2501 M. Abraham, Theory of ionization gages. In German. *Zt. tech. Phys.* 6, 437-438 (1925).
- 2502 K. T. Compton & C. C. Van Voorhis, Probability of ionization of gas molecules by electron impacts. *Phys. Rev.* 26, 436-453 (1925).
- 2503 M. L. Hamlin, A laboratory vacuum gage. *J. Am. Chem. Soc.* 47, 709-712 (1925).
- 2504 E. B. King, Two new types of high vacuum gauge. *Proc. Phys. Soc., London* 38, 80-84 (1925).
- 2505 W. A. Patrick & J. S. Long, The adsorption of butane by silica gel. *J. Phys. Chem.* 29, 336-343 (1925).
- 2506 M. Volmer, Thermodynamic consequences from the equation of state for adsorbed substances. In German. *Zt. phys. Chem.* 115, 253-260 (1925).
- 2507 W. A. Patrick, W. C. Preston & A. E. Owens, A study of adsorption phenomena in the vicinity of the critical temperature. *J. Phys. Chem.* 29, 421-434 (1925).
- 2508 W. A. Patrick & L. H. Opdycke, The adsorption of vapors by silica gel by a dynamic method. *J. Phys. Chem.* 29, 601-609 (1925).
- 2601 J. J. Hopfield, Capillary valves for gases. *J. Opt. Soc. Am.* 12, 391-392 (1926).
- 2602 K. T. Compton & C. C. Van Voorhis, Probability of ionization of gas molecules by electron impacts. II. Critique. *Phys. Rev.* 27, 724-731 (1926).
- 2603 E. Brueche, On plate and fiber vacuum gages. In German. *Ann. Phys.* 79, 695-733 (1926).
- 2604 C. G. Found & N. B. Reynolds, Direct reading ionization gauge. *J. Opt. Soc. Am. & Rev. Sci. Inst.* 13, 217-222 (1926).
- 2605 E. Rumpf, A thermoelectric vacuum gage. In German. *Zt. tech. Phys.* 7, 224-226 (1926).
- 2606 H. Rowe, The adsorption of gases by activated charcoal at very low pressures. I. At air temperature. II. At -183°C. *Phil. Mag.* 1, 109-131, 1042-1054 (1926).
- 2701 J. J. Manley, On the construction and standardization of an interferometer pressure gauge. *Proc. Phys. Soc., London*, 40, 57-61 (1927-28).
- 2702 H. H. Lowry & P. S. Olmstead, The adsorption of gases by solids with special reference to the adsorption of carbon dioxide by charcoal. *J. Phys. Chem.* 31, 1601-1626 (1927).
- 2703 G. Glockler, W. P. Baxter & R. H. Dalton, The activation of molecular hydrogen by electron impact. *J. Am. Chem. Soc.* 49, 58-65 (1927).

- 2704 A. L. Hughes & A. M. Skellet, Dissociation of hydrogen by electrons. *Phys. Rev.* 30, 11-25 (1927).
- 2801 R. J. Clark, A method of calibration of a McLeod gauge. *J. Sci. Inst.* 5, 126-130 (1928).
- 2802 I. Langmuir & H. A. Jones, Collisions between electrons and gas molecules. *Phys. Rev.* 31, 357-404 (1928).
- 2803 G. Mierdel, Electrodeless ring current. In German. *Ann. Phys.* 85, 612-640 (1928).
- 2804 E. Brueche & W. Littwin, Experimental research on radiometer problems. In German. *Zt. Phys.* 52, 318-333 (1928).
- 2805 L. F. Stanley, The construction and calibration of a sensitive form of Pirani gauge for measurement of high vacua. *Proc. Phys. Soc., London*, 41, 194-203 (1928-29).
- 2806 H. Zeise, Research on the monomolecular character of the adsorption of gases on glass and charcoal. In German. *Zt. phys. Chem.* A136, 385-418 (1928).
- 2901 M. C. Johnson & G. O. Harrison, A pressure gauge for continuous reading in moderate vacua. *J. Sci. Inst.* 6, 305-308 (1929).
- 2902 A. R. Olsen & L. L. Hirst, A new differential pressure gage. *J. Am. Chem. Soc.* 51, 2378-2379 (1929).
- 2903 K. C. D. Hickman, On some vacuum gauges. *J. Opt. Soc. Am.* 18, 305-331 (1929).
- 2904 G. Kornfeld & E. Klingler, The kinetics of the reaction  $2\text{NO} + \text{O}_2 = 2\text{NO}_2$  at low pressures. In German. *Zt. phys. Chem. B*, 4, 37-66 (1929).
- 2905 A. Simon & F. Fehér, New method for the distant indication of small pressures. In German. *Zt. Elektrochem.* 35, 162-165 (1929).
- 2906 E. Mueller & K. Schwabe, The absorption of hydrogen by platinum metals. In German. *Zt. Elektrochem.* 35, 165-184 (1929).
- 2907 A. Magnus & H. Kratz, On the adsorption of carbon dioxide and ammonia by charcoal and graphite. In German. *Zt. anorg. Chem.* 184, 241-271 (1929).
- 2908 A. Magnus, Theory of gas adsorption. In German. *Zt. phys. Chem.* A142, 401-430 (1929).
- 2909 C. R. Burch, Some experiments on vacuum distillation. *Proc. Roy. Soc., London, Ser. A* 123, 271-284 (1929).
- 2910 J. L. Hodgson, A sensitive micromanometer. *J. Sci. Inst.* 6, 153-156 (1929).
- 3001 J. K. Roberts, The exchange of energy between gas atoms and solid surfaces. *Proc. Roy. Soc.* A129, 146-161 (1930).
- 3002 M. Knudsen, Radiometric pressure and accommodation coefficients. In German. *Ann. Phys.* 6, 129-185 (1930). Translation into English: *K. Danske Vidensk Selsk.* 11, No. 1 (1930-32).
- 3003 P. T. Smith, The ionization of helium, neon, and argon by electron impact. *Phys. Rev.* 36, 1293-1302 (1930).
- 3004 W. Bleakney, The ionization of hydrogen by single electron contact. *Phys. Rev.* 35, 1180-1186 (1930).
- 3005 W. Bleakney, Ionization potentials and probabilities for the formation of multiply charged ions in helium, neon and argon. *Phys. Rev.* 36, 1303-1308 (1930).
- 3006 P. Bricout, Absolute manometer, electrostatically compensated. *Compte Rendus* 190, 733-735 (1930).
- 3007 E. A. Stewardson, A continuous reading aneroid manometer for moderately low pressures. *J. Sci. Inst.* 7, 217-221 (1930).
- 3101 A. Ellett & R. M. Zabel, The Pirani gauge for the measurement of small changes in pressure. *Phys. Rev.* 37, 1102-1111 (1931).
- 3102 N. B. Reynolds, Studies with an ionization gauge. *Physics* 1, 182-191 (1931).
- 3103 M. D. Sarbey, Measurement of vacuum in radio tubes. *Electronics* 2, 594-595 (1931).
- 3104 P. T. Smith, The ionization of mercury vapor by electron impact. *Phys. Rev.* 37, 808-814 (1931).
- 3105 E. K. Jaycox & H. W. Weinhart, A new design of an ionization manometer. *Rev. Sci. Inst.* 2, 401-411 (1931).
- 3106 T. G. Pearson, A manometer for measuring low pressures of easily condensable gases. *Zt. phys. Chem. A*, 156, 86-88 (1931).
- 3107 K. Sommermeyer, Sensitive diaphragm manometer. In German. *Zt. phys. Chem. A*, 155, 208-210 (1931).
- 3108 T. Theodorsen, Investigation of the diaphragm type pressure cell. *Nat. Advisory Comm. Aeronaut. Tech. Report No. 388*, 18 p. (1931).

- 3109 S. Dushman, Recent advances in the production and measurement of high vacua. 59 references. *J. Franklin Inst.* 211, 689-750 (1931).
- 3110 P. I. Lukirsky & S. W. Ptizyn, On the absorption of metastable and ionized nitrogen by magnesium. In German. *Zt. Phys.* 71, 339-349 (1931).
- 3111 A. Betz, A micromanometer with convenient indicating means. In German. *Messtechnik* 7, 37-39 (1931).
- 3201 K. Newbury & C. L. Utterback, Low vapor pressure gauge. *Rev. Sci. Inst.* 3, 593-595 (1932).
- 3202 J. K. Roberts, The exchange of energy between gas atoms and solid surfaces. II. The temperature variation of the accommodation coefficient of helium. *Proc. Roy. Soc.* A135, 192-205 (1932).
- 3203 J. T. Tate & P. T. Smith, The efficiencies of ionization and ionization potentials of various gases under electron impact. *Phys. Rev.* 39, 270-277 (1932).
- 3204 E. Fredlund, On the performance limits of the Knudsen manometer. In German. *Ann. Phys.* 13, 802-810 (1932).
- 3205 E. Fredlund, Investigation of the Knudsen manometer. In German. *Ann. Phys.* 14, 617-643 (1932).
- 3206 L. A. DuBridge & W. W. Roehr, The thermionic and photoelectric work functions of molybdenum. *Phys. Rev.* 42, 52-57 (1932).
- 3207 H. Klumb & T. Haase, Measurement of differences in mercury level. In German. *Zt. tech. Phys.* 13, 372-373 (1932).
- 3208 M. R. Andrews, Reaction of gases with incandescent tantalum. *J. Am. Chem. Soc.* 54, 1845-1854 (1932).
- 3209 G. Glockler & J. L. Wilson, The activation of molecular oxygen by electron impact. *J. Am. Chem. Soc.* 54, 4544-4556 (1932).
- 3210 K. Neumann & E. Voelker, Torsion balance method of measuring small vapor pressure. *Zt. phys. Chem.* A161, 33-45 (1932).
- 3211 M. Rusch & O. Bunge, Sources of error in measuring pressure using a cold trap. In German. *Zt. tech. Phys.* 13, 77-81 (1932).
- 3212 K. H. Ramaswamy, The calibration of a McLeod gauge in a vacuum system. *Phil. Mag.* 14, 96-99 (1932).
- 3301 A. W. Porter, Capillary ascent or depression of liquids in cylindrical tubes. *Trans. Faraday Soc.* 29, 702-707 (1933).
- 3302 J. K. Roberts, The exchange of energy between gas atoms and solid surfaces. III. The accommodation coefficient of neon. *Proc. Roy. Soc.* A142, 518-524 (1933).
- 3303 R. J. Cashman & W. S. Huxford, Photoelectric sensitivity of magnesium. *Phys. Rev.* 43, 811-818 (1933).
- 3304 H. Murmann, Vacuum measurement by means of hot wires. In German. *Zt. Phys.* 86, 14-20 (1933).
- 3305 H. Murmann, Hot wire indicating vacuum gage. In German. *Zt. tech. Phys.* 14, 538-540 (1933).
- 3306 A. L. Reimann, The cleanup of hydrogen by magnesium. *Phil. Mag.* 16, 673-686 (1933).
- 3307 I. Langmuir, Surface chemistry. 37 references. *Chem. Reviews* 13, 147-191 (1933).
- 3308 W. von Meyeren, Improvement of vacua by electrical discharge. In German. *Zt. Phys.* 84, 531-540 (1933).
- 3309 R. M. Zabel, Vapor pressure of vacuum cements. *Rev. Sci. Inst.* 4, 233-234 (1933).
- 3401 B. G. Dickins, The effect of accommodation on heat conduction through gases. *Proc. Roy. Soc.* A143, 517-540 (1934).
- 3402 W. B. Mann, Exchange of energy between platinum surface and gas molecules. *Proc. Roy. Soc.* A146, 776-791 (1934).
- 3403 A. L. Reimann, The clean-up of various gases by magnesium, calcium and barium. *Phil. Mag.* 18, 1117-1132 (1934).
- 3404 N. Morgulis, On the theory of ionization gages. In German. *Phys. Zt. Sowjetunion* 5, 407-417 (1934).
- 3405 S. G. Foord, An improved Bourdon gauge. *J. Sci. Inst.* 11, 126-127 (1934).
- 3406 W. Gaede, Vacuum measurement. In German. *Zt. tech. Phys.* 15, 664-668 (1934).
- 3407 J. B. H. Kuper, A. C. operation of an ionization gauge. *Rev. Sci. Inst.* 8, 394 (1934).  
1937
- 3408 W. P. Overbeck & F. A. Meyer, Grid current control for the ionization gauge. *Rev. Sci. Inst.* 5, 287-289 (1934).
- 3409 R. M. Barrer, The mechanism of activated diffusion through silica glass. *J. Chem. Soc.* p. 378-386 (1934).
- 3410 W. von Meyeren, Improvement of vacua by electrical discharge. II. In German. *Zt. Phys.* 91, 727-736 (1934).

- x
- 3501 M. J. Copley, T. E. Phipps & J. Glasser, An ionization gage for the detection of molecular rays. *Rev. Sci. Inst.* 6, 371 (1935).
- 3502 P. A. Anderson, The contact difference of potential between tungsten and barium. The external work function of barium. *Phys. Rev.* 47, 958-964 (1935).
- 3503 R. E. H. Rasmussen, Radiometer force and dimensions of radiometer elements. In German. *Ann. Phys.* 22, 643-656 (1935).
- 3504 J. W. M. DuMond & W. N. Pickels, Superiority of a Knudsen type vacuum gauge for large metal systems with organic vapor pumps; its design and operation. *Rev. Sci. Instr.* 6, 362-370 (1935).
- 3505 M. Francis, On the use of the McLeod gauge with non-permanent gases. *Trans. Faraday Soc.* 31, 1325-1331 (1935).
- 3506 V. Kunzl & J. Slavik, Valve for close regulation of the pressures of gases and its application to vacuum tubes. In German. *Zt. tech. Phys.* 16, 272-276 (1935).
- 3507 H. Moser, Rotating vacuum gauge with three ranges covering 0.0001 to 700 mm Hg. In German. *Phys. Zt.* 36, 1-2 (1935).
- 3508 R. H. Fowler, A statistical derivation of Langmuir's adsorption isotherm. *Proc. Camb. Phil. Soc.* 31, 260-264 (1935).
- 3509 W. G. Palmer & R. E. D. Clark, Adsorption on measured surfaces of vitreous silica. I. & II. *Proc. Roy. Soc., London*, A149, 360-384 (1935); A160 254-267 (1937).
- 3510 H. Reichardt, Torsion balance micromanometer. *Zt. Instrumentenk.* 55, 23-33 (1935).
- 3511 H. Reichardt, Pressure gage for small pressure differences. In German. *Ver. Deut. Ing.* 79, 1503-1504 (1935).
- 3601 E. Schmidt, Measurement of small pressure differences at high pressures. *Ver. Deut. Ing.* 80, 635 (1936)
- 3602 R. D. Huntoon & A. Ellett, Ionization gauge for atomic beam measurements. *Phys. Rev.* 49, 381-387 (1936).
- 3603 W. Heinze & S. Wagner, Activation of oxide-cathodes. I. Changes in the emitting area. In German. *Zt. tech. Phys.* 17, 645-653 (1936).
- 3604 H. G. de Boer & J. D. Fast, The influence of oxygen and nitrogen on the  $\alpha - \beta$  transition of zirconium. *Rec. trav. Chim.* 55, 459-467 (1936).
- 3605 E. W. Muller, Theory of electron emission under the act on strong fields. *Phys. Zt.* 37, 838-842 (1936); *Zt. tech. Phys.* 17, 412-416 (1936).
- 3606 E. W. Müller, Dependence of the emission of field electrons on the work function. In German. *Zt. Phys.* 102, 734-761 (1936).
- 3607 C. J. Smithells & C. E. Ransley, The diffusion of gases through metals. III. The degassing of nickel and the diffusion of carbon monoxide through nickel. *Proc. Roy. Soc., London*, 155, 195-212 (1936).
- 3608 C. F. DeVoe, The photoelectric properties of zinc. *Phys. Rev.* 50, 481-485 (1936).
- 3609 K. C. D. Hickman, Vacuum pumps and pump oils. Part II. Comparison of pump oils. *J. Franklin Inst.* 221, 383-402 (1936).
- 3610 K. C. D. Hickman, Vacuum pumps and pump oils. Part I. Fractionation pumps. *J. Franklin Inst.* 221, 215-235, 383-402 (1936).
- 3611 V. Deitz, The vapor pressure of potassium chloride and caesium iodide crystals. *J. Chem. Physics*, 4, 575-580 (1936).
- 3612 Th. Haase, G. Klages & H. Klumb, Heat loss of bodies in gases and application to measurement of gas pressure. In German. *Phys. Zt.* 37, 440-444 (1936).
- 3613 H. Klumb & Th. Haase, Low pressure manometers. In German. *Phys. Zt.* 37, 27-32 (1936).
- 3614 R. H. Fowler, Adsorption isotherms. Critical conditions. *Proc. Camb. Phil. Soc.* 32, 144-151 (1936).
- 3615 H. Alterthum, A. Lompe & R. Seeliger, Cleanup of inert gases by electric discharge. In German. *Zt. tech. Phys.* 17, 407-412 (1936).
- 3616 H. J. de Boer & J. D. Fast, The  $\alpha - \beta$  transition of zirconium in the presence of hydrogen. *Rec. trav. Chim.* 55, 350-356 (1936).
- 3701 K. C. D. Hickman, J. C. Hecker & N. D. Embree, Determination of low vapour pressures. *Ind. Eng. Chem., Anal. Ed.* 9, 264-267 (1937).
- 3702 W. B. Mann & W. C. Newell, The exchange of energy between a platinum surface and hydrogen and deuterium molecules. *Proc. Roy. Soc.* A158, 397-402 (1937).
- 3703 G. C. Dunlap & J. G. Trump, Thermocouple gauge for vacuum measurement. *Rev. Sci. Inst.* 8, 37-38 (1937).
- 3704 J. B. Hoag & N. M. Smith, Jr., A thyratron-controlled ionization gauge. *Rev. Sci. Inst.* 7, 497-499 (1937).



- 3705 F. M. Penning, High vacuum gauges. Philips. Tech. Rev. 2, 201-208 (1937).
- 3706 F. M. Penning, A new manometer for low gas pressures. In German. Physica 4, 71-75 (1937).
- 3707 L. N. Ridenour & C. W. Lampson, Thermionic control of an ionization gage. Rev. Sci. Inst. 8, 162-164 (1937).
- 3708 E. A. Lederer & D. H. Walmsley, Batalum, a barium getter for metal tubes. RCA Review 2, 117-123 (July 1937).
- 3709 A. L. Hughes, Simple Knudsen gauge. Rev. Sci. Insts. 8, 409-412 (1937).
- 3710 E. Fredlund, Low pressure radiometer manometer. In German. Ann. Phys. 30, 99-112 (1937).
- 3711 E. W. Müller, Field emission and cathodic dispersion of thoriated tungsten. In German. Zt. Phys. 106, 132-140 (1937).
- 3712 E. W. Müller, Electron microscope observation of field cathodes. In German. Zt. Phys. 106, 541-550 (1937).
- 3713 L. Walden, Instrument suspensions. J. Sci. Inst. 14, 257-268 (1937).
- 3714 J. B. H. Kuper, A vacuum gauge for leak hunting. Rev. Sci. Inst. 8, 131-132 (1937).
- 3715 J. R. Lacher, A theoretical formula for the solubility of hydrogen in palladium. Proc. Roy. Soc., London, A161, 525-545 (1937).
- 3716 H. Adzumi, On the flow of gases through a porous wall. Bull. Chem. Soc., Japan 12, 304-312 (1937).
- 3717 W. B. Nottingham, Electrical and luminescent properties of willemite under electron bombardment. J. Appl. Phys. 8, 762-778 (1937).
- 3801 P. Rosenberg, Method for diminishing the sticking of mercury in capillaries. Rev. Sci. Inst. 9, 258-259 (1938).
- 3802 E. W. Flosdorf, A simplified and portable McLeod gage. Ind. Eng. Chem., Anal. Ed. 10, 534 (1938).
- 3803 C. T. Archer, Thermal conduction in hydrogen-deuterium mixtures. Proc. Roy. Soc. A165, 474-485 (1938).
- 3804 H. Spencer-Gregory & E. H. Dock, The effect of temperature on the thermal conductivity and the accommodation coefficient of hydrogen below 0°C. Phil. Mag. 25, 129-147 (1938).
- 3805 C. G. Montgomery & D. D. Montgomery, Grid controlled ionization gage. Rev. Sci. Insts. 9, 58 (1938).
- 3806 E. Fredlund, Absolute measurement of radiometric action in gases. Phil. Mag. 26, 987-1000 (1938).
- 3807 A. E. Lockenvitz, Radiometer-type vacuum gage. Rev. Sci. Insts. 9, 417-420 (1938).
- 3808 P. A. Anderson, The contact difference of potential between barium and magnesium. Phys. Rev. 54, 753-757 (1938).
- 3809 E. W. Müller, Further observations with the field electron microscope. Zt. Phys. 108, 668-680 (1938).
- 3810 W. Hunsmann, A differential method of measuring small amounts of absorbed gases. In German. Zt. Elektrochem. 44, 540-542 (1938).
- 3811 S. Brunauer, P. H. Emmett & E. Teller, adsorption of gases in multimolecular layers. J. Am. Chem. Soc. 60, 309-319 (1938).
- 3812 F. J. Wilkins, Statistical mechanics of the adsorption of gases at solid surfaces. Proc. Roy. Soc., London, A164, 496-509 (1938).
- 3813 F. J. Wilkins, The adsorption of argon, nitrogen and oxygen on smooth platinum foil at low temperatures and pressures. Proc. Roy. Soc., London, A164, 510-531 (1938).
- 3901 P. Rosenberg, Design of an accurate McLeod gauge. Rev. Sci. Insts. 10, 131-134 (1939).
- 3902 B. Raines, The accommodation coefficient of helium on nickel. Phys. Rev. 56, 691-695 (1939).
- 3903 G. Wetterer, Quartz fiber manometer. In German. Zt. techn. Phys. 20, 281-283 (1939).
- 3904 R. Grigorovici, Simple glass manometer for low pressures. Zt. tech. Phys. 20, 102-104 (1939).
- 3905 E. J. Scott, An automatic Pirani vacuum gauge. Rev. Sci. Inst. 10, 349-350 (1939).
- 3906 F. H. Verhoek & A. L. Marshall, Vapor pressures and accommodation coefficients of four non-volatile compounds. J. Am. Chem. Soc. 61, 2737-2742 (1939).
- 3907 J. P. Blewett, The properties of oxide-cathodes. I. & II. J. Appl. Phys. 10, 668-679, 831-848 (1939).
- 3908 L. T. Work & V. W. Haedrich, Performance of ejectors as a function of molecular weights of vapors. 27 references. J. Ind. Eng. Chem. 31, 464-477 (1939).
- 3909 S. T. Martin, On the thermionic and adsorptive properties of the surfaces of a tungsten single crystal. Phys. Rev. 56, 947-959 (1939).

- 3910 S. Werner, A simple Knudsen gage. Zt. tech. Phys. 20, 13-16 (1939).
- 4001 P. Sederholm & C. Benedicks, Differential liquid manometer of high sensitivity, founded on O. Pettersson's theory of submarine waves. Arkiv f. Mat. Astro. och Fys. 27A, 8, 5 p. (1940).
- 4002 L. F. Ehrke & C. M. Slack, Gettering powers of various metals for H<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub> and air. J. Appl. Physics 11, 129-136 (1940).
- 4003 R. S. Morse & R. M. Bowie, Ionization gage. Rev. Sci. Insts. 11, 91-94 (1940).
- 4004 R. M. Bowie, Ionization gage circuit. Rev. Sci. Inst. 11, 265-267 (1940).
- 4005 E. Fredlund, Absolute measurements of radiometric action in gases. II. Ark. Mat. Astron. Fys. A27, No. 12 (1940).
- 4006 P. A. Anderson, Contact p. d. between Ba and Zn. External work function of Zn. Phys. Rev. 57, 122-127 (1940).
- 4007 M. Benjamin & R. O. Jenkins, Distribution of autoelectronic emission from single crystal metal points. Part I. Tungsten, molybdenum, nickel in the clean state. Proc. Roy. Soc., London, A176, 262-279 (1940).
- 4008 C. Kenty, Rugged quartz membrane manometers of small volume. 16 references. Rev. Sci. Inst. 11, 377-386 (1940).
- 4009 E. J. Lawton, More about vacuum leak testing. Rev. Sci. Inst. 11, 134 (1940).
- 4010 W. J. H. Moll & H. C. Burger, Thermoelectric vacuum gage. In German. Zt. tech. Phys. 21, 199-203 (1940).
- 4011 A. O. Nier, A mass spectrometer for routine isotope abundance measurements. Rev. Sci. Inst. 11, 212-216 (1940).
- 4012 C. Weiss & H. Westmeyer, A simple vacuum gage. In German. Zt. Instrumentenk. 60, 53-54 (1940).
- 4013 R. R. Sullivan & K. L. Hertel, Flow of air through porous media. J. Appl. Phys. 11, 761-765 (1940).
- 4014 K. J. Laidler, S. Glasstone & H. Eyring, Application of the theory of absolute reaction rates to heterogeneous processes. I. The adsorption and desorption of gases. J. Chem. Phys. 8, 659-667 (1940).
- 4015 I. Langmuir, Monolayers on solids. J. Chem. Soc. p. 511-543 (1940).
- 4016 S. von Friesen, Large molecular pumps of the disk type. Rev. Sci. Inst. 11, 362-364 (1940).
- 4017 H. Schwarz, The mechanism of electronic clean-up of gases at pressures below about 10<sup>-4</sup> Torr. In German. Zt. Phys. 117, 23-40 (1940).
- 4018 H. D. Hagstrum & J. T. Tate, On the thermal activation of the oxygen molecule. Phys. Rev. 57, 1071 (1940).
- 4019 H. F. Baird & C. J. Banwell, Recording of air-pressure oscillations associated with microseisms at Christchurch. N. Z. J. Sci. Techn. 21, 314B-329B (1940).
- 4101 H. Weidemann, Theory of the ring manometer. In German. Luftfahrtforschung 18, 223-229, (1941).
- x 4102 W. E. Parkins & W. A. Higginbotham, An ionization gage circuit with a magic eye. Rev. Sci. Insts. 12, 366-367 (1941).
- 4103 L. N. Ridenour, Magic eye ionization gage. Rev. Sci. Insts. 12, 134-136 (1941).
- 4104 R. W. Ditchburn & J. C. Gilmour, Vapor pressures of monotomic vapors. Rev. Modern Phys. 13, 310-327 (1941).
- 4105 W. Bartholomycz, Thermoelectric method of measuring pressure. In German. Zt. tech. Phys. 22, 25-27 (1941).
- 4106 K. S. Rao, Hysteresis in sorption. III. Permanance and scanning of the hysteresis loop. Silica gel-water system. J. Phys. Chem. 45, 513-517 (1944).
- 4107 S. Hukagawa & J. Nambo, Adsorption properties of metallic zirconium for gases and its applications. Electrotech. J., Japan, 5, 27-30 (1941).
- 4108 W. H. Keesom & J. Schweers, Measurements of hydrogen adsorption on glass. Physica 8, 1007-1019 (1941).
- 4109 W. H. Keesom & J. Schweers, Measurements of helium and neon adsorption on glass. Physica 8, 1020-1031 (1941).
- 4110 W. H. Keesom & J. Schweers, Measurements of helium on solidified layers of some gases. Physica 8, 1032-1043 (1941).
- 4111 B. Gutenberg & H. Benioff, Atmospheric-pressure waves near Pasadena. Trans. Am. Geophys. Union 22, 424-426 (1941).
- 4112 N. G. Keevil, R. F. Errington & L. T. Newnam, The use of the McLeod gage in measuring volumes. Rev. Sci. Inst. 12, 609-611 (1941).

- 4201 J. E. De Graaf and H. C. Hamaker, The sorption of gases by barium. *Physica* 9, 297-309 (1942).
- 4202 R. B. Nelson & A. K. Wing, Emission regulating circuit for an ionization gage. *Rev. Sci. Instr.* 13, 215-217 (1942).
- 4203 J. H. Daniel, Field emission from tungsten and thoriated tungsten single crystals. *Phys. Rev.* 61, 657-667 (1942).
- 4204 E. Wichers, Pure mercury. *Chem. Eng. News* 20, 1111 (1942).
- 4205 M. H. Armbruster, The adsorption of gases at low temperature and pressure on smooth silver. *J. Am. Chem. Soc.* 64, 2545-2553 (1942).
- 4206 E. A. Gulbransen, Some observations on the formation and stability of oxide films. 24 references. *Trans. Am. Electrochem. Soc.* 82, 375-387 (1942).
- 4207 R. Jaeckel, Application of organic oils for diffusion pumps and a new design of oil diffusion pump. In German. *Zt. tech. Phys.* 23, 177-186 (1942).
- 4208 W. A. Wildhack & V. H. Goerke, The limiting deflections of corrugated metal diaphragms. *Natl. Advisory Comm. Aeronaut. Tech. Note* No. 876, 47 p. (1942).
- 4301 F. Kirby, A tilting oil McLeod gage. *Atom. Energy Comm. AEC-D2673*, 5 p. (1943).
- 4302 L. B. Thomas & F. Olmer, The accommodation coefficients of He, Ne, A, H<sub>2</sub>, D<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub> and Hg on platinum as a function of temperature. 20 references. *J. Am. Chem. Soc.* 65, 1036-1043 (1943).
- 4303 F. E. E. Germann & K. A. Gagos, Accurate low-pressure gage. *Ind. Eng. Chem., Anal. Ed.* 15, 285-286 (1943).
- 4304 A. Rostagni, Universal vacuum meter. In *Italian. Ricerca Sci.* 14, 416-421 (1943).
- 4305 G. Burrows, Notes on high-vacuum technique. *J. Sci. Inst.* 20, 21-28 (1943).
- 4306 G. Haase, A McLeod gage with high accuracy and sensitivity. In German. *Zt. tech. Phys.* 24, 27-34 (1943).
- 4307 E. Weise, Semiconductor type gage for measuring high and low gas pressures. In German. *Zt. tech. Phys.* 24, 66-69 (1943).
- 4308 L. A. Wooten & C. Brown, Surface area of oxide coated cathodes by adsorption of gas at low pressures. *J. Am. Chem. Soc.* 65, 113-118 (1943).
- 4309 G. Haase, On the measurement of very low pressures with a McLeod gage. In German. *Zt. tech. Phys.* 24, 53-55 (1943).
- 4401 I. Amdur, M. M. Jones & H. Pearlman, Accommodation coefficients on gas covered platinum. *J. Chem. Phys.* 12, 159-166 (1944).
- 4402 O. Klemperer, Prevention of capillary disturbances in electrolytic field plotting troughs and in McLeod gages. *J. Sci. Instr.* 21, 88 (1944).
- 4403 K. M. Simpson, Philips type vacuum gage. *Univ. Calif. Rad. Lab. Report No. RL20.6.19* (1944).
- 4404 L. F. Wouters, The characteristics of Philips-type gauges. *Univ. Calif. Rad. Lab. Report No. RL20.6.18* (1944).
- 4405 H. Schwarz, Gettering by ionization gages. In German. *Zt. Phys.* 122, 437-450 (1944).
- 4406 S. Weber, On the theory of radiometers and Knudsen's radiometer force. In German. *K. Danske Vidensk Selsk* 21, No. 1, 57 p. (1944).
- 4407 H. Klumb & H. Schwarz, On an absolute vacuum gage. In German. *Zt. Phys.* 122, 418-436 (1944).
- 4408 J. L. v. Eichborn, Mutual adhesion of substances not miscible spatially. II. Evidence of adhesion in condensed moisture and hysteresis of the borderline of water drops on mercury surfaces. *Kolloid-Zt.* 109, 62-78 (1944).
- 4409 H. Veith, Determination of the thickness of water films adhering to glass. *Zt. Phys. Chem.* 193, 378-385 (1944).
- 4410 W. G. Frankenburg, The adsorption of hydrogen on tungsten. I. & II. *J. Am. Chem. Soc.* 66, 1827-1847 (1944).
- 4411 H. K. Livingston, Cross-sectional areas of molecules adsorbed on solid surfaces. *J. Am. Chem. Soc.* 66, 569-573 (1944).
- 4412 R. M. Barrer & D. A. Ibbitson, Occlusion of hydrocarbons by chabazite and analcite. *Trans. Faraday Soc.* 40, 195-206 (1944).
- 4413 R. M. Barrer, Sorption by gmelinite and mordenite. *Trans. Faraday Soc.* 40, 555-564 (1944).
- 4414 K. C. D. Hickman, High-vacuum short-path distillation--a review. 110 references. *Chem. Reviews* 34, 51-106 (1944).

- 4415 Anonymous, Getting and getters. Light metals, 7, 34-52, 77-94 (1944).
- 4416 F. J. Norton & A. L. Marshall, The degassing of metals. Trans. Am. Inst. Mining & Met. Eng. 156, 351-371 (1944).
- 4501 L. Saxer, Electrical measurements of small variations in atmospheric pressures. Helvetica Physica Acta 18, 527-550 (1945).
- 4502 E. W. Flosdorf, Water vapour and the McLeod type of vacuum gauge. Ind. Eng. Chem. Anal. Ed. 17, 198-199 (1945).
- 4503 S. Dushman & A. H. Young, Calibration of ionization gauge for different gases. Phys. Rev. 68, 278 (1945).
- 4504 G. L. H. Jonker & B. D. H. Tellegen, The current to a positive grid in electron tubes. Phillips Research Reports 1, 13-32 (1945-46).
- 4505 H. Nelson, The hydrogen gauge--an ultra-sensitive device for location of air leaks in vacuum-device envelopes. Rev. Sci. Inst. 16, 273-275 (1945).
- 4506 R. B. Nelson, An a. c. operated leak detector and ionization gauge. Rev. Sci. Inst. 16, 55-57 (1945).
- 4507 R. A. Beebe, J. B. Beckwith & J. M. Honig, The determination of small surface areas by Krypton adsorption at low temperatures. J. Am. Chem. Soc. 67, 1554-1558 (1945).
- 4508 P. H. Emmett, Gas adsorption methods for measuring surface area of adsorbents. 24 references. Ind. Eng. Chem. 37, 639-644 (1945).
- 4509 A. G. Foster, The sorption of condensable vapours by porous solids. III. Multimolecular adsorption. J. Chem. Soc. p. 769-773 (1945).
- 4510 R. E. Honig, Gas flow in the mass spectrometer. J. Appl. Physics 16, 646-654 (1945).
- 4511 R. Witty, High vacuum pumps. J. Sci. Inst. 22, 201-206 (1945).
- 4601 H. G. East & H. Kuhn, Accurate bellows manometer. J. Sci. Inst. 23, 185 (1946).
- 4602 M. H. Armbruster, The sorption of water vapor at low pressure on the surface of some cold-rolled steels at 20°C. J. Am. Chem. Soc. 68, 1342-1347 (1946).
- 4603 E. S. Rittner, A Pirani gage for use at pressures up to 15 mm. Rev. Sci. Inst. 17, 113-114 (1946).
- 4604 E. D. Hart & W. H. Elkin, Welding fine thermocouple wires. J. Sci. Inst. 23, 17-18 (1946).
- 4605 R. G. Picard, P. C. Smith, & S. M. Zollers, A reliable high-vacuum gauge and control system. Rev. Sci. Inst. 17, 125-129 (1946).
- 4606 R. J. Webber & C. T. Lane, An easily constructed all-metal vacuum gage. Rev. Sci. Inst. 17, 308 (1946).
- 4607 A. H. King, Ionization gauge control unit. J. Sci. Inst. 23, 85 (1946).
- 4608 J. R. Downing & G. Mellon, A sensitive vacuum gauge with linear response. Rev. Sci. Inst. 17, 218-223 (1946).
- 4609 G. L. Mellen, Radium-type vacuum gage. Electronics 19, April, 142-146 (1946).
- 4610 N. Cabrera & J. Terrien, Time lag of a Knudsen manometer incorporating an oscillatory system. In French. Rev. Sci., Paris, 84, 224-226 (1946).
- 4611 S. E. Williams, A Knudsen absolute manometer. J. Sci. Inst. 23, 144-146 (1946).
- 4612 H. Robinson & M. C. Flanagan, Thermocouple vacuum gage. Gen. Elect. Rev. 49, 42-44 (1946).
- 4613 G. P. Brown, A. DiNardo, G. K. Cheng & T. K. Sherwood, The flow of gases in pipes at low pressures. J. Appl. Phys. 17, 802-813 (1946).
- 4614 A. Bobenrieth, Ionization gage for vacuum measurement. In French. Le Vide, 1, 61-64 (1946).
- 4615 W. E. Barr & V. J. Anhorn, Scientific glass blowing techniques. X. Vacuum gages. 20 references. Instruments 19, 666-680, 734-746 (1946).
- 4616 C. M. Fogel, An ionization gauge of simple construction. Proc. Inst. Radio Eng. 34, 302-304 (1946).
- 4617 E. A. Hamacher, An automatic ionization vacuum gauge and monitor. Rev. Sci. Inst. 17, 281 (1946).
- 4618 H. A. Thomas, T. W. Williams & J. A. Hipple, A mass spectrometer type of leak detector. Rev. Sci. Inst. 17, 368-372 (1946).
- 4619 H. E. Van Valkenburg, Application of the ion gage in high vacuum measurement. Gen. Elect. Rev. 49, 38-42 (June 1946).
- 4620 W. G. Worcester & E. G. Doughty, High vacuum leak testing with the mass spectrometer. Trans. Am. Inst. Elect. Eng. 65, 946-955 (1946).

- 4621 P. Alexander, The theory of the mercury vapour vacuum pump and a new high-speed pump. *J. Sci. Inst.* 23, 11-16 (1946).
- 4622 I. Estermann, Molecular beam technique. 69 references. *Rev. Mod. Phys.* 18, 300-323 (1946).
- 4623 R. C. Jones & W. H. Furry, The separation of isotopes by thermal diffusion. *Rev. Modern Phys.* 18, 151-224 (1946).
- 4624 M. L. Wiedmann & P. R. Trumpler, Thermal accommodation coefficients. *Trans. A.S.M.E.* 68, 57-64 (1946).
- 4625 C. Kemball, On the surface tension of mercury. *Trans. Faraday Soc.* 42, 526-537 (1946).
- 4626 J. A. Becker, C. B. Green & G. L. Pearson, Properties and uses of thermistors. *Trans. Am. Inst. Elect. Eng.* 65, 711-725 (1946).
- 4627 J. W. Hodgins, E. A. Flood & J. R. Dacey, The flow of gases and vapors through media. *Can. J. Research*, 24B, 167-177 (1946).
- 4628 C. Kemball & E. K. Rideal, The adsorption of vapors on mercury. I. Nonpolar substances. *Proc. Roy. Soc., London* A187, 53-73 (1946).
- 4629 G. D. Yarnold, The hysteresis of the angle of contact of mercury. *Proc. Phys. Soc., London* 58, 120-125 (1946).
- 4630 H. M. Carlson, Adjustable-range sensitive draft gage. *Instruments* 19, 134-135 (1946).
- 4631 L. Pauling, R. E. Wood & J. H. Sturdivant, An instrument for determining the partial pressure of oxygen in a gas. *J. Am. Chem. Soc.* 68, 795-798 (1946).
- 4632 P. Tarbes, Improvement of McLeod gage. In French. *Le Vide* 1, 9-11 (1946).
- 4701 J. C. Lilly, V. Legallais & R. Cherry, A variable capacitor for measurement of pressure and mechanical displacement; a theoretical analysis and its experimental evaluation. *J. Appl. Physics* 18, 613-628 (1947).
- 4702 H. R. Hindley, A direct-reading differential micromanometer. *J. Sci. Inst.* 24, 295-297 (1947).
- 4703 Naval Ord. Lab., Microbarometric waves from Helgoland "Big Bang". Naval Ord. Lab. Report No. 1070 49 p. (1947).
- 4704 H. Von Ubisch, An investigation on hot-wire vacuum gauges. 43 references. *Arkiv f. Mat. Astro. och Fysik* 34A, No. 14 33 p. (1947).
- 4705 C. Kenty & F. W. Reuter, An apparatus for micro gas analysis. *Rev. Sci. Inst.* 18, 918-924 (1947).
- 4706 J. W. Tills, J. B. Lovatt, & J. F. C. Potts, Improvements in pressure gages. British Patent No. 589,176 (1947). Provisional specifications. No. 9234 (1944), 14037 (1944), 19307 (1944), 4909 (1945).
- 4707 J. Tills & F. C. Potts, Improvements in vacuum gages. British Patent No. 592,379 (1947).
- 4708 J. Blears, Measurement of the ultimate pressures of oil-diffusion pumps. *Proc. Roy. Soc., London* A188, 62-76 (1947).
- 4709 C. G. McIlwraith, Starter for cold cathode ionization gauges. *Rev. Sci. Inst.* 18, 683 (1947).
- 4710 S. Weber, Investigation of the effect of accommodation coefficients on radiometers and molecular manometers. In German. *K. Danske Vidensk Selsk.* 24, No. 4, 59 p. (1947).
- 4711 A. Rostagni & I. Filosofo, Compensating radiometric vacuum meter. In Italian. *Nuovo Cimento* 4, 74-84 (1947).
- 4712 D. R. Stull, Vapor pressure of pure substances. Organic and inorganic compounds. 965 references. 1500 compounds. *Ind. Eng. Chem.* 39, 517-550 (1947).
- 4713 R. B. Jacobs & H. F. Zuhr, New developments in vacuum engineering. *J. Appl. Physics* 18, 34-48 (1947).
- 4714 W. A. Weyl, Chemical aspects of some mechanical properties of glass. *Research* 1, 50-61 (1947).
- 4715 W. P. Dryer, Calculations for high vacuum systems. *Chem. Eng.* 54, 127-131, Nov., 122-124, Dec. (1947).
- 4716 W. S. Young & R. C. Taylor, Vacuum micro-manometer. *Anal. Chem.* 19, 133-135 (1947).
- 4717 B. V. Deryagin, V. I. Gol'danskii & B. V. Karasev, Multimolecular adsorption and condensation of vapor on glass as studied by optical methods. *Doklady Akad. Nauk S. S. S. R.* 57, 697-700 (1947).
- 4718 C. Kemball, The adsorption of vapours on mercury. III. Polar substances. *Proc. Roy. Soc., London* A190, 117-137 (1947).
- 4719 B. B. Dayton, Standardization and sensitivity of ionization gages. In French. *Le Vide* 2, 349-355 (1947).
- 4720 J. E. Brow & F. A. Schwertz, Simple micro-manometer. *Rev. Sci. Inst.* 18, 183-186 (1947).

- 4721 A. J. Ede, Use of McLeod gauge with a mixture of gas and vapour. *J. Sci. Inst.* 24, 198-199 (1947).
- 4722 N. F. Mott, The theory of the formation of protective oxide films on metals. III. *Trans. Faraday Soc.* 43, 429-434 (1947).
- 4723 W. Gaede, Gas ballast pumps. In German. *Zt. Naturf.* 2A, 233-238 (1947).
- 4801 A. S. Halliday, A distant reading manometer with particular application to the measurement of small pressures. *Aero. Res. Comm. Grt. Brit. Reports and Memoranda R M No.* 2744, 5 p. (1948).
- 4802 A. E. Cameron & D. F. Eggers, An ion velocitron. *Rev. Sci. Inst.* 19, 605-606 (1948).
- 4803 H. Matheson & M. Eden, A highly sensitive differential manometer. *Rev. Sci. Inst.* 19, 502-506 (1948).
- 4804 P. Romann, The inherent errors in the readings of a McLeod gage. In French. *Le Vide* 3, 522-530 (1948).
- 4805 C. M. Schwartz & R. Lavender, A stable Pirani-gauge circuit for indication and control of vacuum equipment. *Rev. Sci. Inst.* 19, 814-815 (1948).
- 4806 H. Von Ubisch, An investigation on hot-wire vacuum gauges. III. *Arkiv. f. Mat. Astro. och Fysik*, 36A, No. 4, 14 p. (1948); *Nature* 161, 927 (1948).
- 4807 R. R. Legault, B. Makower & W. F. Talburt, Apparatus for measurement of vapor pressure. *Anal. Chem.* 20, 428-430 (1948).
- 4808 L. Apker, Surface phenomena useful in vacuum techniques. *Ind. Eng. Chem.* 40, 846-847 (1948).
- 4809 R. I. Garrod & K. A. Gross, A combined thermocouple and cold-cathode vacuum gauge. *J. Sci. Insts.* 25, 378-383 (1948).
- 4810 H. I. S. Allwood, Vacuum protection system for oil diffusion pumps and thermionic filaments. *J. Sci. Insts.* 25, 207-208 (1948).
- 4811 L. Apker, E. Taft & J. Dickey, Energy distribution of photoelectrons from polycrystalline tungsten. *Phys. Rev.* 73, 46-50 (1948).
- 4812 J. H. Martin, Adjustable glass capillary gas leak. *Rev. Sci. Inst.* 19, 404-405 (1948).
- 4813 P. Alexander, The glycerol vapour vacuum pump. *J. Sci. Inst.* 25, 313-314 (1948).
- 4814 W. C. White & J. S. Hickey, Electronics simulates sense of smell. *Electronics* 21, 100-102 (March, 1948).
- 4815 R. H. Savage & C. Brown, Chemical and physical adsorption of gases on carbon dust. *J. Am. Chem. Soc.* 70, 2362-2366 (1948).
- 4816 B. B. Dayton, Measurement and comparison of pumping speeds. 32 references. *Ind. Eng. Chem.* 40, 795-803 (1948).
- 4817 R. Neumann, High vacuum pumps. I. Early types. II. Modern developments. III. Diffusion pumps. IV. Diffusion pump design. V. Conclusion. 148 references. *Electronic Eng.* 20, 3-8, 44-48, 79-82, 122-125, 163-167 (1948).
- 4818 C. E. Norman, Design of high vacuum systems. *Ind. Eng. Chem.* 40, 783-787 (1948).
- 4819 H. M. Sullivan, Vacuum pumping equipment and systems. *Rev. Sci. Inst.* 19, 1-15 (1948).
- 4820 B. B. Dayton, The speed of oil and mercury diffusion pumps for hydrogen, helium and deuterium. *Rev. Sci. Inst.* 19, 793-804 (1948).
- 4821 E. A. Gulbransen & W. S. Wysong, Thin oxide films on tungsten. 27 references. *Am. Inst. Mining & Met. Eng., Inst. of Metals Div.* 175, 611-627 (1948).
- 4822 C. Kemball, E. K. Rideal & E. A. Guggenheim, Thermodynamics of monolayers. *Trans. Faraday Soc.* 44, 948-954 (1948).
- 4823 R. I. Razouk & A. S. Salem, The adsorption of water vapor on glass surfaces. *J. Phys. & Colloid. Chem.* 52, 1208-1227 (1948).
- 4824 G. W. Monk, Apparatus for weighing in vacuum. *J. Appl. Phys.* 19, 485-486 (1948).
- 4825 J. A. H. Kersten, On the relation between the thermal conductivity of rarified gases and the sensitivity range of Pirani gauges. *Physica* 14, 567-568 (1948).
- 4826 R. W. Makinson & P. B. Treacy, An ionization manometer of high sensitivity. *J. Sci. Inst.* 25, 298-299 (1948).
- 4827 R. W. Asmussen & B. Buchmann-Olsen, A note on the absolute manometer. *Trans. Danish Acad. Tech. Sci. No.* 6, 8 p. (1948).
- 4828 G. L. Mellen, New techniques in the measurement of pressures below 10 mm. *Ind. Eng. Chem.* 40, 787-791 (1948).
- 4829 I. E. Puddington, A sensitive mercury manometer. *Rev. Sci. Inst.* 19, 577-579 (1948).
- 4901 R. R. Cyr, A 16-point Pirani gage recorder. *Univ. California, Eng. Dept. Berkeley, Report He-150-53; N7-ONR-295 Task 3* (Feb. 28, 1949).

- 4902 E. F. Cox, J. V. Atanasoff, B. I. Snively, D. W. Becker & J. Brown, Upper-atmosphere temperature from Helgoland big bang. *J. Meteor.* 6, 306-311 (1949).
- 4903 L. Dunoyer, Study of the thermal vacuum gage. In French. *Comptes Rendus* 228, 372-374, 471-473 (1949); *Le Vide* 4, 571-584; 603-618; 643-660 (1949).
- 4904 F. M. Penning & K. Nienhuis, Construction and application of a new design of the Philips vacuum gauge. *Philips Tech. Rev.* 11, 116-122 (1949).
- 4905 E. A. Gulbransen & K. F. Andrews, Kinetics of the reactions of zirconium with O<sub>2</sub>, N<sub>2</sub>, and H<sub>2</sub>. 34 references. *Trans. Am. Inst. Mining & Met. Eng., J. Metals* 185, 515-525 (1949).
- 4906 G. Herrmann & O. Krieg, The effect of gases and vapors on the emission from oxycathodes. In German. *Ann. Phys. Leipzig* 4, 441-464 (1949).
- 4907 C. Hayashi, K. Hashimoto, et al, Several improvements on the Philips gauge. *Rev. Sci. Insts.* 20, 524-526 (1949).
- 4908 P. Leduc, Precautions to be taken in the use of the Philip's gauge. In French. *Le Vide* 4, 684 (1949).
- 4909 G. C. Fryburg & J. H. Simons, A precision vacuum gauge. *Rev. Sci. Insts.* 20, 541-548 (1949).
- 4910 C. H. Bachman, A new principle in controlled vacuum leaks. *Rev. Sci. Inst.* 20, 219-220 (1949).
- 4911 J. Groszkowski, A McLeod gauge of multiple compression. In French. *Le Vide* 4, 668-672 (1949).
- 4912 T. Hibi & K. Isikawa, On the method of determining the best operating condition of a fractionating oil diffusion pump. *Sci. Rep., Res. Inst. Tohoku Univ.* A1, 261-265 (Oct. 1949).
- 4913 E. A. Gulbransen & K. F. Andrews, Kinetics of the reactions of titanium with O<sub>2</sub>, N<sub>2</sub> and H<sub>2</sub>. 48 references. *Trans. Am. Inst. Mining & Met. Eng., J. of Metals* 185, 741-748 (1949).
- 4914 W. M. Hickam, Design for a metal mass spectrometer tube. *Rev. Sci. Inst.* 20, 472-474 (1949).
- 4915 G. Haase, Wetting of glass surfaces. *Glasstech. Ber.* 22, 262 (1949).
- 4916 B. L. Harris & P. H. Emmett, Adsorption studies. Physical adsorption of nitrogen, toluene, benzene, ethyl iodide, hydrogen sulphide, water vapor, carbon disulphide and pentane on various porous, nonporous solids. *J. Phys. & Colloid Chem.* 53, 811-825 (1949).
- 4917 M. Seddig & G. Haase, Experimental investigations of the critical condensation temperature. *Kolloid-Zt.* 114, 169-174 (1949).
- 4918 C. J. Milner, Ionization gauge pressure switch. *J. Sci. Inst.* 26, 159 (1949).
- 4919 J. S. Nisbet, A pressure controller sensitive to 10<sup>-4</sup> mm of mercury. *J. Sci. Inst.* 26, 271-273 (1949).
- 4920 E. A. Gulbransen & H. F. Andrews, Mullite and zircon furnace tubes for high temperature and high vacuum systems. *Ind. Eng. Chem.* 41, 2762-2767 (1949).
- 4921 G. Briegleb, Baro-photometer for measuring small differential pressures. In German. *Chemie-Ing.-Technik* 21, 6-8 (1949).
- 4922 R. Comolet, New method of recording the position of a meniscus. *Comptes Rendus* 229, 867-868 (1949).
- 4923 J. A. H. Kersten & H. Brinkman, Construction and theoretical analysis of direct reading hot-wire vacuum gauge with zero point control. *Appl. Sci. Research* A1, 289-305 (1949).
- 4924 N. Cabrera, On the oxidation of metals at low temperatures and the influence of light. *Phil. Mag.* 40, 175-188 (1949).
- 5001 A. P. Crary, Stratosphere winds and temperature from acoustical propagation studies. *J. Meteor.* 7, 233-242 (1950). *AF Camb. Res. Lab., Geophys. Res. Paper No. 5* (1950).
- 5002 R. Havens, R. Koll & H. LaGow, A new vacuum gauge. *Rev. Sci. Insts.* 21, 596-598 (1950).
- 5003 J. E. Johnston, A demountable tetrode ionization gauge. *Atom. Energy Res. Establ. Grt. Brit. Report No. G/R 480* (1950).
- 5004 A. H. Turnbull, Experiments with a differential Pirani gauge leak detector. *At. Energy Res. Establ. Grt. Br., Report No. AERE G/R 477*, 9 p. (Mar. 1950).
- 5005 E. Wenk, Jr., A diaphragm-type gage for measuring low pressures in fluids. *D. Taylor Model Basin Report No. 665* 15 p. (1950).
- 5006 M. Axelbank, A rotary McLeod gage. *Rev. Sci. Inst.* 21, 511-513 (1950).
- 5007 W. Franzen & J. Horton, A reliable Pirani vacuum safety circuit. *Rev. Sci. Inst.* 21, 935 (1950).
- 5008 E. Blasco & L. Miranda, A new Pirani type vacuum gauge. *Rev. Sci. Inst.* 21, 494-495 (1950).
- 5009 S. Wagener, A method of measuring the efficiency of getters at low pressures. *British J. Applied Physics* 1, 225-231 (1950).

- 5010 W. Espe, W. Knoll, & M. P. Wilder, Getter materials for electron tubes. 74 references. *Electronics* 23, 80-86 October (1950).
- 5011 F. M. Kelly, An all metal ionization gage. *Rev. Sci. Inst.* 21, 673-674 (1950).
- 5012 R. T. Bayard & D. Alpert, Extension of the low pressure range of the ionization gauge. *Rev. Sci. Insts.* 21, 571-572 (1950).
- 5013 J. J. Lander, Ultra-high vacuum ionization manometer. *Rev. Sci. Inst.* 21, 672-673 (1950).
- 5014 W. Steckelmacher & S. Van Der Meer, Automatic regulation of thermionic emission. *J. Sci. Insts.* 27, 189-191 (1950).
- 5015 M. Shepherd & J. A. Hipple, Mass spectrometry. 79 references. *Anal. Chem.* 22, 23-25 (1950).
- 5016 E. C. Evans & K. E. Burmaster, A Philips-type ionization gauge for measuring of vacuum from  $10^{-7}$  to  $10^{-1}$  mm Hg. *Proc. Inst. Radio Eng.* 38, 651-654 (1950).
- 5017 C. P. Butler & F. E. Carpenter, A motor for use in vacuum systems. *Rev. Sci. Inst.* 21, 103 (1950).
- 5018 J. W. Clark & G. H. Witts, An automatic control of high vacuum systems. *Electronics* 23, 108-110 (June 1950).
- 5019 W. J. Clark, The telerecording of thickness, pressure flow and other physical quantities using a simple electromagnetic circuit. *Trans. Soc. Instr. Technol.* 2, 18-45 (March 1950).
- 5020 Z. G. Deutsch & F. Raible, Mass spectrometer for leak detection. *Chem. Engg.* 57, 279-284 (1950).
- 5021 H. E. Duckworth, A large Dempster double-focussing mass spectrograph. *Rev. Sci. Inst.* 21, 54-59 (1950).
- 5022 N. A. Eckstein, J. W. Fitzgerald & C. A. Boyd, A method of making glass-to-metal seals. *Rev. Sci. Inst.* 21, 398-399 (1950).
- 5023 R. I. Garrod, A low-impedance high vacuum valve. *J. Sci. Instr.* 27, 205 (1950).
- 5024 R. M. Ilfeld, A recording mass spectrometer. *Instrumentation*. (Minn.-Honeywell Reg. Co) 4, 20-22 (Spring 1950).
- 5025 J. T. Lloyd, An audible vacuum leak detector. *J. Sci. Inst.* 27, 76 (1950).
- 5026 L. K. Nash, Gas analysis. 358 references. *Anal. Chem.* 22, 108-118 (1950).
- 5027 W. P. Ratchford & M. L. Fein, An improved manostat and manometer. *Anal. Chem.* 22, 838-839 (1950).
- 5028 L. Spiers & W. P. Jolly, The Pirani effect in a thermionic filament as a means of measuring low pressure. *Brit. J. Appl. Phys.* 1, 132-133 (1950).
- 5029 J. A. Allen & J. W. Mitchell, The adsorption of gases on copper films. *Discuss. Faraday Soc.* No. 8, 309-314 (1950).
- 5030 Ch. Biguenet, The photo-absorption of a thin film of barium. In French. *Le Vide* 5, 831-836 (1950).
- 5031 R. Champeix, On the possibility of using the ionization of gas molecules for the production of low pressures. In French. *Comptes Rendus* 231, 40-42 (1950); *Le Vide* 5, 912-913 (1950).
- 5032 R. W. Cloud & S. F. Philp, Vacuum tests of rubber, lead, and teflon gaskets and vinyl acetate joints. *Rev. Sci. Inst.* 21, 731-733 (1950).
- 5033 L. Dunoyer, Formulae for the flow of gases in pipes at low pressures. In French. *Le Vide* 5, 881-886 (1950).
- 5034 I. Filosofo, M. Merlin & A. Rostagni, Measuring low vapour pressure. In Italian. *II Nuovo Cimento* 7, 69-75 (1950).
- 5035 G. Haase, The gettering efficiency of thin barium films at low pressures. In German. *Zt. angew. Phys.* 2, 188-191 (1950).
- 5036 R. Henry, Measurement of the pumping speed of rotary pumps. In French. *Le Vide* 5, 859-865 (1950).
- 5037 J. J. Hopfield, Glass variable microleaks for gases. *Rev. Sci. Inst.* 21, 671-672 (1950).
- 5038 S. Oyama, On the vapor flow in the diffusion pump. *J. Phys. Soc., Japan* 5, 192-197 (1950).
- 5039 J. W. A. van der Scheer, A universal power supply circuit for use with ionization gauges. *Het PTT-Bedrijf, Holland* 3, 24-29 (May 1950).
- 5040 G. W. Sears & E. R. Hopke, An effective vacuum cut-off. *Rev. Sci. Inst.* 21, 570 (1950).
- 5041 R. Witty, The characteristics of diffusion pumps. *Brit. J. Appl. Phys.* 1, 232-237 (1950).
- 5042 H. D. Hagstrum & H. W. Weinhart, A new porcelain rod leak. *Rev. Sci. Inst.* 21, 394 (1950).
- 5043 R. E. Halsted & Alfred O. Nier, Gas flow through the mass spectrometer viscous leak. *Rev. Sci. Inst.* 21, 1019-1021 (1950).
- 5044 R. E. Honig, A greaseless gas flow valve. *Rev. Sci. Inst.* 21, 1024-1025 (1950).



- 5045 G. H. Jenks, A convenient leak for testing helium leak detectors. *Rev. Sci. Inst.* 21, 674-675 (1950).
- 5046 L. Kerwin, A new type mass spectrometer. *Rev. Sci. Inst.* 21, 96-97 (1950).
- 5047 J. P. Molnar & C. D. Hartman, Data on porcelain rod leak. *Rev. Sci. Inst.* 21, 394-395 (1950).
- 5048 A. B. Stewart, Degassing extended glass systems. *Rev. Sci. Inst.* 21, 258 (1950).
- 5049 R. I. Garrod & R. A. Coyle, Multiple high-vacuum valve unit. *J. Sci. Inst.* 27, 228-229 (1950).
- 5050 J. E. Stanworth, Nickel-chromium-iron for sealing to glass. *J. Sci. Inst.* 282-284 (1950).
- 5051 A. S. Iberall, Permeability of glass wool and other highly porous media. *J. Research, Nat. Bur. Stds.* 45, 398-406 (1950). RP 2150.
- 5052 S. Nagaeda, Changes of glass surface by acidic gases. *J. Japan. Ceram. Assoc.* 50, 648-650 (1950).
- 5053 F. Ayer, Suppressing mercury vapor in vacuum systems. *Rev. Sci. Inst.* 21, 496 (1950).
- 5054 G. H. Metson, Vacuum factor of the oxide-cathode valve. *Brit. J. Appl. Phys.* 1, 73-77 (1950).
- 5055 F. D. Werner, An investigation of the possible use of the glow discharge as a means for measuring air flow characteristics. *Rev. Sci. Inst.* 21, 61-68 (1950).
- 5056 D. B. Spalding, Simple manometer for use in measuring low air velocities. *J. Sci. Inst.* 27, 310-312 (1950).
- 5057 W. H. Bennett, Radio frequency mass spectrometer. *J. Appl. Phys.* 21, 143-149 (1950).
- 5101 D. Alpert, C. G. Matland & A. O. McCoubrey, A null-reading absolute manometer. *Rev. Sci. Inst.* 22, 370-371 (1951).
- 5102 V. H. Dibeler & F. Cordero, Diaphragm-type micromanometer for use on a mass spectrometer. *J. Research NBS* 46, 1-4 (1951). RP 2167.
- 5103 M. L. Greenough & W. E. Williams, An electronic circuit for measuring the displacement of pressure-sensitive diaphragms. *J. Research, NBS* 46, 5-10 (1951). RP 2168.
- 5104 J. M. Los & J. A. Morrison, A sensitive differential manometer. *Rev. Sci. Inst.* 22, 805-809 (1951).
- 5105 H. Schwarz, Procedures and instruments for vacuum measurement. In German. 173 references. *Arch. f. Tech. Mess.* V1341-2, 4 p. (Sept. 1951); V1341-3, 4 p. (Jan. 1952); V1341-4, 4 p. (March 1952); V1341-5, 4 p. (May 1952).
- 5106 G. H. Metson, The physical basis of the residual vacuum characteristics of a thermionic valve. *Brit. J. Appl. Physics* 2, 46-48 (1951).
- 5107 S. Wagener, Efficiency and mechanism of barium getters at low pressures. *Brit. J. Appl. Physics* 2, 132-138 (1951).
- 5108 P. A. Richards & W. A. Tuthill, A simple ion-gauge regulator. *Rev. Sci. Insts.* 22, 841-842 (1951).
- 5109 L. Riddiford, Notes on the ionization gage. 22 references. *J. Sci. Insts.* 28, 375-379 (1951). Correction, *JSI*, 31, 111 (1954).
- 5110 O. A. Weinreich, Thermionic properties of incoated and thoria-coated rhodium and iridium cathodes. *Phys. Rev.* 82, 573 (1951).
- 5111 G. Gimenez & J. Labeyrie, Vacuum gauge using alpha rays. In French. *J. Phys. Radium* 12, 64A-65A (1951).
- 5112 J. Blears, Application of the mass spectrometer to high vacuum problems. *J. Sci. Insts.* 28, Suppl. No. 1, p. 36-42 (1951).
- 5113 W. Steckelmacher, Review of vacuum gages. 65 references. *J. Sci. Insts.* 28, Suppl. No. 1, 10-19 (1951).
- 5114 J. Blears & J. H. Leck, General principles of leak detection. 22 references. *J. Sci. Insts.* 28, Suppl. No. 1, 20-28 (1951).
- 5115 C. G. Milner, A cold-cathode mass spectrometer leak detector. *J. Sci. Insts.* 28, Suppl. No. 1, 29-36 (1951).
- 5116 L. Riddiford, The vacuum system of the Birmingham proton synchrotron. *J. Sci. Insts.* 28, Suppl. No. 1, 47-58 (1951).
- 5117 R. Gomer, A novel method for the estimation of very low pressures. *J. Chem. Phys.* 19, 1072-1073 (1951).
- 5118 M. H. Mueller & R. B. Bilinski, Sensitive leak control. *Rev. Sci. Inst.* 22, 704 (1951).
- 5119 H. Hinterberger, Experience with metal foil as high vacuum seals. In German. *Zt. Naturforsch.* 6A, 459-462 (1951). Translation No. 2554, Atomic Energy Com.
- 5120 D. Alpert, Vacuum valve for the handling of very pure gases. *Rev. Sci. Inst.* 22, 536-537 (1951).

- 5121 H. Sommer, H. A. Thomas & J. A. Hipple, The measurement of  $e/M$  by cyclotron resonance. *Phys. Rev.* 82, 697-702 (1951).
- 5122 L. L. Katan, Vacuum-powder insulation for low temperatures. 13 references. *Vacuum* 1, 191-202 (1951).
- 5123 D. Latham, B. D. Power & N. T. M. Dennis, Investigations into the ultimate pressures of diffusion pumps designed to purify their working fluids. *Vacuum* 1, 97-114 (1951).
- 5124 A. von Engel, New trends in vacuum research based on ionization phenomena. 15 references. *Vacuum* 1, 257-265 (1951).
- 5125 W. Steckelmacher, Knudsen gauges. 48 references. *Vacuum* 1, 266-282 (1951).
- 5126 E. Eberhardt, H. Kern & H. Klumb, Investigation of quartz fibers. In German. *Zt. angew. Phys.* 3, 209-211 (1951).
- 5127 J. Blears & J. H. Leck, Differential methods of leak detection. *Brit. J. Appl. Phys.* 2, 227-232 (1951).
- 5128 H. R. Dvorak & R. N. Little, Jr., Interchangeable glass-to-metal seals for high vacuum work. *Rev. Sci. Inst.* 22, 1027-1028 (1951).
- 5129 W. A. Jenkins, A bubble counter for vacuum systems. *Rev. Sci. Inst.* 22, 845 (1951).
- 5130 C. Kenty, A new self-locking mercury cutoff. *Rev. Sci. Inst.* 22, 844-845 (1951).
- 5131 J. Stern, A vacuum valve for glass systems. *Rev. Sci. Inst.* 22, 702-703 (1951).
- 5132 F. P. Bowden & J. E. Young, Friction of clean metals and the influence of adsorbed films. *Proc. Roy. Soc., London*, 208A, 311-325 (1951).
- 5133 M. Chiozzotto, Automatic pressure control unit for high vacuum plant. In Italian. *Nuovo Cimento* 5, 345-348 (1951).
- 5134 H. Ebert, Progress in vacuum technology in 1949-1950. In German. *Glastech. Berichte* 24, 152-157, 177-178 (1951).
- 5135 R. I. Garrod, A compact sliding vacuum seal. *J. Sci. Inst.* 28, 187 (1951).
- 5136 R. Gilmont, Design and operational characteristics of Cartesian manostats. *Anal. Chem.* 23, 157-162 (1951).
- 5137 J. M. Goldschwartz, A high-speed ionization gauge. In French. *Le Vide* 6, 955-956 (1951).
- 5138 K. Hickman, Reverse separation in fractionation pumps. *Rev. Sci. Inst.* 22, 141-146 (1951).
- 5139 R. B. Jacobs, The design of molecular pumps. *Rev. Sci. Inst.* 22, 217-220 (1951).
- 5140 C. Kenty, A McLeod gauge with an electrical contact. *Rev. Sci. Inst.* 22, 217-218 (1951).
- 5141 R. L. Longini, A high-speed hot baffle for oil diffusion pump systems. *Rev. Sci. Inst.* 22, 345-346 (1951).
- 5142 J. Romand, V. Schwetzoﬀ & B. Vodar, The absorption of ultraviolet light for detecting leaks and measuring pressure. In French. *Le Vide* 6, 1046 (1951).
- 5143 E. Umblia, Metallising glass. *Glass* 28, 343-351 (1951).
- 5144 F. Wade, The measurement of high vacuum by electrical methods. *Electronic Eng.* 23, 30-34, Jan., 44-48, Feb. (1951).
- 5145 S. Wagener & C. B. Johnson, Calibration of ionization gauges for various gases at low pressures. *J. Sci. Inst.* 28, 278 (1951).
- 5146 R. M. Barrer & D. M. Grove, Flow of gases and vapours in a porous medium and its bearing on adsorption problems. I. The steady state of flow. *Trans. Faraday Soc.* 47, 826-837 (1951).
- 5147 R. M. Barrer & D. M. Grove, Flow of gases and vapours in a porous medium and its bearing on adsorption problems. II. Transient flow. *Trans. Faraday Soc.* 47, 837-844 (1951).
- 5148 R. C. Dartnell, H. V. Fairbanks & W. A. Koehler, Investigation of the adherence of glass to metals and alloys. *J. Am. Ceramic Soc.* 34, 357-360 (1951).
- 5149 D. R. Goddard, Modern vacuum pumps. *J. Sci. Inst.* 28, Suppl. 1, 1-7 (1951).
- 5150 B. Gutenberg, Sound propagation in the atmosphere. 30 references. *Compendium of Meteorology*, T. F. Malone, Editor, Am. Meteor. Soc. 366-375 (1951).
- 5151 A. J. Madden, Jr. & E. L. Piret, Heat transfer from wires to gases at subatmosphere pressures under natural convection conditions. *Proc. Gen. Discuss. on Heat Transfer*, *Inst. Mech. Eng.*, Section 4 (1951).
- 5152 R. Meakin, Determination of mercury level in a steel tube manometer. *J. Sci. Inst.* 28, 372-373 (1951).
- 5153 M. J. Reddan & G. F. Rouse, Clean-up of helium gas in an arc discharge. *Trans. Am. Inst. Elect. Engs.* 70, Pt. 2, 1924-1929 (1951).

- 5154 M. E. Reinders, J. Schutten & J. Kistemaker, Leak detection with a mass spectrometer using hydrogen gas. *Appl. Sci. Res.* B2, 66-70 (1951).
- 5155 L. Riddiford & R. F. Coe, Leaks in vacuum liquid-air traps. *J. Sci. Inst.* 28, 352-353 (1951).
- 5156 H. Von Ubisch, On the conduction of heat in rarified gases and its manometric application. I. *Appl. Sci. Res.* A2, 364-402 (1951).
- 5157 E. Volcker, A simple method of leak detection in high vacuum apparatus. In German. *Zt. Naturforsch.* 6a, 512-513 (1951).
- 5158 H. Von Ubisch, On the conduction of heat in rarified gases and its manometric application. II. *Appl. Sci. Res.* A2, 403-430 (1951).
- 5159 N. Warmoltz, On the application of a Philips ionization gauge type of oin source in a mass spectrometer leak detector. *Appl. Sci. Res.* 2B, 61-65 (1951).
- 5160 C. G. Youngs, T. M. Mallard & B. M. Craig, Photo-electric vacuum controller. *Canad. J. Techn.* 29, 447-450 (1951).
- 5161 J. A. Becker, The use of the field emission electron microscope in adsorption studies of W on W and Ba on W. *Bell Syst. Tech. J.* 30, 907-932 (1951).
- 5162 A. Kobayashi & S. Furuya, Reactions of barium film with oxygen. I. *J. Phys. Soc., Japan* 6, 238-243 (1951).
- 5163 R. L. Sproull, W. C. Dash, W. W. Tyler & A. R. Moore, Growth and manipulation of barium oxide crystals. *Rev. Sci. Inst.* 22, 410-414 (1951).
- 5164 J. D. Babbitt, The diffusion of adsorbed gases through solids. *Canad. J. Phys.* 29, 437-446 (1951).
- 5165 G. Jura, The determination of surface area of the surfaces of solids. 71 references. Chapter in *physical methods in chemical analysis*, W. G. Berl, Editor, Academic Press, p. 255-303 (1951).
- 5166 B. B. Dayton, Vacuum techniques and analysis. 227 references. Chapter in *physical methods in chemical analysis*, W. G. Berl, Editor, Academic Press, P. 333-386 (1951).
- 5167 R. E. Peck, W. S. Fagan & P. P. Werlein, Heat transfer through gases at low pressures. *Trans. ASME* 73, 281-287 (1951).
- 5201 R. J. Havens, R. T. Koll & H. E. LaGow, The pressure, density and temperature of the earth's atmosphere to 160 km. *J. Geophys. Research*, 57, 59-72 (1952).
- 5202 J. H. Leck, The high temperature Pirani gauge. *J. Sci. Insts.* 29, 258-263 (1952).
- 5203 A. E. J. Eggleton & F. C. Tompkins, The thermal accommodation coefficient of gases and their absorption on iron. *Trans. Faraday Soc.* 48, 738-749 (1952).
- 5204 T. Arizumi & S. Kotani, Gettering process of barium-sorption properties of oxygen to barium. *J. Phys. Soc., Japan* 7, 300-307 (1952).
- 5205 S. Wagener, The production of very high vacuum by the use of getters. *Proc. Inst. Elect. Engineers, Grt. Brit. Part 3*, 99, 135-147 (1952).
- 5206 J. H. Burrow & E. W. J. Mitchell, The ionization gauge-two modifications. *J. Sci. Insts.* 29, 27-28 (1952).
- 5207 O. A. Weinreich & H. Bleecher, Ionization gage with thoria-coated cathode. *Rev. Sci. Inst.* 23, 56 (1952).
- 5208 N. Warmoltz & E. Bouwmeester, An easily degassable ionization gauge with a simple and stable circuit. *Appl. Sci. Research* 2B, 273-276 (1952).
- 5209 A. H. Beck & A. D. Brisbane, A cylindrical magnetron ionization gauge. *Vacuum* 2, 137-146 (1952).
- 5210 C. N. W. Litting & W. K. Taylor, An automatically-controlled Knudsen-type vacuum gauge. *Proc. Inst. Elect. Eng.* 99, Part IV, Monograph No. 36 (1952).
- 5211 S. C. Brown & J. E. Coyle, An all-metal vacuum valve. *Rev. Sci. Inst.* 23, 570-571 (1952).
- 5212 E. W. Becker & O. Stehl, Electrostatic differential manometer. In German. *Zt. angew. Phys.* 4, 20-22 (1952).
- 5213 G. Burrows & R. Jackson, Determination of the molecular weights of low vapour pressure oils and greases. *Vacuum* 2, 50-55 (1952).
- 5214 Anonymous, The 206 R pressure transmitter. *Taylor Technology* 4, No. 3, 17-19 (1952).
- 5215 G. Von Dardel & H. Von Ubisch, Hot wire manometers. *Teknisk Tidskrift (Sweden)* 82, 203-208 (1952).
- 5216 D. Degras, A thermocouple gage. In French. *Le Vide* 7, 1153-1171 (1952).
- 5217 N. A. Florescu, Shunted thermocouple vacuum gage. *J. Sci. Inst.* 29, 298 (1952).

- 5218 J. S. Foster, Jr. & E. J. Lofgren, Ion pump. *Vacuum* 2, 257 (1952).
- 5219 J. S. Foster, Jr., E. O. Lawrence & E. J. Lofgren, A high vacuum high speed ion pump. Univ. Calif., Radiation Lab. Report No. UCRL 1930 (1952).
- 5220 W. F. Giauque, T. H. Geballe, D. N. Lyon & J. J. Fritz, Some properties of plastics and the use of plastic apparatus at low temperature. *Rev. Sci. Inst.* 23, 169-173 (1952).
- 5221 F. A. Gould & T. Vickers, Capillary depression in mercury barometers and manometers. *J. Sci. Inst.* 29, 85-87 (1952).
- 5222 A. G. Hayward, Simple vacuum seals. *Vacuum* 2, 262-264 (1952).
- 5223 K. C. D. Hickman, Studies in high vacuum evaporation. Surface behavior in the pot still. *Ind. Eng. Chem.* 44, 1892-1902 (1952).
- 5224 K. C. D. Hickman & D. J. Trevo, Studies in high vacuum evaporation. Comparison of high vacuum stills and tensimeters. *Ind. Eng. Chem.* 44, 1903-1911 (1952).
- 5225 K. Hickman & D. J. Trevo, Evaporation from liquid surfaces in vacuum. 16 references. *Vacuum* 2, 3-18 (1952).
- 5226 J. A. W. Huggill, The flow of gases through capillaries. *Proc. Roy. Soc., London*, 212A, 123-136 (1952).
- 5227 H. G. Jensen, An investigation of a metal Knudsen manometer. *Vacuum* 2, 388-389 (1952).
- 5228 D. Latham, B. D. Power & N. T. M. Dennis, An assessment of some working fluids for diffusion pumps. 20 references. *Vacuum* 2, 33-49 (1952).
- 5229 J. B. Lawrence, Mercury the purest metal. *Instruments* 25, 310-312 (1952).
- 5230 G. J. Maslach, A precision differential manometer. *Rev. Sci. Inst.* 23, 367-369 (1952).
- 5231 F. J. Miranda & W. M. Jones, Vacuum seals for continuously evacuated accelerator tubes operating in high ambient pressure. *Vacuum* 2, 259-262 (1952).
- 5232 G. C. Moench, Improving the performance of glass Dewar flasks. In German. *Glas- und Hochvakuum Tech.* 1, 9-13 (1952).
- 5233 N. Ochert & W. Steckelmacher, Leak detection practice with particular reference to the hydrogen palladium method. 71 references. *Vacuum* 2, 125-136 (1952).
- 5234 L. G. Parratt & E. L. Jossem, Backstreaming in oil diffusion pumps. *Rev. Sci. Inst.* 23, 188-189 (1952).
- 5235 L. Riddiford, Comments on new trends in ionization phenomena. *Vacuum* 2, 151-152 (1952).
- 5236 M. Seddig & G. Haase, Measurements of pressures below  $10^{-7}$  mm of mercury by absorption. In German. *Zt. angew. Phys.* 4, 105-108 (1952).
- 5237 H. Sibata, Y. Tuzi & H. Kumagai, A new circuit for ionization vacuum gauge. *Rev. Sci. Inst.* 23, 54-55 (1952).
- 5238 L. R. Sitney, A high speed rotary vacuum seal. *Rev. Sci. Inst.* 23, 505-506 (1952).
- 5239 M. H. Stanier & J. H. Beynon, A greaseless mercury-sealed vacuum tap. *J. Sci. Inst.* 29, 165-166 (1952).
- 5240 J. D. Strong, On a bakable evaporation apparatus. *Vacuum* 2, 111-114 (1952).
- 5241 H. Von Ubisch, Hot wire manometers for chemical applications. *Anal. Chem.* 24, 931-938 (1952).
- 5242 M. J. Vermandé, The operation and performance of the Penning gauge. In French. *Le Vide* 7, 1145-1152 (1952).
- 5243 E. L. Wheeler, Apparatus for triple distillation of mercury. *Anal. Chem.* 24, 751-752 (1952).
- 5244 P. D. Zeman, Free molecular flow in the sample inlet to the mass spectrometer. *J. Appl. Phys.* 23, 924-927 (1952).
- 5245 K. Ziock, Vacuum-measuring techniques. In German. *Glas- und Hochvakuum Tech.* 1, 57-62 (1952).
- 5246 A. Boettcher, Glass surfaces in a high vacuum. In German. *Glastech. Berichte* 25, 347-353 (1952).
- 5247 E. A. Bunt & R. J. McCulloch, The design of high vacuum systems. Part I. & II. *Ind. Chem.* 460-465, 503-508 (1952).
- 5248 W. E. Bush, Causes of failure of vacuum systems. Univ. Calif. Rad. Lab. Report No. UCRL-1887 (1952).
- 5249 W. E. Bush, Design of radiation-heated cathodes for ion pumps. Univ. Calif. Rad. Lab. Report No. UCRL-1929 (1952).

- 5250 N. A. Florescu, A compression vacuum gauge with a large working range. *Investigationes Physicae*, No. 3, 4 p. (1952).
- 5251 G. Glockler & H. V. Horst, The Pirani gauge. *Science* 116, 364-367 (1952).
- 5252 R. Jaeckel & H. G. Noeller, Vacuum pumps for pressures below one Torr. In German. *Zt. Ver. Deut. Ing.* 94, 797-803 (1952).
- 5253 R. Palme, Tungsten and molybdenum in vacuum engineering. In German. *Glas-und-Hochvakuu Tech.* 134-139 (Dec. 1952).
- 5254 P. A. Redhead, Stabilized ion gauge control unit. Nat. Res. Council, Canada, Report No. ERB 275 (1952).
- 5255 H. Schwarz, Method of realizing high vacua by ionization. Design of electronic pump. In French. *Le Vide* 7, 1262-1266 (1952).
- 5256 J. R. Sites & R. Baldock, Mass spectrometer studies of high vacuum materials. Atomic Energy Com. Report No. ORNL-1405 (1952).
- 5257 V. T. Slavianskii, On the conditions of the performance of an absolute mercury manometer. In Russian. *Zhurnal Tekhnicheskoi Fiziki*, Moscow, 22, 1881-1884 (1952).
- 5258 R. A. Wallace & W. R. Vanderveer, Brazing vacuum-tight joints in high nickel alloys. *Materials & Methods* 36, 117-118 (Dec. 1952).
- 5259 R. Gomer & J. K. Hulm, Field emission from tantalum in the normal and superconducting state. *J. Chem. Phys.* 20, 1500-1502 (1952).
- 5260 J. J. Lander, H. E. Kern & A. L. Beach, Solubility and diffusion coefficient of carbon in nickel; Reaction rates of nickel-carbon alloys with barium oxide. *J. Appl. Phys.* 23, 1305-1309 (1952).
- 5261 F. J. Norton, Diffusion of gases through solids. *Gen. Elect. Rev.* 55, 28-29 (Sept. 1952).
- 5262 D. M. Tolstoi, Slip of mercury on glass. *Doklady Akad. Nauk SSSR* 85, 1329-1332 (1952). *Chem. Abstracts* 47, 1450 (1953).
- 5263 L. Akobjanoff, A precise gas manometer. *Rev. Sci. Inst.* 23, 447-448 (1952).
- 5264 W. H. Bergmann, Observations on glow discharges on magnetic fields. In German. *Acta Phys. Austriaca* 5, 425-428 (1952).
- 5265 K. P. Coffin & S. H. Bauer, Apparatus for imposing and measuring rapid pressure changes in gases. *Rev. Sci. Inst.* 23, 115-118 (1952).
- 5266 O. Tsukakoshi, Calibration of Fogel-type and Bayard type ionization gauges. *J. Tokyo Research Inst.* 46, 247-254 (1952).
- 5267 G. Valle, Theory of the discharge potential of coaxial cylindrical electrodes in a transverse magnetic field. In Italian. *Nuovo Cimento* 9, 145-168 (1952).
- 5268 C. I. Witman, On the measurement of vapor pressures by effusion. *J. Chem. Phys.* 20, 161-163 (1952).
- 5269 W. Pupp, Practicality of an ionization vacuum gage. In German. *Glas-und-Hochvakuu Tech.* 1, 3-6 (1952).
- 5270 W. Pupp, Thermoelectric vacuum gage "Theva." *Glas-und-Hochvakuu Tech.* 1, 66-68 (1952).
- 5271 J. L. Patterson, Miniature electrical pressure gage utilizing stretched flat diaphragm. Natl. Advisory Comm. Aeronaut. Tech. Note No. 2659, 47 p. (1952).
- 5272 R. A. Clark, T. I. Gilroy & E. Reissner, Stresses and deformations of toroidal shells of elliptical cross section. *ASME J. Appl. Mechanics* 74, 37-44 (1952).
- 5273 W. Wuest, The influence of the cross-sectional form on the behavior of Bourdon tubes. *Ingenieure Archiv* 20, 116-125 (1952).
- 5301 I. G. Baxter, Differential Capacitance Manometer. *J. Sci. Inst.* 30, 358-360 (1953).
- 5302 D. B. Cook & C. J. Danby, A simple diaphragm micromanometer. *J. Sci. Inst.* 30, 238-240 (1953).
- 5303 W. H. Kaechle & W. G. Brombacher, Diaphragm type vacuum gage. N. B. S. Report No. 2621, 26 p. (1953).
- 5304 R. A. K. Long, An automatic micromanometer for the measurement of low air speeds. *J. Sci. Inst.* 30, 481-482 (1953).
- 5305 T. A. Perls, W. H. Kaechle & D. S. Goalwin, A diaphragm-type, capacitance-type micromanometer for very low differential pressures. N. B. S. Report No. 2165, 7 p. (1953).
- 5306 M. J. Pilny, A small Pirani gage for measurements of nonsteady low pressures. Natl. Advisory Comm. Aeronaut. Tech. Note TN 2946, 36 p. (1953).
- 5307 D. C. Pressey, Temperature-stable, capacitance pressure gauge. *J. Sci. Inst.* 30, 20-24 (1953).
- 5308 S. Wagener, The use of getters for the production of very high vacuum. 19 references. *Vacuum* 3, 11-23 (1953).
- 5309 R. N. Bloomer & M. E. Haine, The electronic clean-up of gases in sealed-off vacuum systems. 14 references. *Vacuum* 3, 128-135 (1953).

- 5310 D. Alpert, New developments in the production and measurement of ultra high vacuum. 37 references. *J. Appl. Phys.* 24, 860-876 (1953).
- 5311 G. K. T. Conn & H. N. Daglish, Cold cathode gauges for the measurement of low pressures. 24 references. *Vacuum* 3, 24-34 (1953).
- 5312 J. H. Leck, Sorption and desorption of gas in the cold-cathode ionization gage. *J. Sci. Insts.* 30, 271-274 (1953).
- 5313 J. A. Becker & C. D. Hartman, Field emission microscope and flash filament techniques for the study of structure and absorption on metal surfaces. *J. Phys. Chem.* 57, 153-159 (1953).
- 5314 H. D. Hagstrum, Instrumentation and experimental procedure for studies of electron ejection by ions and ionization by electron impact. 26 references. *Rev. Sci. Insts.* 24, 1122-1142 (1953).
- 5315 H. Koenig, The formation of adsorbed layers in vacuum chambers and their detection by electrons. 15 references. *Vacuum* 3, 3-10 (1953).
- 5316 F. L. Jones, Electrical discharges and the vacuum physicist. 28 references. *Vacuum* 3, 116-127 (1953).
- 5317 H. Klumb & E. Weissmann, A new manometer for the pressure region  $10^{-2}$  to  $10^{-6}$  mm Hg. *Glas-und-Hochvakuum Tech.* 2, 266-269 (1953).
- 5318 H. Klumb & H. Kollmannsperger, Research on the friction manometer. *Glas-und-Hochvakuum Tech.* 2, 211-213 (1953).
- 5319 K. D. Mielenz & E. Schoenheit, On the theory of the quartz fibre manometer. *Zt. angew. Phys.* 5, 90-94 (1953).
- 5320 J. Yarwood, Isolation values for vacuum systems. 33 references. *Vacuum* 3, 398-411 (1953).
- 5321 M. Michijima, Measurement of vapour pressures; some problems in vacuum techniques. *Oyo Butsuri* 22, 180-184 (1953).
- 5322 H. Wessel, Wettability of glass measured by contact-angle method. In German. *Silikat-tech.* 4, 59-63 (1953).
- 5323 J. S. Foster Jr., Some measurements on a high-vacuum high speed ion pump. *Univ. Calif., UCRL Report No.* 2312 (1953).
- 5324 E. F. Babelay & L. A. Smith, A needle valve type of variable gas leak for mass spectrometers. *Rev. Sci. Inst.* 24, 508-510 (1953).
- 5325 J. Morrison, A leak control tube. *Rev. Sci. Inst.* 24, 546-547 (1953).
- 5326 A. J. Stinnett, A vibrating needle variable gas leak. *Rev. Sci. Inst.* 24, 883-884 (1953).
- 5327 I. G. Baxter, A capacitance manometer of low thermal sensitivity. *J. Sci. Inst.* 30, 456-457 (1953).
- 5328 F. S. Sherman, New experiments on impact pressure interpretation in supersonic and subsonic rarified gas streams. *Natl. Advisory Comm. Aeronaut. Tech. Note No.* 2995, 73 p. (1953).
- 5329 G. A. Alers, J. A. Jacobs & P. R. Malmberg, Increased sensitivity of leak detection with hydrogen. *Rev. Sci. Inst.* 24, 399-400 (1953).
- 5330 D. Alpert, Copper isolation trap for vacuum systems. *Rev. Sci. Inst.* 24, 1004-1005 (1953).
- 5331 M. A. Biondi, Oil manometer for ultra-high vacuum systems. *Rev. Sci. Inst.* 24, 989-990 (1953).
- 5332 R. Forman, A vacuum valve to provide small controlled leak rates. *Rev. Sci. Inst.* 24, 326-327 (1953).
- 5333 J. S. Foster, Jr., E. O. Lawrence & E. J. Lofgren, A high vacuum high speed ion pump. *Rev. Sci. Inst.* 24, 388-390 (1953).
- 5334 G. H. Miller, Vacuum cold trap. *Rev. Sci. Inst.* 24, 549-550 (1953).
- 5335 J. Morrison, A controlled gas leak. *Rev. Sci. Inst.* 24, 230-231 (1953).
- 5336 J. Pollard, A conduction-cooled trap for demountable vacuum systems. *Rev. Sci. Inst.* 24, 996-997 (1953).
- 5337 D. H. Pringle & R. M. Kidd, Improvements to a null-reading absolute manometer. *Rev. Sci. Inst.* 24, 877 (1953).
- 5338 E. G. Reilly, A combination high-vacuum and pressure valve. *Rev. Sci. Inst.* 24, 875-876 (1953).
- 5339 W. W. Schriever, Jr., A double seal vacuum coupling. *Rev. Sci. Inst.* 24, 402-403 (1953).
- 5340 H. Schwarz, Methods of obtaining high vacuum by ionization. Construction of an "electronic pump". *Rev. Sci. Inst.* 24, 371-374 (1953). Error corrected, 25, 924 (1954).
- 5341 C. M. Stevens, A vacuum lock for routine solid analyses with a mass spectrometer. *Rev. Sci. Inst.* 24, 148-151 (1953).
- 5342 E. Tajima, K. Kaneko & A. Katajama, Some characteristics of an oil ejector pump. *Rev. Sci. Inst.* 24, 323-325 (1953).

- 5343 D. J. Trevo & W. A. Torpey, A vacuum anemometer. *Rev. Sci. Inst.* 24, 676-682(1953).
- 5344 R. Haefer, The breakdown voltages of gaseous discharges in transverse magnetic fields in the pressure range 10 to 10<sup>-6</sup> mm Hg. In German. *Acta Phys. Austriaca*, 7, 52-90, 251-277 (1953).
- 5345 M. J. Aitken, An electrical analogue to a high vacuum system. *Brit. J. Appl. Phys.* 4, 188 (1953).
- 5346 S. Asao & K. Muramatsu, A large unwelded vacuum gate valve. *J. Sci. Inst.* 30, 209-210 (1953).
- 5347 A. Bobenrieth, A degassable Penning gauge. In French. *Le Vide* 8, 1302-1304 (1953).
- 5348 W. Duesing, Vacuum tight glass-to-metal seals for use in electrical engineering. In German. *Glastech. Berichte* 26, 232-238 (1953).
- 5349 G. Economos, Behavior of refractory oxides in contact with metals at high temperatures. *Ind. Eng. Chem.* 45, 458-459 (1953).
- 5350 F. J. Fitz Osborne, A simplified ionization gauge circuit. *Canad. J. Phys.* 31, 11-14 (1953).
- 5351 W. L. Harries & A. Von Engel, A new electron multiplication process. *Nature* 171, 517 (1953).
- 5352 E. R. Harrison, Glass leak and control valves. *J. Sci. Inst.* 30, 170-171 (1953).
- 5353 K. Histake & K. Matsuda, A study on diffusion pump oil by the mass spectrometer and the gas analysis of the final volume. *J. Phys. Soc., Japan*, 8, 416-421 (1953).
- 5354 E. L. Holland-Merten, H. Reuther & S. Sliwinski, The use of silicone oil as an operating fuel for diffusion pumps. In German. *Chem. Technik* 5, 301-303 (1953).
- 5355 H. Ishii, Ultimate pressure obtained by oil diffusion pump. *Oyo Butsuri*(*J. Appl. Physics, Univ. of Tokio*) 22, 69-72 (1953).
- 5356 G. L. Kington & J. M. Holmes, Adsorption by evaporated copper films at 78°K. Part I. Krypton and hydrogen. *Trans. Faraday Soc.* 49, 417-423 (1953).
- 5357 G. L. Kington & J. M. Holmes, Adsorption by evaporated copper films at 78°K. Part 2. Krypton and oxygen. *Trans. Faraday Soc.* 49, 425-432 (1953).
- 5358 H. Klumb, E. Robens & O. Scholz, Supersonic speeds in high vacuum. In German. *Naturwiss.* 40, 196-197 (1953).
- 5359 E. R. Lind & J. F. Steinhaus, Development of a large, linear jet, mercury diffusion pump having high pumping speeds in the 10<sup>-6</sup>mm mercury absolute pressure range. *Calif. Res. & Dev. Co.; Atomic Energy Com. Report No. MTA-14* (1953).
- 5360 M. A. Miller & A. S. Russell, Vacuum tightness of welded and brazed aluminum containers. *Welding J.* 116-118 (Feb. 1953).
- 5361 A. O. C. Nier, The mass spectrometer. *Scientific Am.* 68-74 (March, 1953).
- 5362 F. J. Norton, Helium diffusion through glass. *J. Am. Ceramic Soc.* 36, 90-96 (March, 1953).
- 5363 E. Thomas, Calculation of the rate of diffusion through a plate of palladium. In French. *Soc. Roy. Belge Ing. Industr. Mem.* 19-32 (1953).
- 5364 G. M. van Koppen, A metal vacuum valve. *Appl. Sci. Res.* 3B, 141 (1953).
- 5365 G. von Dardel, Combined Pirani and ionization gauge circuit. *J. Sci. Inst.* 30, 114-117 (1953).
- 5366 S. Wagener, Sorption of gases at very low pressures by thorium powder. *Proc. Phys. Soc., London* 66B, 400-413 (1953).
- 5367 R. Gomer & J. K. Hulm, A method for studying the mobility of chemisorbed films: oxygen on tungsten. *J. Am. Chem. Soc.* 75, 4114-4115 (1953).
- 5368 H. D. Hagstrum, Electron ejection from Mo by He<sup>+</sup>, He<sup>++</sup>, and He<sub>2</sub><sup>+</sup>. *Phys. Rev.* 89, 244-255 (1953).
- 5369 R. G. Herb, R. H. Davis, A. S. Divatia & D. Saxon, Evapor-ion pump. (abstract). *Phys. Rev.* 89, 897 (1953).
- 5370 E. Thomas, J. Destappes & J. Dupont, A stainless steel trap for a metal vacuum system. *Vacuum* 3, 413 (1953).
- 5371 L. M. Van der Pyl, Bibliography on Bourdon tubes and Bourdon tube gages. *Am. Soc. Mech. Eng., Paper No. 53-IRD-1*, 22 p. (1953).
- 5372 O. Tsukakoshi, Device for evacuation in high vacuum. *J. Sci. Research Inst., Tokyo*, 47, 133-148 (1953).
- 5373 F. H. Reynolds, An electrical manometer for gas pressures up to 40 mm of mercury. *J. Sci. Inst.* 30, 92-96 (1953).
- 5374 W. Hartel, Method for determining water vapor in vacuum apparatus. In German. *Zt. Ver. Deut. Ing.* 95, 215-218 (1953).

- 5375 R. Uyeda & Y. Sugiura, A flowmeter in vacuum technique. J. Phys. Soc., Japan 8, 99-103 (1953).
- 5376 S. M. Branson, A simple ion gauge stabilizer. Inst. Practice 7, 425-427 (1953).
- 5377 H. Klumb & O. Heiligenbrunner, On the application of the resonance manometer to vacuum measurement. In German. Glas-und-Hochvakuum Tech. 2, 269-271 (1953).
- 5378 G. <sup>Dobbe</sup> ~~Dobbe~~ & B. Schroeder, The application of the ionization gage for the measurement of periodic pressure fluctuations and rapid pressure changes. In German. Glas-und-Hochvakuum Tech. 2, 285-292 (1953).
- 5379 M. M. Wolff & W. E. Stephens, A pulsed mass spectrometer with time dispersion. Rev. Sci. Inst. 24, 616-617 (1953).
- 5380 E. G. Johnson & A. O. Nier, Angular aberrations in sector shaped electromagnetic lenses for focusing beams of charged particles. Phys. Rev. 91, 10-17 (1953).
- 5381 S. Suzuki, Differential recorders of meteorological elements. Geophys. Mag. 24, 171-179 (1953).
- 5401 R. A. Gross, Calibration of sensitive differential pressure devices. Rev. Sci. Inst. 25, 218-220 (1954).
- 5402 H. S. Sicinski, N. W. Spencer, & W. G. Dow, Rocket measurements of upper atmosphere ambient temperature and pressure in the 30 to 75 kilometer region. J. Appl. Physics 25, 161-168 (1954).
- 5403 J. H. Leck, A quartz-coated wire Pirani gauge. J. Sci. Inst. 31, 226-227 (1954).
- 5404 D. J. Santeler & J. F. Norton, A graphical approach to vacuum engineering. Vacuum 4, 176-194 (1954).
- 5405 S. Wagener, Influence of electronic impact on the rate of sorption of gases onto getter materials. Nature 173, 684-685 (1954).
- 5406 S. Wagener, Relations between oxide cathodes and gases at very low pressures. Proc. Physics Soc., London, 67B, 369-386 (1954).
- 5407 P. Della Porta, Performance characteristics of barium getters at elevated working temperatures of the valves. Vacuum 4, 464-475 (1954).
- 5408 P. Della Porta, Performance characteristics of barium getters. 18 references. Vacuum 4, 284-302 (1954).
- 5409 G. K. T. Conn & H. N. Daghli, a thermionic ionization gage of high sensitivity employing a magnetic field. J. Sci. Insts. 31, 412-415 (1954).
- 5410 G. K. T. Conn & H. N. Daghli, The influence of the ballast resistance on the performance of Penning vacuum gauges. J. Sci. Insts. 31, 433-434 (1954).
- 5411 A. H. Beck & G. King, A sensitive leak detector using magnetron ionization gauges. Vacuum 4, 147-158 (1954).
- 5412 G. K. T. Conn & H. N. Daghli, The influence of electrode geometry on cold-cathode vacuum gauges. Vacuum 4, 136-146 (1954).
- 5413 N. A. Florescu, The ultimate vacuum obtainable in vapour pumps. 17 references. Vacuum 4, 30-39 (1954).
- 5414 D. A. Hockly & C. S. Bull, The ultimate vacua of two-stage rotary oil pumps. Vacuum 4, 40-47 (1954).
- 5415 S. Elonka, Gaskets. Power, p. 105-124 (March 1954).
- 5416 M. P. Garfunkel & A. Wexler, Measurement of high vacuum at low temperatures. Rev. Sci. Inst. 25, 170-172 (1954).
- 5417 C. Hayaski, On the rate of decomposition of diffusion pump oil. J. Phys. Soc., Japan, 9, 287-290 (1954).
- 5418 F. A. McMillan, Liquid manometers with high sensitivity and small time-lag. J. Sci. Inst. 31, 17-20 (1954).
- 5419 K. Phillips, Some experiments with a cold-vacuum gauge. J. Sci. Inst. 31, 110 (1954).
- 5420 L. Riddiford & R. F. Coe, The theory of high speed oil diffusion pumps. J. Sci. Insts. 31, 33-36 (1954).
- 5421 E. M. Robson, Some aspects of micro-moisture determination. Vacuum 4, 60-66 (1954).
- 5422 K. A. Savinskii, High vacuum equipment in Russia. 27 references. Vacuum 4, 326-340 (1954). (Translation from Zavodskaya Laboratoriya, No. 9 (1955).)
- 5423 R. S. Bradley, A thermister McLeod gauge for a pressure range  $1-10^{-7}$  mm of mercury. J. Sci. Inst. 31, 129-130 (1954).
- 5424 R. Geller, Economical use of a leak detector spectrometer. In French. Commis. 1<sup>e</sup> Energy Atomique Report No. 256 (1954).
- 5425 H. Gruber, Remarks on a thermister Pirani-type vacuum gage. Glas-und-Hochvakuum Tech. 2, 302-306 (1954).



- 5426 A. M. Gurewitsch & W. F. Westendorp, Ionic pump. *Rev. Sci. Inst.* 25, 389-390 (1954).
- 5427 R. Jaeckel, H. G. Noller & H. Kutscher, The physical processes in diffusion and ejector pumps. In German. *Vakuum-Tech.* 3, 1-15 (April 1954).
- 5428 P. A. Redhead & L. R. McNarry, An ionization manometer and control unit for extremely low pressures. *Canad. J. Phys.* 32, 267-274 (1954).
- 5429 A. Venema, The determination of pump speed. 11 references. *Vacuum* 4, 272-283 (1954).
- 5430 F. de Boer & W. F. Niklas, Applications of a tracer to cathode-gettering and gas-adsorption problems. *Brit. J. Appl. Phys.* 5, 341-342 (1954).
- 5431 G. W. Hess, W. Eaton & J. Lech, The knife-edge vacuum seal. *Vacuum* 4, 438-444 (1954).
- 5432 C. S. Martin & J. H. Leck, Pumping speed fluctuations in the oil diffusion pump. *Vacuum* 4, 486-489 (1954).
- 5433 B. D. Power & D. J. Crawley, Sources, measurement and control of backstreaming in oil vapour vacuum pumps. *Vacuum* 4, 415-437 (1954).
- 5434 W. A. Rogers, R. S. Buritz & D. Alpert, Diffusion coefficient, solubility and permeability for helium in glass. *J. Appl. Phys.* 25, 868-875 (1954).
- 5435 L. J. Varnerin, Jr. & D. White, Ultimate vacuum in a vacuum-enclosed ionization gage. *J. Appl. Phys.* 25, 1207-1208 (1954).
- 5436 M. Reichardt, Investigation of glass mercury diffusion pumps. In German. *Zt. angew. Phys.* 6, 61-64, 104-108 (1954).
- 5437 Y. Takamura, A Pirani gauge combined with triode tube. In Japanese. *Oyo Butsuri*, 23, 558-560 (1954).
- 5438 D. I. Gaffee & A. G. Monroe, Measurement of small differential pressures at low absolute pressures. *Nature* 174, 756 (1954).
- 5439 R. Geller, The leak problem in vacuum engineering. Construction of a leak detector mass spectrometer. In French. *Commis. 1<sup>o</sup> Energy Atomique Report No. 325* (1954).
- 5440 A. E. Cameron, A compact high-vacuum valve. *Rev. Sci. Inst.* 25, 1027-1028 (1954).
- 5441 P. E. Douglas, The vapour pressure of calcium. *Proc. Phys. Soc., London* 67, 783-786 (1954).
- 5442 A. J. Martin, Metal seals in vacuum equipment. *Atomic Weapons Res. Establ. Report No. 0-40/54* (Aug. 1954).
- 5443 D. A. Lundberg, A differential leak detector for evacuated vessels. *Electronic Eng.* 26, 436-440 (1954).
- 5444 L. Landecker & J. Gray, Diffusion of gases through nickel and design of a convenient leak for hydrogen and deuterium. *Rev. Sci. Inst.* 25, 1151 (1954).
- 5445 C. W. Oatley, The experimental determination of the speed of a vacuum pump and of components of a vacuum system. *Brit. J. Appl. Phys.* 5, 358-362 (1954).
- 5446 R. W. Decker, All-glass valves for use in obtaining ultra high vacua. *J. Appl. Phys.* 25, 1441-1442 (1954).
- 5447 E. Waldschmidt, Evolution of gas and permeability to gas of constructional metals for vacuum systems. *Metall*, No. 19/20 (Oct. 1954). Translation, *J. Standring, AEA Report No. IGRL-T/C 25* (1956).
- 5448 D. Alpert & R. S. Buritz, Ultra-high vacuum II. Limiting factors on the attainment of very low pressures. *J. Appl. Phys.* 25, 202-209 (1954).
- 5449 E. Brannen & H. I. S. Ferguson, A simple universal vacuum joint. *Rev. Sci. Inst.* 25, 836-837 (1954).
- 5450 P. F. Varadi, Some remarks on ion pumps. *Vacuum* 4, 66-67 (1954) (published 1956).
- 5451 R. H. Davis & A. S. Divatia, Design and operation of Evapor-ion pumps. *Rev. Sci. Inst.* 25, 1193-1197 (1954).
- 5452 G. L. Fox, A large-diameter reciprocating-action vacuum valve. *Rev. Sci. Inst.* 25, 616 (1954).
- 5453 D. T. Hurd & M. L. Corrin, A recording vacuum gauge. *Rev. Sci. Inst.* 25, 1126-1128 (1954).
- 5454 H. V. Neher & A. R. Johnston, Techniques useful in evacuating and pressurizing metal chambers. *Rev. Sci. Inst.* 25, 517-518 (1954).
- 5455 R. G. Nester, A new type of absolute manometer. *Rev. Sci. Inst.* 25, 1136-1137 (1954).
- 5456 J. R. Pappénheimer, Differential conductance manometer. *Rev. Sci. Inst.* 25, 912-917 (1954).
- 5457 H. H. Pattee, Jr., A demountable ultra-high vacuum joint. *Rev. Sci. Inst.* 25, 1132-1133 (1954).
- 5458 J. H. Reynolds & J. Lipson, A multicircuit control for ultra-high vacuum gauges. *Rev. Sci. Inst.* 25, 1029-1031 (1954).

- 5459 R. J. Richards, A high-vacuum seal-off valve. *Rev. Sci. Inst.* 25, 520-521 (1954).
- 5460 J. A. Stark & A. Langsdorf, Jr., A high vacuum plug valve. *Rev. Sci. Inst.* 25, 188 (1954).
- 5461 F. S. Stein, A three-way vacuum valve. *Rev. Sci. Inst.* 25, 515-516 (1954).
- 5462 M. K. Wilson, Elimination of adsorbed water in vacuum systems. *Rev. Sci. Inst.* 25, 1130 (1954).
- 5463 D. Alpert, Ultra-high vacuum technology. *Vacuum Symp. Trans.* (1954). *Committee Vac. Tech.*, Boston, Mass., 69-75 (1955).
- 5464 C. H. Bachman & P. A. Silberg, Gas flow in capillaries of non-circular cross section. *Vacuum Symp. Trans.* (1954). *Committee Vac. Tech.*, Boston, Mass., 63-64 (1955).
- 5465 R. M. Boehme, A vane type flow meter. *Vacuum Symp. Trans.* (1954). *Committee Vac. Tech.*, Boston, Mass., 7-10 (1955).
- 5466 W. E. Briggs, The molecular vacuum gauge. *Vacuum Symp. Trans.* (1954). *Committee Vac. Tech.*, Boston, Mass., 3-6 (1955).
- 5467 A. S. Divatia & R. H. Davis, Construction and performance of Evapor-ion pumps. *Vacuum Symp. Trans.* (1954). *Committee Vac. Tech.*, Boston, Mass., 40-45 (1955).
- 5468 C. Felheimer & A. A. Litwak, Automatic valving system for vacuum apparatus. *Vacuum Symp. Trans.* (1954). *Committee Vac. Tech.*, Boston, Mass., 35-39 (1955).
- 5469 W. C. Frye, Gas ballast for mechanical high vacuum pumps. *Vacuum Symp. Trans.* (1954). *Committee Vac. Tech.*, Boston, Mass., 17-18 (1955).
- 5470 G. P. Gerow, Pumping systems for the 1 micron to 1 millimeter range. *Vacuum Trans.* (1954). *Committee Vac. Tech.* Boston, Mass., 23-26 (1955).
- 5471 J. J. Kinsella, The dependence of ionization gauge sensitivity on electrode geometry. *Vacuum Symp. Trans.* (1954). *Committee Vac. Tech.*, Boston, Mass., 65-68 (1955).
- 5472 R. B. Lawrance, A simplified method of calculating pressure drop in vacuum piping. *Vacuum Symp. Trans.* (1954). *Committee Vac. Tech.*, Boston, Mass., 55-62 (1955).
- 5473 F. J. Norton, Permeation problems in high vacuum. 14 references. *Vacuum Symp. Trans.* (1954). *Committee Vac. Tech.*, Boston, Mass., 47-51 (1955).
- 5474 W. B. Nottingham, Design and properties of the modified Bayard-Alpert gauge. *Vacuum Symp. Trans.* (1954). *Committee Vac. Tech.*, Boston, Mass., 76-80 (1955).
- 5475 P. A. Silberg & C. H. Bachman, Some studies of the diffusion of hydrogen through palladium. 8 references. *Vacuum Symp. Trans.* (1954). *Committee Vac. Tech.*, Boston, Mass. (52-54).
- 5476 A. L. Smith & J. C. Saylor, The current status of silicone diffusion pump fluids. *Vacuum Symp. Trans.* (1954). *Committee Vac. Tech.*, Boston, Mass., 31-34 (1955).
- 5477 G. A. Sofer, Some observations in the operation of vacuum diffusion pumps. *Vacuum Symp. Trans.* (1954). *Committee Vac. Tech.*, Boston, Mass., 27-30 (1955).
- 5478 G. K. T. Conn & H. N. Daglish, A simple thermionic vacuum gauge. *J. Sci. Inst.* 31, 95-96 (1954).
- 5479 M. F. Behar, Pressure and vacuum. Chapter in *Handbook of measurement and control, Part II, Instruments and automation*, 27, 57-73 (Dec., 1954).
- 5480 E. W. Flosdorf, The McLeod gage. *Inst. & Autom.* 27, 1795-1796 (1954).
- 5481 R. T. Eckenrode & H. A. Kirshner, Measurement of pressure transients. 112 references. *Rev. Sci. Inst.* 25, 33-40 (1954).
- 5482 J. W. Hiby & M. Pahl, Compensated ionization gage. In German. *Zt. Naturforsch.* 9a, 906-907 (1954).
- 5483 Y. Sugiura, Experimental studies on the force exerted on a disc placed in a flow of rarified gas. *J. Phys. Soc., Japan* 9, 244-248 (1954).
- 5484 S. Murata, Relation between gas pressure and ion current in vacuum tubes. In Japanese. *J. Inst. Elect. Comm. Eng., Japan* 37, 865-870 (1954).
- 5485 R. Haefer, The current-voltage characteristics of a self-sustained gaseous discharge in a transverse magnetic field. In German. *Acta Physica Austriaca* 8, 213-224 (1954).
- 5486 K. D. Mielenz, Pressure measurement with a Pirani gage. In German. *Zt. angew. Phys.* 6, 101-104 (1954).
- 5487 E. Huebner, Measurement of low variable pressures. In German. *Forsch. Gebiete Ingenieurwesens* 20, 20-31 (1954).
- 5488 L. F. G. Simmons, Sensitive air manometer. *J. Sci. Inst.* 31, 195-197 (1954).
- 5489 N. B. Hannay, A mass spectograph for the analysis of solids. *Rev. Sci. Inst.* 25, 644-648 (1954).
- 5490 E. A. Flauraud, A. H. Mears, F. A. Crowley & A. P. Crary, Investigation of microbarometric oscillations in eastern Massachusetts. *Air Force Cambr. Research Center Technical Report 54-11, Geophysical Research Paper No. 27*, 62 p. (1954).

- 5491 R. Yamamoto, Microbarographic oscillations produced by the explosions of hydrogen-bombs. Univ. Meteor. Research Inst. Kyoto, Meteor. Notes Ser. 2, No. 1, 14 p. Also, Bull. Inst. Chem. Research, p. 120-123 (1954). Also, Weather, 10, 321-325 (1955).
5501. C. N. W. Litting, A Pirani gauge circuit. J. Sci. Inst. 32, 91-92 (1955).
- 5502 J. Morrison & R. B. Zetterstrom, Barium getters in carbon monoxide. J. Appl. Phys. 26, 437-442 (1955).
- 5503 B. J. Todd, Outgassing of glass. J. Appl. Physics 26, 1138-1243 (1955).
- 5504 E. Bouwmeester & N. Warmoltz, A simple and reliable ionization manometer. Philips Tech. Rev. 17, 121-125 (1955).
- 5505 G. Dumas, Study of gyromagnetic resonance in a Penning gauge. In French. Revue Gen. Elect. 64, 331-349 (1955).
- 5506 E. Brown & J. H. Leck, Desorption of gas in the cold-cathode ionization gauge. Brit. J. Appl. Physics 6, 161-164 (1955).
- 5507 T. B. Kent, A hydrogen Pirani leak detector using a charcoal trap. J. Sci. Insts. 32, 132-134 (1955).
- 5508 R. F. Coe & L. Riddiford, The final vacua of oil diffusion pumps. J. Sci. Insts. 32, 207-213 (1955).
- 5509 R. Thees, Roots pumps, design and performance. Vacuum 5, 25-34 (1955).
- 5510 J. G. S. Biram, Some aspects of handling mercury. 57 references. Vacuum 5, 77-92 (1955).
- 5511 A. G. Edwards, Vacuum research and the mass spectrometer. 46 references. Vacuum 5, 93-108 (1955).
- 5512 H. G. Noller, The physics of modern vapour pumps with particular reference to diffusion pumps. 26 references. Vacuum 5, 59-76 (1955).
- 5513 B. D. Power & R. A. Kenna, Vapour pumping characteristics of gas ballast pumps. Vacuum 5, 35-58 (1955).
- 5514 J. A. Becker, Ultra high vacua. Bell Lab. Record 33, 1-5 (1955).
- 5515 M. Reichardt, Investigation of glass mercury diffusion pumps. III. In German. Zt. angew. Phys. 7, 297-301 (1955).
- 5516 R. Thees & H. Treupel, Mechanical vacuum pumps. In German. Elektrotech. Zt. 7B, 321-324 (1955).
- 5517 L. J. Varnerin & J. H. Carmichael, Ionic pumping mechanism of helium in an ionisation gauge. J. Appl. Phys. 26, 782-783 (1955).
- 5518 F. M. Ernsberger & H. W. Pitman, New absolute manometer for vapour pressures in the micron range. Rev. Sci. Insts. 26, 584-589 (1955).
- 5519 A. Johannin-Gilles & P. Johannin, Apparatus for measuring vapour pressure. In French. J. Phys. Radium 16, 236-237 (1955).
- 5520 Y. Lortie, The uses of thermistors as vacuum gauges. In French. J. Phys. Radium 16, 317-320 (1955).
- 5521 L. R. Taylor, A tilting micromanometer with continuous sensitivity control. J. Sci. Inst. 32, 173-177 (1955).
- 5522 R. Geller, Sensitivity of a leak detector mass spectrometer. In French. Le Vide 10, 119-123 (1955).
- 5523 O. M. Ballentine, Procedure for determining vapour pressures of materials of low volatility. Wright Air Dev. Center Technical Report No. 54-418 (1955).
- 5524 D. G. Bills & F. G. Allen, Ultra-high vacuum valve. Rev. Sci. Inst. 26, 654-656 (1955).
- 5525 E. C. Giaimo, Jr., Ring-type teflon gasket. Rev. Sci. Inst. 26, 520 (1955).
- 5526 E. R. Harrison & L. C. W. Hobbs, Nickel diffusion leak for hydrogen. Rev. Sci. Inst. 26, 305-306 (1955).
- 5527 R. Hoerbe & O. Knacke, Vapour pressure curves for 140 materials. In German. Zt. Ergbergbau Metallhüttenw. 8, 556-561 (1955).
- 5528 O. Knapp, Chemical composition of special glasses for high-vacuum techniques. In German. Silikattech. 6, 99-104 (1955).
- 5529 R. A. Lowry, J. E. Osher & G. H. Miller, A pressure regulator for a low-pressure continuous-flow ionization chamber. Atomic Energy Com. Report No. 15C-599 (1955).
- 5530 F. L. Reynolds, The use of indium in high vacuum equipment. Atomic Energy Com. Report No. UCRL 2989, 3 p. (May 1955).
- 5531 E. Thomas, Lazy-tong linkage to obtain rectilinear movement in an evacuated chamber. Bull. Classe Sci. 839-841 (1955).
- 5532 D. W. Juenker, M. Swaay & C. E. Birchenall, On the use of palladium diffusion membranes for the purification of hydrogen. Rev. Sci. Inst. 26, 888 (1955).
- 5533 D. Alpert, Experiments at very low pressures. Science 122, 729-733 (1955).

- 5534 A. M. O. Smith & J. S. Murphy, Micromanometer for measuring boundary layer profiles. *J. Sci. Inst.* 26, 775-781 (1955).
- 5535 V. L. Stout & M. D. Gibbons, Gettering of gas by titanium. *J. Appl. Phys.* 26, 1488-1492 (1955).
- 5536 L. E. Levina, Modern methods of leak detection. In Russian. *Uspekhi Fizicheskikh Nauk* 55, 101-110 (1955).
- 5537 P. J. van Heerden, Metal gaskets for demountable vacuum systems. *Rev. Sci. Inst.* 26, 1130-1131 (1955).
- 5538 J. Horseling, A high vacuum tap with short outgassing time. *Philips Tech. Rev.* 17, 184-186 (1955).
- 5539 J. H. Leck, Modern developments in the techniques of vacuum pressure measurements. *Proc. Inst. Electronics* 38-2, 25-34 (1955).
- 5540 W. G. Brombacher & T. W. Lashof, Bibliography and index on dynamic pressure measurement. *Nat. Bur. Stds. Circ.* 558, 124 p. (1955).
- 5541 C. R. Meissner, Liquid nitrogen cold traps. *Rev. Sci. Inst.* 26, 305 (1955).
- 5542 I. Alexeff & E. C. Peterson, Evapor-ion pump performance with noble gases. *Vac. Symp. Trans.* (1955). Committee Vac. Tech. Inc., Boston, Mass. 87-90 (1956).
- 5543 G. Hees, W. Eaton & J. Lech, The knife edge vacuum seal. *Vac. Symp. Trans.* (1955). Committee Vac. Tech. Inc., Boston, Mass. 75-79 (1956).
- 5544 P. B. Kennedy & H. R. Smith, A simple two-stage mechanical refrigeration system for cold traps and baffles. *Vac. Symp. Trans.* (1955). Committee Vac. Tech. Inc., Boston, Mass., 80-82 (1956).
- 5545 H. Landsberg, E. E. Escher, & S. A. Dawkins, Continuous analysis of gases in a high vacuum furnace with a monitoring mass spectrometer. *Vac. Symp. Trans.* (1955). Committee Vac. Tech. Inc., Boston, Mass. 45-50 (1956).
- 5546 J. L. Peters, Development and performance of a new ion gauge tube and control circuit. *Vac. Symp. Trans.* (1955). Committee Vac. Tech. Inc., Boston, Mass., 71-73 (1956).
- 5547 F. L. Reynolds, All-metal vacuum valve using an indium seat. *Vac. Symp. Trans.* (1955). Committee Vac. Tech. Inc., Boston, Mass., 74 (1956).
- 5548 D. J. Santeler, A graphical solution for the analysis of vacuum systems performance. *Vac. Symp. Trans.* (1955). Committee Vac. Tech. Inc. Boston, Mass., 31-41 (1956).
- 5549 H. R. Smith, The technology of large mercury pumped vacuum systems. *Vac. Symp. Trans.* (1955). Committee Vac. Tech. Inc., Boston, Mass. p. 22-30 (1956).
- 5550 J. C. Swartz, Evapor-ion pump characteristics. *Vac. Symp. Trans.* (1955). Committee Vac. Tech. Inc., Boston, Mass., 83-86 (1956).
- 5551 R. Haefer, Methods of measurement of low gas pressures by means of a self-sustaining gaseous discharge in a transverse magnetic field. *Acta Phys. Austriaca* 9, 200-215 (1955).
- 5552 A. G. Edwards, Some properties of a simple omegatron-type mass spectrometer. *Brit. J. Appl. Phys.* 6, 44-48 (1955).
- 5553 R. Gomer, Field emission microscopy and some applications to catalysis and chemisorption. *Advances in Catalysis VII*, Academic Press, New York, p. 93-134 (1955).
- 5554 J. A. Becker, Adsorption on metal surfaces and its bearing on catalysis. *Advances in Catalysis VII*, Academic Press, New York, p. 135-211 (1955).
- 5555 N. D. Morgulis, Ionization method of obtaining very high vacuum. *J. Tech. Phys. USSR* 25, 1667-1670 (1955).
- 5556 D. G. Bills, F. G. Allen & N. P. Carleton, Measurement of the pumping speed of an ionization gauge. (Abstract). *Phys. Rev.* 99, 1662 (1955).
- 5557 J. A. Becker & R. G. Brandes, The adsorption of oxygen on tungsten as revealed in the field emission electron microscope. *J. Chem. Phys.* 23, 1323-1330 (1955).
- 5558 L. E. Bollinger, 3C24 ionization gage. *Inst. & Autom.* 28, 1507-1509 (1955).
- 5559 B. G. Childs & J. Penfeld, Automatic vacuum pump control circuit. *Rev. Sci. Inst.* 26, 235-236 (1955).
- 5560 H. Kiefer & B. Ziegler, Combined quartz-fiber and Knudsen gage for measuring vapor pressure. In German. *Zt. angew. Phys.* 7, 48-50 (1955).
- 5561 M. Varičák & B. Vošicki, Oscillographic measurement of the Penning-gauge characteristics. *J. Sci. Inst.* 32, 346-348 (1955).
- 5562 J. J. Opstelten & N. Warmoltz, A double-sided micromanometer. *Appl. Sci. Res.* 4B, 329-336 (1955).
- 5563 B. L. Harris, Adsorption. 352 references. *Ind. Eng. Chem.* 47, 508-517 (1955).

- 5564 R. W. Raible & M. K. Testermann, Ion-gage supply protects tubes. *Electronics* 28, 210-218 (Feb. 1955).
- 5565 H. Seifert, R. Buhl & K. F. Seifert, Fine structure in adsorption processes on quartz surfaces. *Kolloid Zt.* 141, 146-159 (1955).
- 5566 D. J. Wright, Hysteresis of the angle of contact of mercury against steel. *Proc. Phys. Soc., London*, 68B, 297-303 (1955).
- 5567 H. G. Noeller, The physical processes occurring in diffusion and vapor-jet pumps. I. Properties of the vapor jet stability of the forevacuum. II. Mixing of air and vapor, and the pumping speed. In German. *Zt. angew. Phys.* 7, 218-229 (1955).
- 5568 L. T. Minchen, New ideas in manometer design. *Gas J.* 283, 389 (1955).
- 5569 D. Patterson & R. C. Seymour, Automatic pressure recorder for study of gas phase kinetics. *J. Sci. Inst.* 32, 50-51 (1955).
- 5570 E. Rideal & A. J. Robertson, Sensitive manometer for rapid chemical changes. *J. Sci. Inst.* 32, 349-350 (1955).
- 5571 A. M. Thackara, Fundamentals of pressure control. *Inst. & Automation* 28, 2094-2097 (1955).
- 5572 K. Ziock, Development of a vacuum gage in the range 0.1-10 mm. In German. *Forschungsber. Wirtsch-u-Verkehrsministeriums Nordrhein-Westfalen*, No. 189, 24-28 (1955).
- 5573 H. S. Katzenstein & S. S. Friedland, New time-of-flight-mass spectrometer. *Rev. Sci. Inst.* 26, 324-327 (1955).
- 5574 E. Weissmann, Measurement of gas-kinetic cross-section by radiometric forces. *Vakuum-Tech.* 4, 152-155 (1955).
- 5575 G. H. Lee & L. M. Van der Pyl, A bibliography on diaphragms and aneroids. 426 abstracts. *Am. Soc. Mech. Eng. Paper No. 55-A-180* (1955). 60-WA-122 (1960).
- 5601 J. H. Leck & C. S. Martin, A Pirani gauge for operation up to a pressure of 10 mm of mercury. *J. Sci. Inst.* 33, 181-183 (1956).
- 5602 D. J. Santeler & T. W. Moller, Leak detection I. Fluid flow conversion in leaks and capillaries. *General Engineering Lab., General Electric Co. Report No. 56-GL-261*, 16 p. (Oct. 1956).
- 5603 B. J. Todd, Equilibrium between glass and water vapor at bake out temperatures. *J. Appl. Physics* 27, 1209-1210 (1956).
- 5604 J. H. Leck & A. Riddoch, Observations on the characteristics of the cold cathode ionization gauge. *Brit. J. Appl. Phys.* 7, 153-155 (1956).
- 5605 P. F. Varadi & L. G. Sebestyen, A simple vacuum detector using a radio-frequency mass spectrometer. *J. Sci. Insts.* 33, 392-394 (1956).
- 5606 R. M. Glaister, A magnetically operated vacuum valve. *J. Sci. Inst.* 33, 34-35 (1956).
- 5607 R. G. Nester, High vacuum gas valve. *Rev. Sci. Inst.* 27, 874-875 (1956).
- 5608 R. K. Smither, Controlled capillary gas leak. *Rev. Sci. Inst.* 27, 964-965 (1956).
- 5609 R. P. Henry, Absolute pressure determination with the aid of an ionization gauge. In French. *Le Vide* 11, 54-63 (1956).
- 5610 A. Beck, The stability of thermistors. *J. Sci. Inst.* 33, 16-18 (1956).
- 5611 J. Delcher, R. Geller, G. Mongodin & F. Prevot, Diffusion pump with freon-12. In French. *Le Vide* 11, 78-80 (1956).
- 5612 D. J. Harris & P. O. Hawkins, Use of Krypton 85 in measuring gas clean-up rates. *Nature* 177, 285-286 (1956).
- 5613 P. Lott, Simplified method for McLeod gauge design and calibration. *Anal. Chem.* 28, 276-277 (1956).
- 5614 S. Lynn, W. H. Corcoran & B. H. Sage, Micro-manometer of high sensitivity. *Rev. Sci. Inst.* 27, 368-369 (1956).
- 5615 P. G. Morgan, The Pirani gauge, *Elect. J.* 156, 1999-2000 (1956).
- 5616 J. J. Opstelten, N. Warmoltz & J. J. Z. van Zelst, A direct-reading double sided micro-manometer. *Appl. Sci. Res.* 6B, 129-136 (1956).
- 5617 K. M. Sancier & W. Richeson, Simple sensitive electrical pressure gage. *Rev. Sci. Inst.* 27, 134-136 (1956).
- 5618 H. Schlitt, A thermoelectric vacuum gauge. In German. *Zt. angew. Phys.* 8, 216-217 (1956).
- 5619 M. Varicak, Thermistors for the measurement of low pressures. In French. *Compte Rend.* 243, 893-895 (1956).
- 5620 J. P. Verkamp & S. L. Williams, Testing nuclear-plant leak tightness. *Nucleonics* 14, 54-57 (June 1956).
- 5621 H. A. Wyllie, A McLeod gage for measuring a wide range of pressures. *J. Sci. Insts.* 33, 317 (1956).

- 5622 H. A. Wyllie, A gas introducer for a vacuum system. *J. Sci. Inst.* 33, 360-361 (1956).
- 5623 J. Ainsworth & H. E. LaGow, Vacuum gauge chamber response time. *Rev. Sci. Inst.* 27, 653-654 (1956).
- 5624 D. T. Scag, Ultra-high vacuum with an all-metal system. Conference on controlled thermonuclear reactions, Gatlinburg, Tenn., p. 630-635 (1956). (TID-7520 Pt. 2).
- 5625 W. Espe, Copper as a high vacuum material. In German. *Nachrichtentech.* 6, 355-364 (1956).
- 5626 A. W. Knudsen, Fast-closing vacuum valve. *Rev. Sci. Inst.* 27, 148-150 (1956).
- 5627 M. Varičák, Penning gauge as leak detector. *Rev. Sci. Inst.* 27, 655 (1956).
- 5628 T. P. Vogl & H. D. Evans, Electromagnetically operated ultra-high vacuum valve. *Rev. Sci. Inst.* 27, 657 (1956).
- 5629 O. Amsel & G. Wittwer, A null method for the measurement of low vapor pressures. In German. *Zt. angew. Phys.* 8, 20-24 (1956).
- 5630 R. L. Bell, The omegatron as a leak detector. *J. Sci. Inst.* 33, 269-272 (1956).
- 5631 W. Espe, Methods and technique of degassing metals. In German. *Vakuum-Tech.* 5, 39-53 (May 1956); 69-82 (June 1956).
- 5632 J. T. Law & E. E. Francois, Adsorption of gases on a silicon surface. *J. Phys. Chem.* 60, 353-358 (1956).
- 5633 A. S. Newton, Method of degassing liquids. *Anal. Chem.* 28, 1214-1215 (1956).
- 5634 R. N. Bloomer, Absorption of oxygen and carbon monoxide by barium getters. *Nature* 178, 1000-1001 (1956).
- 5635 W. Dong, Vacuum flow of gases through channels with circular, annular and rectangular cross sections. Atomic Energy Com. Report No. UCRL 3353 (April 1956).
- 5636 C. Jech, Clean-up of radioactive gases used for surface studies. *Nature* 178, 1343-1344 (1956).
- 5637 F. Kirchner & H. Kirchner, On the measurement of very low gas and vapour pressures. In German. *Zt. angew. Phys.* 8, 478-481 (1956).
- 5638 G. Urry & W. H. Urry, Automatic Toeppler pump of improved design. *Rev. Sci. Inst.* 27, 819-820 (1956).
- 5639 H. Moesta, The behavior of the gas discharge in the Penning vacuum gauge. In German. *Zt. angew. Phys.* 8, 598-603 (1956).
- 5640 J. H. Beynon & G. R. Nicholson, A radioactive ionization gauge and its application to the measurement of latent heat of vaporization. *J. Sci. Inst.* 33, 376-380 (1956).
- 5641 P. Hariharan & M. S. Bhalla, An improved ionization gauge control circuit. *J. Sci. Inst.* 33, 488-491 (1956).
- 5642 H. Black, A small mercury cut-off withstanding large pressure differences. *Nature* 178, 1307-1308 (1956).
- 5643 G. Milazzo, The measurement of small vapour pressures. In German. 28 references. *Chem. Ing. Tech.* 28, 646-653 (1956).
- 5644 R. Millican, Low flow variable leak. Atomic Energy Com. Report No. KY-166, 13 p. (1956).
- 5645 C. M. Van Atta, Theory and performance characteristics of a positive displacement rotary compressor as a mechanical booster vacuum pump. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 62-70 (1957).
- 5646 J. M. Benson, Thermopile vacuum gauges having transient temperature compensation and direct reading over extended ranges. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 87-90 (1957).
- 5647 C. G. Blatchley, Control of ejector type vacuum pumps. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 45-51 (1957).
- 5648 D. E. Charpentier, A simplified mass spectrometer type helium leak detector. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 114-118 (1957).
- 5649 N. E. Cooke, An inherent error in the Knudsen effusion manometer and a method of correction. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 82-86 (1957).
- 5650 B. B. Dayton, Gas flow patterns at entrance and exit of cylindrical tubes. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech. Inc., Boston, Mass., 5-11 (1957).
- 5651 A. J. Gale, Cold sealed getter/ion pumped superevoltage X-ray tubes. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech. Inc., Boston, Mass., 12-14 (1957).
- 5652 R. W. Griessel, Applications of the mass spectrometer to tube development. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 101-106 (1957).
- 5653 E. A. Gulbransen & K. F. Andrews, Electron optical studies of oxidation processes occurring in high vacuum. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 190-201 (1957).

- 5654 K. C. D. Hickman & J. J. Kinsella, A preconditioned vapor vacuum pump. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 52-56 (1957).
- 5655 J. A. LeBlanc, Vacuum gauge calibration system. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 78-81(1957).
- 5656 C. R. Meissner, A high vacuum laboratory for vapor deposition of conductors and dielectrics. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 15-23 (1957).
- 5657 R. E. Moody, Versatile RF type leak detector. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 119-123 (1957).
- 5658 A. Nerken, Experiments on flow of gases through leaks. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 1-4 (1957).
- 5659 J. Peters & F. Raible, A new helium mass spectrometer leak detector. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 107-109 (1957).
- 5660 J. A. Roberts, Precision leaks for standardizing leak detection equipment. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 124-126 (1957).
- 5661 C. E. Rufer, The measurement of pumping speeds. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 74-77 (1957).
- 5662 D. J. Santeler & T. W. Moller, Fluid flow conversion in leaks and capillaries. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 29-36 (1957).
- 5663 H. J. Schwarz, Acoustical vacuum gauge. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 37-38 (1957).
- 5664 R. H. Vacca, Recent advances in the Alphasatron vacuum gauge. *Vacuum Symp. Trans.* (1956). Committee Vac. Tech., Inc., Boston, Mass., 93-100 (1957).
- 5665 J. R. Young, Electrical clean-up of gases in an ionization gauge. *J. Appl. Phys.* 27, 926-928 (1956).
- 5666 N. Jensen, Vapour pressure of plastic materials. *J. Appl. Phys.* 27, 1460-1462 (1956).
- 5667 R. Haefer & O. Winkler, Factors which determine the final vacuum in vacuum systems equipped with oil diffusion pumps. *Vakuum-Tech.* 7, 149-155 (1956).
- 5668 J. H. Reynolds, High sensitivity mass spectrometer for noble gas analysis. *Rev. Sci. Inst.* 27, 928-934 (1956).
- 5669 M. J. Higatsberger & W. W. Erbe, Improved metal to metal vacuum seals. *Rev. Sci. Inst.* 27, 110-11 (1956).
- 5670 G. Ehrlich, The mechanism of chemisorption on metals. *J. Phys. Chem. Solids* 1, 3-13 (1956).
- 5671 G. Ehrlich, The interaction of nitrogen with a tungsten surface. *J. Phys. Chem.* 60, 1388-1400 (1956).
- 5672 R. E. Sohler & H. E. Farnsworth, Low-energy electron diffraction studies of cleaned and gas-covered germanium (100) surfaces. *Semiconductor Surface Physics*, R. H. Kingston, Editor, Univ. Penna. Press, 3-22 (1956).
- 5673 H. D. Hagstrum, Effect of monolayer adsorption on the ejection of electrons from metals by ions. *Phys. Rev.* 104, 1516-1527 (1956).
- 5674 J. M. Houston, New ultra-high-vacuum ionization gauge. (Abstract). *Bull. Am. Phys. Soc.*, (II) 1, 301 (1956).
- 5675 J. H. de Boer, Adsorption phenomena. 407 references. *Advances in catalysis*, VIII Academic Press, New York, 18-161 (1956).
- 5676 V. R. Deitz, Bibliography of solid adsorbents. 13,763 references. *Nat. Bur. Stds. Circ.* 566, 1528 p. (1956).
- 5677 G. Milazzo, On a possible source of error in measuring pressure with a capacity micro-manometer. *Zt. Elektrochemie* 60, 185-188 (1956).
- 5678 W. B. Nottingham, Thermionic emission. *Handbuch der Physik*, Springer-Verlag, 21, 1-175 (1956). Also Tech Report 321, Mass. Inst. Tech. Research Lab. of Electronics, 178 p. (1956).
- 5679 F. B. Jennings, Theories on Bourdon tubes. *Trans. Am. Soc. Mech. Eng.* 78, 55-64 (1956).
- 5680 J. B. Johnson, Convection type manometer. *Rev. Sci. Inst.* 27, 303-305 (1956).
- 5681 P. Tritsmans, Gas analysis with the mass spectrometer. In Dutch. *Techn.-Wetensch. Tijdschrift.* 25, 183-186 (1956).
- 5682 A. von Weiss, Vibration-free mountings and vibration-proof construction of instruments. In German. *Ver. Deut. Ing. Zt.* 98, 205-208 (1956).
- 5683 W. Schuetze & F. Bernhard, A new method of measuring very small ion currents in high vacuum. In German. *Zt. Phys.* 145, 44-47 (1956).

- 5684 E. W. Mueller, Field emission microscopy. 58 references. Physical methods in chemical analysis. W. G. Berl, Editor, Academic Press, vol. 3, 135-182 (1956).
- 5701 J. Drowart, P. Goldfinger & R. Van Steenwinkel, A new demountable ultra-high vacuum joint. J. Sci. Insts. 34, 248-249 (1957)
- 5702 G. Burrows, Some consequences of the behavior of mobile molecules. Vacuum 7-8, 3-18 (1957) (publ. 1959).
- 5703 N. W. Robinson, Some vacuum problems in the valve industry. 21 references. Vacuum 6, 21-40 (1957) (publ. 1959).
- 5704 L. Pátý, High vacuum gas-leak valves. 18 references. Vacuum 7-8, 80-86 (1957) (publ. 1959).
- 5705 G. K. T. Conn & H. N. Daglish, A three-electrode form of cold cathode ionisation gage. Vacuum 7-8, 72-79 (1957) (publ. 1959).
- 5706 J. Amoignon, J. Delcher & R. Geller, Micro-leak valves. In French. Le Vide 12, 176-183 (1957).
- 5707 R. N. Bloomer, Barium getters and oxygen. Brit. J. Appl. Phys. 8, 40-43 (1957).
- 5708 R. N. Bloomer, The oxidation of evaporated barium films (getters). Brit. J. Appl. Phys. 8, 321-329 (1957).
- 5709 R. N. Bloomer, Barium getters and carbon monoxide. Brit. J. Appl. Phys. 8, 352-355 (1957).
- 5710 R. W. Cloud, L. Beckman & J. G. Trump, Barium absorption pumps for high-vacuum systems. Rev. Sci. Inst. 28, 889-892 (1957).
- 5711 A. R. Hamilton, Extended range thermal conductivity vacuum gage. Rev. Sci. Inst. 28, 693-695 (1957).
- 5712 W. J. Lange & D. Alpert, Step-type demountable metal vacuum seal. Rev. Sci. Inst. 28, 726 (1957).
- 5713 J. H. Leck & C. S. Martin, Feedback controlled heat conductivity gauge for measuring pressure in vacuum systems. Rev. Sci. Inst. 28, 119-121 (1957).
- 5714 J. A. McMillan & Tomas Buch, Wide-range thermal convection manometer. Rev. Sci. Inst. 28, 881-882 (1957).
- 5715 R. G. Noster, New device for measuring low gas pressures. Rev. Sci. Inst. 28, 577 (1957).
- 5716 C. J. Penther, Vactroller-A laboratory vacuum controller. Rev. Sci. Inst. 28, 460-463 (1957).
- 5717 L. Pátý & P. Schürer, New ultra-high vacuum valve. Rev. Sci. Inst. 28, 654-655 (1957).
- 5718 G. J. Schulz & A. V. Phelps, Ionization gauges for measuring pressures up to the millimeter range. Rev. Sci. Inst. 28, 1051-1054 (1957).
- 5719 A. H. Spees, C. A. Reynolds, A. Boxer & G. Pearson, Vacuum gasket at low temperatures. Rev. Sci. Inst. 28, 1090 (1957).
- 5720 L. H. Varnerin & J. H. Carmichael, Trapping of helium ions and re-emission of trapped atoms from molybdenum. J. Appl. Phys. 28, 913-919 (1957).
- 5721 J. Yarwood, Ultra-high vacua. 25 references. J. Sci. Inst. 34, 297-304 (1957).
- 5722 R. W. Crompton & M. T. Elford, A precision capsule-type pressure gauge for the range 0-20 mm of mercury. J. Sci. Inst. 34, 405-407 (1957).
- 5723 L. D. Hall, Rhenium ion gauge filament. Rev. Sci. Inst. 28, 653-654 (1957).
- 5724 H. Ishii & K. Nakayama, High vacuum standards. I. The design and construction of a large standard McLeod gage. J. Japanese Vacuum Soc. 7, 113-120 (1957).
- 5725 H. Ishii & K. Nakayama, High vacuum standards. II. Factors influencing the calibration of sub-standard ionization gauges. J. Japanese Vacuum Soc. 7, 176-188 (1957).
- 5726 M. W. Mallett & W. M. Albrecht, Low-pressure solubility and diffusion of hydrogen in zirconium. J. Elect. Chem. Soc. 104, 142-146 (1957).
- 5727 H. Okamoto, On the abnormal outgassing in an ionization gauge. J. Japanese Vacuum Soc. 7, 71-89 (1957).
- 5728 J. S. Wagener & P. T. Marth, Analysis of gases at very low pressures by using the omegatron spectrometer. J. Appl. Phys. 28, 1027-1030 (1957).
- 5729 G. J. Schulz, Characteristics of the Bayard-Alpert ionization gauge at pressures above  $10^{-5}$  mm Hg. J. Appl. Phys. 28, 1149-1152 (1957).
- 5730 P. E. Seiden, Wide range thermistor gauge. Rev. Sci. Inst. 28, 657-658 (1957).
- 5731 S. S. Stivala & V. L. Denniger, Epoxy resin as sealant for high vacuum systems. Ind. Eng. Chem. 49, 1106 (1957).
- 5732 Y. Tuzi & H. Okamoto, The adsorption of water vapour on glass surfaces in vacuum. J. Japanese Vacuum Soc. 7, 216-230 (1957).



- 5733 H. A. Adam, S. Kaufman & B. S. Liley, Indium seals for dismountable vacuum systems. *J. Sci. Inst.* 34, 123-124 (1957).
- 5734 A. E. Barrington & F. T. Turner, A controllable source of low-pressure hydrogen. *J. Sci. Inst.* 34, 286-287 (1957).
- 5735 R. N. Bloomer, Oxidation of barium: a confirmation of Mott's theory of oxidation. *Nature* 179, 493 (1957).
- 5736 C. D'Amico & H. D. Hagstrum, Improvements in the use of the porcelain rod gas leak. *Rev. Sci. Inst.* 28, 60 (1957).
- 5737 V. A. Heathcote & W. E. Read, A demountable seal for high vacuum work. *J. Sci. Inst.* 34, 247 (1957).
- 5738 S. Kobayashi & K. Yada, A standard leak utilising gas permeation. *J. Japanese Vacuum Soc.* 7, 189-196 (1957).
- 5739 S. Toby & K. O. Kutschke, Alloy-filled cut-off for high temperatures. *Rev. Sci. Inst.* 28, 470-471 (1957).
- 5740 F. J. Norton, Permeation of gases through solids. *J. Appl. Phys.* 28, 34-39 (1957).
- 5741 N. W. Robinson, Bakeable high vacuum seals. *J. Sci. Inst.* 34, 121 (1957).
- 5742 M. Sakisaka, Y. Oyama & T. Furushima, Spectral analysis-type leak detector. *J. Japanese Vacuum Soc.* 7, 121-130 (1957).
- 5743 B. W. Schumacher, Leak detector for hermetic seals. *Electronics* 30, 284-294 (March 1957).
- 5744 F. Sterzer, Simple high temperature vacuum-tight mica window. *Rev. Sci. Inst.* 28, 208-209 (1957).
- 5745 G. A. Bottomley, A valve for the grease-free manipulation of mercury. *J. Sci. Inst.* 34, 369-370 (1957).
- 5746 G. Comsa & G. Musa, A new type of ionization pump. *J. Sci. Inst.* 34, 291-292 (1957).
- 5747 G. K. T. Conn & H. N. Daglish, A vapour trap for vacuum systems. *J. Sci. Inst.* 34, 245 (1957).
- 5748 H. J. Curnow, On the high residual pressure obtained during the activation of valves containing oxide-coated cathodes. *J. Sci. Inst.* 34, 73-74 (1957).
- 5749 A. Franks, An automatic vacuum isolation valve. *J. Sci. Inst.* 34, 122 (1957).
- 5750 M. P. Reece, A simple and inexpensive emission regulator for ionization gauges. *J. Sci. Inst.* 34, 513-514 (1957).
- 5751 R. N. Edwards & J. F. Lawyer. Design criteria for accelerator vacuum systems. 16 references. *Trans. Fourth Natl. Symp., Am. Vac. Soc.* (1957) 73-82. (Pergamon Press, New York, 1958).
- 5752 V. V. Fondrk, The steam jet ejector: A versatile pump for high vacuum. *Trans. Fourth Natl. Symp., Am. Vac. Soc.* (1957) 88-94. (Pergamon Press, New York, 1958).
- 5753 A. R. Hamilton, A magnetic amplifier control circuit for a thermal conductivity vacuum gauge. *Trans. Fourth Natl. Symp., Am. Vac. Soc.* (1957) 112-114. (Pergamon Press, New York, 1958).
- 5754 C. Hayashi, Role of adsorption in production and measurement of high vacuum. *Trans. Fourth Natl. Symp., Am. Vac. Soc.* (1957) 13-26. (Pergamon Press, New York, 1958).
- 5755 A. R. Huntress, A. L. Smith, B. D. Power, & N. T. M. Dennis, A new silicon diffusion pump fluid. *Trans. Fourth Natl. Symp., Am. Vac. Soc.* (1957) 104-111. (Pergamon Press, New York, 1958).
- 5756 J. M. Kendall, Permeation of air through walls of plastic tubing used in low pressure systems. *Trans. Fourth Natl. Symp., Am. Vac. Soc.* (1957) 120-124. (Pergamon Press, New York, 1958).
- 5757 R. C. Knechtli, Distributed differential pumping. *Trans. Fourth Natl. Symp., Am. Vac. Soc.* (1957) 83-87. (Pergamon Press, New York, 1958).
- 5758 N. Milleron, Utilization of the surface tension of liquid metals in making high-vacuum seals. *Trans. Fourth Natl. Symp., Am. Vac. Soc.* (1957) 38-41. (Pergamon Press, New York, 1958).
- 5759 J. Morrison, Gas collection and analysis system employed in vacuum tube problems. *Trans. Fourth Natl. Symp., Am. Vac. Soc.* (1957) 100-103. (Pergamon Press, New York, 1958).
- 5760 H. G. Nöller, G. Reich & W. Bächler, Oil diffusion pumps for very low ultimate pressures. *Trans. Fourth Natl. Symp., Am. Vac. Soc.* (1957) 6-12. (Pergamon Press, New York, 1958).
- 5761 G. D. Perkins & D. E. Charpentier, A simple mass spectrometer for the identification of residual gases in high vacuum systems. *Trans. Fourth Natl. Symp., Am. Vac. Soc.* (1957) 125-128. (Pergamon Press, New York, 1958).
- 5762 G. Reich & H. G. Nöller, Production of very low pressures with getter-ion pumps. *Trans. Fourth Natl. Symp., Am. Vac. Soc.* (1957) 97-99. (Pergamon Press, New York, 1958).

- 5763 K. C. Taylor, Vacuum stream degassing. Trans. Fourth Natl. Symp., Am. Vac. Soc. (1957) 157-160. (Pergamon Press, New York, 1958).
- 5764 F. L. Torney, Jr., A new type of vacuum leak detector, Trans. Fourth Natl. Symp., Am. Vac. Soc. (1957) 115-119. (Pergamon Press, New York, 1958).
- 5765 N. A. Florescu, On the measurement of the speed of vacuum pumps. Appl. Sci. Res. 7B, 63-72 (1957).
- 5766 N. A. Florescu, An improvement to the vacuum vapour pump with theoretical and practical consequences. Austr. J. Appl. Sci. 8, 305-316 (1957).
- 5767 E. A. Trendelenburg & J. H. Carmichael, Ion induced re-emission of noble gases from the surface of metal wall ion gauge. (Abstract). Bull. Am. Phys. Soc. 2, 35 (1957).
- 5768 R. Barré, R. Geller & G. Mongodin, Outgassing at room temperature of materials under vacuum. Le Vide 12, 195-201 (1957).
- 5769 R. Horowitz & H. E. LaGow, Upper air pressure and density measurements from 90 to 220 km with the Viking 7 rocket. J. Geophys. Res. 62, 57-78 (1957).
- 5770 J. Schutten, A new electronic circuit for a hot-cathode ionization gauge. Appl. Sci. Res. B6, 276-284 (1957).
- 5771 F. Cordero, H. Matheson & D. P. Johnson, A nonlinear instrument diaphragm. NBS J. Res. 58, 333-337 (1957).
- 5772 W. A. Wildhack, R. F. Dressler & E. C. Lloyd, Investigation of the properties of corrugated diaphragms. 19 references. Trans. Am. Soc. Mech. Eng. 79, 65-82 (1957).
- 5773 J. Antal & A. Koenig, New acoustical method of vacuum measurement. Periodica Polytechnica, Elect. Eng. 1, 297-300 (1957).
- 5774 J. Farguharson & H. A. Kermicle, Precise automatic manometer reader. Rev. Sci. Inst. 28, 324-325 (1957).
- 5775 R. Gilmont, I. Gepner, et al, Pressure control by Cartesian diver. Inst. & Automation 30, 1486-1489 (1957).
- 5776 H. Moser & H. Poltz, A McLeod gage for low pressures. In German. Zt. Instrumentenk. 65, 43-46 (1957).
- 5777 G. F. Wells & C. E. Melton, Mass spectrometer for study of ion-molecule collision processes. Rev. Sci. Inst. 28, 1065-1069 (1957).
- 5778 S. P. Wolsky, Positive-ion bombardment of germanium and silicon. Phys. Rev. 108, 1131-1136 (1957).
- 5779 R. Geller, Generalities about outgassing at room temperature. Le Vide 12, 194 (1957).
- 5780 H. Gervais & J. J. Trillat, Some devices for vacuum work. Le Vide 12, 413-418 (1957).
- 5781 G. Mongodin, Calibration of helium leak detectors. Le Vide 12, 395-397 (1957).
- 5782 J. Antal & A. Koenig, Combined vacuum meter for laboratory use. Acta Phys. Hungar. 7, 117-124 (1957).
- 5783 M. Varičák, Influence of the wall temperature on the sensitivity of the thermal manometer. In French. J. Phys. Rad. 18, Suppl. No. 7, 70A-72A (1957).
- 5784 C. T. Johnson & J. R. Chiles, Jr., The NEL T21 microbarographic recording system. Navy Electronics Lab. Res. & Dev. Report No. 773, 68 p. (1957).
- 5785 G. Reich & H. G. Noeller, Partial pressure analysis of the ultimate pressure of oil diffusion pumps with the omegatron. In German. Zt. angew. Phys. 9, 617-621 (1957).
- 5786 V. V. Mikhnevich, Measuring pressure in the upper atmosphere. Soviet Phys., Advances in Physics, SSSR Acad. Sci. 63 (Sept. 1957). Translation, Russian Literature of Satellites, Part II., Int. Phys. Index, Inc., New York, 9 p. (1960).
- 5787 B. S. Danilin, V. V. Mikhnevich, A. I. Repher & E. C. Shvidkovskii, Problem of measuring density and pressure of upper layers of the atmosphere using an artificial earth satellite. Soviet Physics, Advances in Physics, SSSR Acad. Sci. 63 (Sept. 1957). Translation, Russian Literature of Satellites, Part II., Int. Phys. Index, Inc., New York, 21 p. (1960).
- 5788 A. Herlet & G. Reich, An apparatus for measuring vapor pressure below  $10^{-2}$  Torr. In German. Zt. angew. Phys. 9, 14-23 (1957).
- 5789 C. E. Normand, O. C. Yonts & C. W. Blue, Some observations on the pumping action of a carbon arc in vacuum. Conference on controlled thermonuclear reactions, Berkeley, Cal., p. 462-465 (1957). (TID-7536, Pt. 2).
- 5801 D. J. Santeler, General problems of leak detection and fluid flow in leaks. Gen. Engineering Lab., Gen. Electric Co. Report No. 58GL192 (July 1958).
- 5802 D. J. Santeler, Outgassing characteristics of ionization gages. General Engineering Lab., General Electric Co. Report No. 58GL-154 13 p. (May 1958).

- 5803 D. J. Santeler, Modified mass spectrometer leak detector. General Engineering Lab., General Electric Co. Report No. 58-GL-228, 10 p. (July 1958).
- 5804 D. J. Santeler, Outgassing characteristics of various materials. Gen. Engineering Lab., General Electric Co. Report No. 58GL303 13 p. (Nov. 1958).
- 5805 D. J. Santeler, Vacuum process evaluation. Gen. Engineering Lab., General Electric Co. Report No. 58GL146, 42 p. (May 1958).
- 5806 T. W. Moller & D. J. Santeler, Evaluation of barium getters using vacuum process evaluation. Gen. Engineering Lab., Gen. Electric Co. Report No. 58GL152, 13 p. (1958).
- 5807 R. J. Loneragen, Improvements in high vacuum gages. Armament Research, Dev. Establ. Gt. Brit. ARDE Memo No. MX48/58, 6 p. (1958).
- 5808 L. Amariglio & M. M. Benarie, A corrosion proof vacuum controller for pressures under 1 mm of mercury. J. Sci. Inst. 35, 385 (1958).
- 5809 A. G. Davies, A note on the use of polytetrafluoroethylene in vacuum seals. J. Sci. Inst. 35, 378-379 (1958).
- 5810 R. Eichhorn & T. F. Irvine, Jr., Description of a sensitive micromanometer. Rev. Sci. Insts. 29, 23-27 (1958).
- 5811 R. O. Jenkins, The construction of small vacuum leaks of constant value. J. Sci. Inst. 35, 428-429 (1958).
- 5812 J. R. Anderson, Pressure gauge for corrosive gases in the micron and submicron region. Rev. Sci. Insts. 29, 1073-1078 (1958).
- 5813 H. Wieder & A. W. Smith, Electrical lead for vacuum systems. Rev. Sci. Insts. 29, 794 (1958).
- 5814 J. R. Young, Vacuum limitations of rubber O-ring joints. Rev. Sci. Insts. 29, 795-796 (1958).
- 5815 A. Venema & M. Bandringa, The production and measurement of ultra-high vacua. Philips Tech. Rev. 20, 145-157 (1958).
- 5816 R. J. Corruccini, Gaseous heat conduction at low pressures and temperatures. 22 references. Vacuum 7-8, 19-29 (1958) (publ. 1959).
- 5817 P. della Porta, The gettering process in modern receiving valve manufacture. Vacuum 6, 41-58 (1958) (publ. 1959).
- 5818 J. W. L. DeVilliers, Method for making vacuum feedthrough terminals. Rev. Sci. Inst. 29, 527-528 (1958).
- 5819 N. A. Florescu, Compact oil McLeod gage. Rev. Sci. Inst. 29, 528-529 (1958).
- 5820 R. H. McFarland & D. G. McDonald, Study of the effectiveness of a copper foil trap for mercury in vacuum. Rev. Sci. Inst. 29, 530-531 (1958).
- 5821 C. C. Minter, Thermal conductivity leak detector. Rev. Sci. Inst. 29, 793-794 (1958); 31, 458-459 (1960).
- 5822 R. C. Frank, R. W. Lee & R. L. Williams, Ratio of diffusion coefficients for the diffusion of hydrogen and deuterium in steel. J. Appl. Phys. 29, 898-900 (1958).
- 5823 J. Rothstein, Rate of exhaust through a tube or orifice. Rev. Sci. Inst. 29, 243-244 (1958).
- 5824 C. Cochran, Hydrogen-sensitive McLeod gauge. Rev. Sci. Inst. 29, 69-70 (1958).
- 5825 K. W. Ehlers, Constant-pressure leak-rate gauge. Rev. Sci. Inst. 29, 72 (1958).
- 5826 L. D. Hall, Electronic ultra-high vacuum pump. Rev. Sci. Inst. 29, 367-370 (1958).
- 5827 J. H. Leck, A feedback-controlled Pirani gage. J. Sci. Inst. 35, 107-108 (1958).
- 5828 J. L. Williams & G. F. Eveson, A vibrating condenser manometer. J. Sci. Inst. 35, 97 (1958).
- 5829 E. A. Billett & J. Bishop, A greaseless vacuum seal for rotating shafts. J. Sci. Inst. 35, 70-71 (1958).
- 5830 L. Blanaru, A high-vacuum valve. J. Sci. Inst. 35, 184 (1958).
- 5831 J. O. Cope, Magnetically operated needle valve. Rev. Sci. Inst. 29, 232-234 (1958).
- 5832 E. Glueckauf & G. P. Kitt, Leak testing of vacuum plant by helium analysis. J. Sci. Inst. 35, 220-223 (1958).
- 5833 S. A. Gordon, Construction of small fixed leaks of predictable throughput. 24 references. Rev. Sci. Inst. 29, 501-504 (1958).
- 5834 C. J. Meechan & A. Sosin, Electrically-insulating thermally-conducting vacuum seal for low-temperature use. Rev. Sci. Inst. 29, 323 (1958).
- 5835 A. R. Strad, Mica window assembly for use at elevated bake-out temperatures. Rev. Sci. Inst. 29, 533 (1958).
- 5836 I. Ames, R. L. Christensen & J. Teale, Means for attaining vacua without the use of pump fluids. Rev. Sci. Inst. 29, 736-737 (1958).
- 5837 M. H. Greenblatt, Sealing a calcium fluoride window to glass. Rev. Sci. Inst. 29, 738 (1958).

- 5838 H. T. Knight, Piezoelectric detector for low pressure shock waves. *Rev. Sci. Inst.* 29, 174-175 (1958).
- 5839 J. Seehof, S. Smithberg & M. Armstrong, Electron-permeable window for cathode ray tube. *Rev. Sci. Inst.* 29, 776-778 (1958).
- 5840 H. E. Flotow, B. M. Abraham & R. D. Carlson, Differential pressure gauge for use with liquids and corrosive fluids. *Rev. Sci. Inst.* 29, 869-870 (1958).
- 5841 A. G. Kramer & P. M. Platzman, Microwave manometer. *Rev. Sci. Inst.* 29, 897-898 (1958)
- 5842 W. R. Mickelsen & J. Childs, Theoretical analysis of ultra-high vacuum condensers. *Rev. Sci. Inst.* 29, 871-873 (1958).
- 5843 G. A. Bottomley, A method of obtaining accurate relative pressures in the range 20 to 200 mm of mercury. *J. Sci. Inst.* 35, 254-257 (1958).
- 5844 W. D. Edwards, An insulated vacuum lead-in using an O ring. *J. Sci. Inst.* 35, 111-112 (1958).
- 5845 A. C. Prior, A neoprene vacuum gasket for wires. *J. Sci. Inst.* 35, 382-383 (1958).
- 5846 W. T. Davis, Lag in pressure systems at extremely low pressures. *Natl. Advisory Comm. Aeronaut. Tech. Note No. 4334*, 16 p. (1958).
- 5847 B. M. Bailey & R. L. Chuan, Cryopumping for high vacuum with low power. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 262-267. (Pergamon Press, New York, 1959).
- 5848 N. Beecher & M. P. Hnilicka, High vacuum pumping techniques. 61 references. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 94-100. (Pergamon Press, New York, 1959).
- 5849 W. A. Blonn, The evaporation of various alloys at high temperature in vacuo. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 30-34. (Pergamon Press, New York, 1959).
- 5850 W. E. Briggs, A. C. Jones & J. A. Roberts, Leak detection techniques. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 129-136. (Pergamon Press, New York, 1959).
- 5851 F. C. Brown, Basic techniques in design and construction of the vacuum plant. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 89-93. (Pergamon Press, New York, 1959).
- 5852 J. H. Carmichael & J. S. Knoll, Trapping of noble gas ions and the re-emission of the trapped atoms from nickel and molybdenum. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 18-21. (Pergamon Press, New York, 1959).
- 5853 J. H. Carmichael & W. J. Lange, The use of copper foil isolation traps with ultra-high vacuum systems. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 137-139. (Pergamon Press, New York, 1959).
- 5854 K. Diels & H. Moesta, A new high frequency mass spectrometer and its use in high vacuum technology. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 115-117. (Pergamon Press, New York, 1959).
- 5855 K. A. Geiger, An altitude chamber control. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 110-114. (Pergamon Press, New York, 1959).
- 5856 D. J. Grove, The application of ultra-high vacuum techniques to controlled thermonuclear devices. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 9-17. (Pergamon Press, New York, 1959).
- 5857 L. D. Hall, Properties and behavior of electronic ultra-high vacuum pumps. *Trans. Natl. Symp., Am. Vac. Soc.* (1958) 158-163. (Pergamon Press, New York, 1959).
- 5858 A. R. Hamilton, A pressure-responsive relay control circuit. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 123-125. (Pergamon Press, New York, 1959).
- 5859 E. G. Huschke, Jr., Simple outgassing determinations aid high temperature vacuum brazing. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 50-57. (Pergamon Press, New York, 1959).
- 5860 T. Kraus, A simple formula for the pressure-time dependence during the evacuation of vacuum systems. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 38-40. (Pergamon Press, New York, 1959).
- 5861 A. A. Landfors & M. H. Hablanian, Diffusion pump speed measurements at very low pressures. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 22-24. (Pergamon Press, New York, 1959).
- 5862 G. Lewin & R. Mark, Theory of dissimilar tubular seals of glass, ceramics and metals for critical applications. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 44-49. (Pergamon Press, New York, 1959).
- 5863 A. Lorenz, New design of mechanical vacuum pumps. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 79-82. (Pergamon Press, New York, 1959); *Le Vide* 14, 121-127 (1959).
- 5864 N. Milleron, Some component designs permitting ultra-high vacuum with large oil diffusion pumps. 11 references. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 140-147. (Pergamon Press, New York, 1959).

- 5865 N. Milleron & E. C. Popp, Gettering hydrogen at ultra-low pressures by evaporated metal coatings. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 153-157. (Pergamon Press, New York, 1959).
- 5866 P. della Porta & F. Ricca, The kinetics of the adsorption of nitrogen on barium getters. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 25-29. (Pergamon Press, New York, 1959).
- 5867 P. A. Redhead, The production and measurement of ultra-high vacuum ( $10^{-8}$  -  $10^{-13}$  mm Hg). *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 148-152. (Pergamon Press, New York, 1959).
- 5868 M. P. Rivera & R. P. LeRiche, A compensated thermocouple vacuum gauge. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 118-122. (Pergamon Press, New York, 1959).
- 5869 D. J. Santeler, Outgassing characteristics of various materials. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 1-8. (Pergamon Press, New York, 1959).
- 5870 F. W. Trabert, Effect of cooling diffuser walls on performance of a mercury ejector pump. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 101-104. (Pergamon Press, New York, 1959).
- 5871 E. A. Winzenburger, The effect of rotational speed on the performance of a Roots blower. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 83-85. (Pergamon Press, New York, 1959).
- 5872 R. H. Work, Silica-glass helium leaks as standards in leak detection. *Trans. Fifth Natl. Symp., Am. Vac. Soc.* (1958) 126-128. (Pergamon Press, New York, 1959).
- 5873 R. E. Schlier, Adsorption of oxygen and carbon oxide on tungsten. *J. Appl. Phys.* 29, 1162-1167 (1958).
- 5874 D. Alpert, Production and measurement of ultra-high vacuum. About 180 references. *Handbuch der Physik*, S. Fluegge, Editor, Springer-Verlag, Berlin, v. 12, 609-663 (1958).
- 5875 R. Jaekel, Vacuum physics, In German. *Handbuch der Physik*, S. Fluegge, Editor, Springer-Verlag, Berlin, v. 12, 515-608 (1958).
- 5876 L. D. Hall, Ionic vacuum pumps. 22 references. *Science* 128, 279-285 (1958).
- 5877 W. Becker, A new molecular pump. In German. *Vakuum-Tech.* 7, 149-152 (1958).
- 5878 J. H. Carmichael & E. A. Trendelenburg, Ion induced re-emission of noble gases from a nickel surface. *J. Appl. Phys.* 29, 1570-1577 (1958).
- 5879 J. A. Dillon, Jr. & H. E. Farnsworth, Work function and sorption properties of silicon crystals. *J. Appl. Phys.* 29, 1195-1202 (1958).
- 5880 H. E. Farnsworth, R. E. Schlier, T. H. George & R. M. Burger, Application of the ion bombardment cleaning method to titanium, germanium, silicon, and nickel as determined by low-energy electron diffraction. *J. Appl. Phys.* 29, 1150-1161 (1958).
- 5881 M. E. Haine, E. W. R. Francis & R. N. Bloomer, Removal of gases in high vacuum systems by metal abrasion. *Nature* 182, 931-932 (1958).
- 5882 P. Kisliuck, Using cathode resistance to measure adsorption of gases on metals. *Bell System Tech. J.* 37, 925 (1958).
- 5883 C. H. Rehkopf, Measurements of gas evolution or sorption of anode materials under simulated life conditions. *Sylvania Technol.* 11, 114-116 (1958).
- 5884 G. F. Wells, Precision liquid nitrogen trap level controller. *Rev. Sci. Inst.* 29, 893-895 (1958).
- 5885 D. G. Bills & N. P. Carleton, Adsorption of activated gases. *J. Appl. Phys.* 29, 692-697 (1958).
- 5886 J. H. Beynon & S. Clough, A mass spectrometer mass marker. *J. Sci. Inst.* 35, 289-291 (1958).
- 5887 F. Bernhard, & H. Bumm, The technique of brazing in vacuum. In German. *Vakuum-Tech.* 7, 153-158 (1958).
- 5888 L. Holland, L. Laurenson & J. T. Holden, A new type of titanium getter pump. *Nature* 182, 851-852 (1958).
- 5889 J. Eisinger, Properties of hydrogen chemisorbed on tungsten. *J. Chem. Phys.* 29, 1154-1160 (1958).
- 5890 W. Espe, Quartz, fused quartz and quartzlike glasses as constructional materials in high vacuum work. 63 references. In German. *Vakuum-Tech.* 7, 65-77, 101-110 (1958).
- 5891 P. A. Silberg & C. H. Bachman, Diffusion of hydrogen in palladium. 20 references. *J. Chem. Phys.* 29, 777-781 (1958).
- 5892 R. C. Frank, Some observations regarding the present status of measurement of the diffusion coefficients of hydrogen in iron and mild steel. *J. Appl. Phys.* 29, 1262-1263 (1958).
- 5893 H. Klumb & D. Fuchs, On radiometer forces in the pressure range  $10^{-3}$  to 3 Torr. In German. *Vakuum-Tech.* 7, 131-135 (1958).

- 5894 Y. Tuzi & H. Okamoto, The adsorption of water vapour on lead borosilicate glass in vacuum. *J. Phys. Soc., Japan*, 13, 960-965 (1958).
- 5895 M. G. Manov, Mean gas flow velocity and gas flow rate in jets of high vacuum pumps. *J. Tech. Phys. USSR*, 5, 28, No. 2. Translation *Sov. Phys. Tech. Phys.* 3, 289-296 (1958).
- 5896 O. German, Kinetic theory of the flow of gas through a cylindrical tube. *Soviet Physics, JETP* 34, 1016-1019 (1958).
- 5897 A. Zincke, Glass problems in electron tube technology. *Vakuum-Tech.* 7, 93-100 (1958).
- 5898 G. Haase, McLeod gage with a linear scale. In German. *Chemische Tech. (Beiblatt Glas-Apparate-Technik)* 10, 37-39 (1958).
- 5899 P. Lienard, Manometer responding to a large frequency band for measuring rapidly varying pressure. In French. *NATO AGARD Rept. No.* 170, 15 p. (1958).
- 58100 A. Thom & C. J. Apelt, The pressure in a two-dimensional static hole at low Reynolds numbers. *Aero. Research Comm., Grt. Brit., Repts & Memo., No.* 3090, 13 p. (1958).
- 58101 E. P. Muntz, Pressure measurements in free molecule flow with a rotating arm apparatus. *Univ. Toronto Inst. Aerophysics TN* 22,49 p. (1958).
- 58102 L. J. Griffiths, A modified McLeod gage for low pressure measurements. *Advances in Vacuum Science & Technology, Proc. 1st Int. Cong. on Vac. Techniques*, 263-265 (1958). (Pergamon Press 1960).
- 58103 H. Hintenberger & E. Doernenburg, Applications of mass spectroscopy to vacuum technology. 94 references. *Vakuum-Tech.* 7, 121-130, 159-171 (1958).
- 58104 British Standards Institution, Glossary of terms used in high vacuum technology. *British Std. No.* 2951, 29 p. (1958).
- 58105 D. Allenden, Control circuit for Bayard-Alpert ionization gage. In French. *Le Vide* 13, 247-255 (1958).
- 58106 H. W. Drawin, Electrical capacity-diaphragm vacuum gage. In German. *Vakuum-Tech.* 7, 177-185 (1958).
- 58107 M. Goto, The standard McLeod gage and the calibration of ionization gauges against it. *Advances in Vacuum Science and Technology, Proc. 1st Int. Cong. on Vac. Techniques*, (1958) 266-270. (Pergamon Press, New York, 1960).
- 58108 R. Bénichou, J. C. Blaire & R. P. Henry, Study on the degassing of rubber joints. In French. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques* (1958) 355-363. (Pergamon Press, New York, 1960).
- 58109 D. A. Degras, Measurement of pumping speed. In French. 8 references. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques* (1958) 315-322. (Pergamon Press, New York, 1960).
- 58110 H. W. Drawin, Electrical capacity-diaphragm vacuum gage. In German. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques* (1958) 274-284. (Pergamon Press, New York, 1960).
- 58111 H. Ebert, On vacuum measurement with the McLeod gage. In German. *Advances in Vacuum Science & Technology, Proc. 1st Int. Cong. on Vacuum Techniques* (1958) 260-263. (Pergamon Press, New York, 1960).
- 58112 R. P. Henry, Stabilization of power supply for ionization gages used in industry. In French. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques* (1958) 299-301. (Pergamon Press, New York, 1960).
- 58113 A. M. Grigor'ev, Enlarging the range of the pressures measured by cold-cathode ionization gauges. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques* (1958) 308-310. (Pergamon Press, New York, 1960).
- 58114 J. Groszkowski, Extension of range of a conductivity vacuum gage by compression. In French. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques* (1958) 288-289. (Pergamon Press, New York, 1960).
- 58115 S. Kobayashi, High sensitive hot cathode ionization gage. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques* (1958) 271-273. (Pergamon Press, New York, 1960).
- 58116 S. Komiya & T. Ikeda, The effect on the test dome in the measuring of the speed of an oil-diffusion pump. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques* (1958) 325-328. (Pergamon Press, New York, 1960).
- 58117 J. J. Opstelten & N. Warmoltz, A diaphragm manometer with a linear scale for the range  $10^{-5}$  to 10 mm Hg. In French. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques* (1958) 295-298. (Pergamon Press, New York, 1960).

- 58118 G. F. Vanderschmidt & J. C. Simons, Jr., A new radiological vacuum gauge. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 305-307. (Pergamon Press, New York, 1960).
- 58119 M. Varićak & B. Saftić, The use of thermistors for low pressure-measurements. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 285-287. (Pergamon Press, New York, 1960).
- 58120 N. A. Florescu, Ultra-high vacuum investigations. 28 references. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 367-372. (Pergamon Press, New York, 1960).
- 58121 H. L. Eschbach, Diffusion coefficients and outgassing of helium and hydrogen for various glasses. In German. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 373-377. (Pergamon Press, New York, 1960).
- 58122 S. Garbe, Analysis of residual gases with an omegatron. In German. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 404-409. (Pergamon Press, New York, 1960).
- 58123 H. Huber & M. Warnecke, A titanium pump designed to maintain a vacuum in an electronic tube. *Le Vide* 74, 84-90 (1958); *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 457-462. (Pergamon Press, New York, 1960).
- 58124 I. A. Kaljabina & Y. A. Yakhvidin, Experience in using mass-spectrometric methods in electro-vacuum technology. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 418-426. (Pergamon Press, New York, 1960).
- 58125 A. Klopfer, The omegatron as a partial pressure measuring gage. In German. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 397-400. (Pergamon Press, New York, 1960).
- 58126 A. Klopfer & W. Ermrich, Experiments with titanium ion pumps. In German. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 427-429. (Pergamon Press, New York, 1960).
- 58127 S. Sibata, C. Hayashi & H. Kumagai, A barium getter-ion pump. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 430-432. (Pergamon Press, New York, 1960).
- 58128 H. Kumagai, C. Hayashi, Y. Ishibe, N. Dogi, et al, Characteristics of titanium evaporation pump. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 433-438. (Pergamon Press, New York, 1960).
- 58129 J. H. Leck & G. Carter, Adsorption and desorption of positive ions on glass and metal surfaces. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 463-467. (Pergamon Press, New York, 1960).
- 58130 E. Baronetzky & A. Klopfer, Influence of gas reactions in vacuum systems on the combination of residual gases. In German. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 401-403. (Pergamon Press, New York, 1960).
- 58131 J. Markali, Mechanism of titanium getter and titanium evapor-pump. In German. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 450-452. (Pergamon Press, New York, 1960).
- 58132 P. Prugne & P. Garin, A getter pump with a low temperature trap. In French. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 439-442. (Pergamon Press, New York, 1960).
- 58133 P. A. Redhead, The Townsend discharge in a coaxial diode with axial magnetic field. *Canad. J. Phys.* 36, 255-270 (1958).
- 58134 J. P. Hobson & P. A. Redhead, Operation of an inverted-magnetron gauge in the pressure range  $10^{-3}$  to  $10^{-12}$  mm Hg. *Canad. J. Phys.* 36, 271-288 (1958).
- 58135 J. P. Hobson & P. A. Redhead, Factors limiting ultimate pressure in ultra-high vacuum systems. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 384-388. (Pergamon Press, New York, 1960).
- 58136 P. A. Redhead, Pressure measurements at ultra-high vacuum ( $10^{-8}$  to  $10^{-14}$  mm Hg). *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 410-413. (Pergamon Press, New York, 1960).
- 58137 G. Reich & H. G. Noeller, Ion getter pump for low pressures. In German. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 443-445. (Pergamon Press, New York, 1960).
- 58138 N. W. Robinson & F. Berz, Initial pumping and recovery of ionization gauges. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 378-383. (Pergamon Press, New York, 1960).
- 58139 A. Schram, On a new principle of operation for the titanium getter pump. In French. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 446-449. (Pergamon Press, New York, 1960).
- 58140 J. Schutten, Measurement of ultra-high vacuum. 17 references. *Advances in Vacuum Science Technology, Proc. 1st Int. Cong. on Vacuum Techniques (1958)* 414-417. (Pergamon Press, New York, 1960).

- 58141 A. Venema, The production of ultra-high vacua by means of a diffusion pump. *Advances in Vacuum Science Technology*, Proc. 1st Int. Cong. on Vacuum Techniques (1958) 389-392. (Pergamon Press, New York, 1960).
- 58142 M. I. Winogradoff, Evapor-ion pump. *Advances in Vacuum Science Technology*, Proc. 1st Int. Cong. on Vacuum Techniques (1958) 453-456. (Pergamon Press, New York, 1960).
- 58143 F. B. Newell, Diaphragm characteristics, design and terminology. *Manual*, Am. Soc. Mech. Eng., 74 p. (1958).
- 58144 D. J. Bogardus & J. R. Mahoney, Oak Ridge gaseous diffusion plant reports on 15 years of process mass spectrometry. *Inst. Soc. Am. J.* 5, 26-30 (Aug. 1958).
- 58145 R. Haefler, Progress in the design of oil diffusion pumps. In French. *Revue Univ. des Mines* 14, 21-29 (1958).
- 58146 W. Paul, H. P. Reinhard & U. von Zahn, Electric mass filter as mass spectrometer and isotope separator. *Zt. Phys.* 152, 143-182 (1958).
- 58147 K. Scheibe & W. Wuest, Liquid manometer with photoelectric sensing. In German. *Zt. Instrumentenk.* 66, 185-188 (1958).
- 58148 American Vacuum Society, Glossary of terms used in vacuum technology. Pergamon Press, New York, 63 p. (1958).
- 58149 A. J. Rosenberg, The adsorption of krypton on germanium. *J. Phys. Chem.* 62, 1112-1119 (1958).
- 58150 N. Hackerman & A. C. Hall, The adsorption of water vapor on quartz and calcite. *J. Phys. Chem.* 62, 1212-1214 (1958).
- 58151 W. W. Willmarth, Small barium titanate transducer for aerodynamic or acoustic pressure measurements. *Rev. Sci. Inst.* 29, 218-222 (1958).
- 58152 R. Geller, Vacuum degassing of materials. *Le Vide* 13, 71-76 (1958).
- 58153 L. Holland, The cleaning of glass in a glow discharge. *Brit. J. Appl. Phys.* 9, 410-415 (1958).
- 58154 L. Pátý & R. Neuzilová, A new construction of a high-vacuum high-speed ion pump. *Czech. J. Phys.* 8, 746-747 (1958).
- 58155 B. B. Dayton, International cooperation on vacuum standards and literature abstracting. *Advances in Vacuum Science Technology*, Proc. 1st Int. Cong. on Vacuum Techniques (1958) 71-75. (Pergamon Press, New York, 1960).
- 58156 J. van Katwijk, Experience with the automation of mass spectrometry gas analysis. In German. *Zt. Anal. Chem.* 164, 73-80 (1958).
- 58157 R. Haefler, On automation of high vacuum apparatus based on the requirements for a particle accelerator. In German. *Advances in Vacuum Science Technology*, Proc. 1st Int. Cong. on Vacuum Techniques (1958) 508-513. (Pergamon Press, New York, 1960).
- 58158 J. Bishop, Vacuum techniques in mass spectrometry. *Advances in Vacuum Science Technology*, Proc. 1st Int. Cong. on Vacuum Techniques (1958) 484-490. (Pergamon Press, New York, 1960).
- 58159 J. Blears, E. J. Greer & J. Nightingale, Factors determining the ultimate pressure in large high-vacuum systems. *Advances in Vacuum Science Technology*, Proc. 1st Int. Cong. on Vacuum Techniques (1958) 473-480. (Pergamon Press, New York, 1960).
- 58160 H. Bridge, R. Budde, A. Burger, et al, Some vacuum problems at low temperature. *Advances in Vacuum Science Technology*, Proc. 1st Int. Cong. on Vacuum Techniques (1958) 481-483. (Pergamon Press, New York, 1960).
- 58161 W. L. Donn, The microbarovariograph: a new instrument for measuring minute atmospheric pressure variations. *Trans. Am. Geophys. Union* 39, 366-368 (1958).
- 58162 I. P. Passechnik & N. E. Fedosseenko, An electrodynamic microbarograph with galvanometer recording. *Bull. (Izv) Acad. Sci. USSR, Geophys. Ser. No. 1* (1958).
- 58163 K. E. Wakefield, An investigation of the effect of a Kovar ring on a uniform magnetic field. *Princeton Univ., Proj. Matterhorn, Tech. Memo No. 21*, 15 p. (1958). (NYO-6366).
- 58164 U. O. Hutton & J. F. Gilheany, A two-inch range precision mercury manometer. *NBS Report No. 6193*, 32 p. (1958); *NBS Tech. News Bull.* 43, 71 (1959).
- 5901 G. F. Vanderschmidt, Using isotopes to measure low pressures. *Electronics* 32, 60-61 (June 19, 1959).
- 5902 A. W. Smith, Extended range Pirani gage. *Rev. Sci. Instr.* 30, 485-486 (1959).
- 5903 N. de Haas, Metal-glass vacuum seal for use at low temperatures. *Rev. Sci. Inst.* 30, 594-595 (1959).
- 5904 W. J. Lange, Large ultra-high vacuum valve. *Rev. Sci. Inst.* 30, 602-603 (1959).
- 5905 L. A. Green & A. C. Richardson, A dismantlable vacuum joint for bakeable glass vacuum systems. *J. Sci. Inst.* 36, 324-325 (1959).
- 5906 M. A. Biondi, High-speed nonrefrigerated isolation traps for ultra high-vacuum systems. *Rev. Sci. Inst.* 30, 831-832 (1959).



- 5907 R. A. Rapp, New techniques in the attainment of high vacuum. *Rev. Sci. Inst.* 30, 839-840 (1959).
- 5908 F. G. Allen, J. Eisinger, H. D. Hagstrum & J. T. Law, Cleaning of silicon surfaces by heating in high vacuum. 20 references. *J. Appl. Phys.* 30, 1563-1571 (1959).
- 5909 N. Beecher, High vacuum pumping for modern electronic needs. *Electronics* 32, 66-69 (Oct. 9, 1959).
- 5910 U. O. Hutton, A tilting air-lubricated piston gage for pressures below one-half inch of mercury. *NBS J. Research* 63C, 47-57 (1959).
- 5911 N. W. Spencer & R. L. Boggess, A radioactive ionization gage pressure measurement system. *J. Am. Rocket Soc.* 29, 68-71 (1959).
- 5912 J. L. Peters, Mass spectrometer leak detector with improved sensitivity. *Rev. Sci. Inst.* 30, 1093-1095 (1959).
- 5913 A. Crocker, All-metal high-conductance vacuum tap. *J. Sci. Inst.* 36, 447-448 (1959).
- 5914 N. D. Morgulis, G. Ptushinskii & B. A. Chuikov, Certain features of the partial adsorption of residual gas components at very high vacuum. In Russian. *Doklady Akad. Nauk SSSR* 128 No. 5, 930-932 (1959). Translation, *Soviet Physics, Doklady*, *Am. Inst. Physics* 4, 1108-1110 (1960).
- 5915 D. Alpert, Recent advances in ultra-high vacuum technology. 37 references. *Vacuum* 9, 89-96 (1959).
- 5916 N. C. Balchin & B. L. Mordike, Semi-automatic control of vacuum pumping systems. *Vacuum* 9, 264-268 (1959).
- 5917 R. C. Bradley, Secondary positive ion emission from metal surfaces. *J. Appl. Phys.* 30, 1-8 (1959).
- 5918 G. Carter, Dual pumping speeds of some ionization pumps. *Nature* 183, 1619-1620 (1959).
- 5919 G. Carter, Electrical clean-up of gases in hot cathode discharge tubes. 42 references. *Vacuum* 9, 190-200 (1959).
- 5920 C. L. Gould, Vacuum system for a thirty billion electron volt particle accelerator. *Vacuum* 9, 63-68 (1959).
- 5921 R. G. Herb, Evapor-ion pump development at the University of Wisconsin. *Vacuum* 9, 97-107 (1959).
- 5922 L. Holland, Theory and design of getter-ion pumps. 63 references. *J. Sci. Inst.* 36, 105-116 (1959).
- 5923 R. Jaeckel, The physics and techniques of diffusion pumps. In German. 24 references. *Vacuum* 9, 209-218 (1959).
- 5924 C. G. J. Jansen & A. Venema, A McLeod manometer with prescribed volumes for use as a standard instrument. *Vacuum* 9, 219-230 (1959).
- 5925 I. A. Kaljabina & Y. A. Yukhvidin, Experience in using mass-spectrometric methods in electro-vacuum technology. *Vacuum* 9, 117-125 (1959).
- 5926 M. J. D. Low & H. A. Taylor, Enhanced surface reactions. III. Adsorption of gases on prepared ruthenium surfaces. *J. Electrochem. Soc.* 106, 138-142 (1959).
- 5927 M. L. Lyubimov, K. P. Shakhov & Y. A. Yukhvidin, Experience in designing and manufacturing all-metal vacuum systems. *Vacuum* 9, 108-116 (1959).
- 5928 R. C. Marker, Vacuum techniques and components used for a continuously pumped linear electron accelerator. *Vacuum* 9, 128-133 (1959).
- 5929 L. D. Miller & P. N. Peterson, Automatic level control for liquid nitrogen trap. *Vacuum* 9, 231-232 (1959).
- 5930 D. J. Pacey, A piezoelectric oscillator manometer. *Vacuum* 9, 261-263 (1959).
- 5931 N. W. Robinson & F. Berz, Initial pumping and recovery of ionization gauges. *Vacuum* 9, 48-53 (1959).
- 5932 D. S. Stark, Measurements on the properties of a simple omegatron. *Vacuum* 9, 288-294 (1959).
- 5933 E. Thomas, R. Servranckx & R. Leyniers, On the choice of units of pressure and of flow in vacuum technique. *Vacuum* 9, 207-208 (1959).
- 5934 S. Veis, The measurement of the pressures of various gases by means of a Pirani gauge. *Vacuum* 9, 186-189 (1959).
- 5935 S. A. Vekshinsky, M. I. Menshikov & I. S. Rabinovich, High-vacuum pumps and units for accelerators. *Vacuum* 9, 201-206 (1959).
- 5936 A. Venema, The production of ultra-high vacua by means of a diffusion pump. *Vacuum* 9, 54-57 (1959).
- 5937 L. Dunoyer, The experimental basis of the kinetic theory of gases. *Vacuum* 9, 36-40 (1959).
- 5938 J. Eisinger, Adsorption of oxygen on silicon. *J. Chem. Phys.* 30, 410-412 (1959).
- 5939 J. Eisinger, Adsorption of oxygen on tungsten. *J. Chem. Phys.* 30, 412-416 (1959).

- 5940 W. Espe, Mica as constructional material for high vacuum applications. In German. 74 references. *Vakuu-Tech.* 8, 15-19, 29-38, 67-76 (1959).
- 5941 F. Engel, Gas electrolysis in electron tubes. *Vakuu-Tech.* 8, 44-47 (1959).
- 5942 D. O. Hayward & R. Gomer, Adsorption of carbon dioxide on tungsten. *J. Chem. Phys.* 30, 1617 (1959).
- 5943 J. R. Hearst, S. H. Ahn & E. N. Strait, Vacuum seals at liquid nitrogen temperatures. *Rev. Sci. Inst.* 30, 200 (1959).
- 5944 J. P. Hobson, First adsorbed layer of He at 4.2°K. *Can. J. Phys.* 37, 300-312 (1959).
- 5945 J. F. Kemp, Liquid manometer with electromagnetic balance indicator. *J. Sci. Inst.* 36, 77-81 (1959).
- 5946 H. Klumb & J. Lueckert, Two methods for measuring low vapor pressure. In German. *Vakuu-Tech.* 8, 62-66 (1959).
- 5947 T. Kraus, The pumping speed in high vacuum systems. In German. *Vakuu-Tech.* 8, 39-43 (1959).
- 5948 J. T. Law, Adsorption of hydrogen on silicon. *J. Chem. Phys.* 30, 1568-1576 (1959).
- 5949 S. Petralia & U. Valdre, On the pumping speed of oil diffusion pumps. *Il Nuovo cimento* 12, 616-622 (1959).
- 5950 V. Roberts, Coolable vacuum-tight window seals for optical use. *J. Sci. Inst.* 36, 99 (1959).
- 5951 G. Saini, F. Ricca & A. Nasini, Adsorption of nitrogen on tungsten at ultra-vacuum. *La ricerca Scientifica* 29, 1523-1533 (1959).
- 5952 H. A. Smith, J. C. Posey & C. O. Thomas, Mercury glass check valves. *Rev. Sci. Inst.* 30, 202 (1959).
- 5953 J. R. Young, Cleaning techniques for rubber o-rings used in vacuum systems. *Rev. Sci. Inst.* 30, 291 (1959).
- 5954 F. C. Hurlbut, Electron beam density probe for measurements in rarefied gas flows. *J. Appl. Phys.* 30, 273-279 (1959).
- 5955 J. F. Kemp, Centrifugal manometer. *Trans. Am. Soc. Mech. Eng.* 81, 341-348 (1959).
- 5956 N. S. Silsby, External interference effects of flow through static-pressure orifices of an airspeed head at several supersonic Mach numbers and angles of attack. *Nat. Aero. Space Agency Memo.* 2-13-59L, 14 p. (1959).
- 5957 N. W. Spencer, R. L. Boggess, H. E. LaGow & R. Horowitz, On the use of ionization gage devices at very high altitude. 21 references. *J. Am. Rock. Soc.* 29, 290-294 (1959).
- 5958 H. Suzuki, Analysis of the air micro pressure gage by the Laplace transformation method. *Hosei U. Tech. Coll. Rept. No.* 4, 48-58 (1959).
- 5959 N. M. Wiederhorn, J. H. Vreeland & R. R. Perron, A new instrument for the determination of molecular weight by differential vapor pressure. *USAF Wright Aero. Dev. Center TR* 58-623, 32 p. (1959).
- 5960 G. N. Patterson, Theory of free molecule, orifice-type pressure probes in isentropic and nonisentropic flows. *Univ. Toronto Inst. Aerophysics Rept.* 41, 15 p. (1959).
- 5961 J. Bailleul-Langlais, A radiometer vacuum gage. *Le Vide* 14, 59-73 (1959).
- 5962 C. R. Brymmer & W. Steckelmacher, Demountable vacuum seal for operation at temperatures from -188 to 880°C. *J. Sci. Inst.* 36, 278-281 (1959).
- 5963 H. J. Bueltemann, The influence of water vapor on the readings of compression vacuum gages. *Vakuu-Tech.* 8, 104-108 (1959).
- 5964 D. A. Degras & P. Andrieux, A new thermistor vacuum gage. *Le Vide* 14, 45-58 (1959).
- 5965 J. Holden, L. Holland & L. Laurenson, Bakeable vacuum seals using aluminum-wire gaskets. *J. Sci. Inst.* 36, 281-283 (1959).
- 5966 F. Kirchner, Flow in high vacuum apparatus. In German. *Zt. f. angew. Phys.* 11, 167-169 (1959).
- 5967 M. Varićak & B. Saftić, Principles of semiconductor manometer in pressure range of 1 to 10<sup>-6</sup> mm Hg. *Rev. Sci. Inst.* 30, 891-896 (1959).
- 5968 H. B. Benton, Small, light weight ionization gauge control circuit. *Rev. Sci. Inst.* 30, 887-888 (1959).
- 5969 J. P. Boulloud & J. Schweitzer, Experimental study of metal gasketed joints for ultra-high vacuum. *Le Vide* 14, 241-249 (1959).
- 5970 D. A. Degras, Evapor-ion pump with liquid helium trap. *Le Vide* 14, 128-140 (1959).
- 5971 R. P. Henry, Measurement of outgassing speed by Oatley's method. *Le Vide* 14, 226-240 (1959).
- 5972 E. C. Evans & P. E. Melroy, Cartesian manostat for precise differential pressure control. *Inst. Soc. Am. J.* 6, 39 (Oct. 1959).
- 5973 L. Holland & L. Laurenson, The performance and design of a titanium getter pump. *Le Vide* 14, 141-145 (1959).
- 5974 H. Huber, A. M. Shroff & M. Warnecke, Pumping of electron tubes with the titanium pump. *Le Vide* 14, 214-225 (1959).

- 5975 R. L. Jepson, Important characteristics of new type getter-ion pump. *Le Vide* 14, 80-94 (1959).
- 5976 B. G. Lazarev & M. F. Fedorova, Vacuum adsorption pump. In Russian. *Zhurnal Tekhnicheskoi Fiziki* 29, No. 7 862-865 (1959). Translation: *Soviet Physics, Technical Physics* 4, 778-780 (1960).
- 5977 A. Lorenz, New design of mechanical vacuum pump. *Le Vide* 14, 121-127 (1959).
- 5978 G. Mongodin, Welded pumping assembly for high vacuum, easy to outgas. *Le Vide* 14, 95-97 (1959).
- 5979 K. G. ~~Maier~~<sup>Maeller</sup>, Description of a gauge for ultra-high vacua and remarks about ultra-high vacua techniques for all-metal mountings. *Le Vide* 14, 250-259 (1959).
- 5980 J. Schweitzer, Ultra high vacuum techniques. 22 references. *Le Vide* 14, 165-182 (1959).
- 5981 E. A. Trendelenburg, Production of ultra high vacua with oil diffusion pumps. *Le Vide* 14, 74-79 (1959).
- 5982 A. Venema, Measurement of pumping speed of vacuum pumps. *Le Vide* 14, 113-120 (1959).
- 5983 E. Wintergerst & H. Lintz, Properties and application of metal diaphragms. *Reglungetech.* 7, 160-165 (1959).
- 5984 D. Charles, R. J. Warnecke & J. C. Marchais, Omegetron type low pressure gas analyzer AM 100. *Le Vide* 14, 274-289 (1959).
- 5985 M. Pequignot & M. Yerna, The use of silica seals in the production of special valves with numerous lead-in wires. *Le Vide* 14, 290-294 (1959).
- 5986 R. Servranckx & R. Leyniers, Security valve for vacuum pumping units. *Le Vide* 14, 295-299 (1959).
- 5987 J. W. Beams, Molecular pumping. *Science* 130, 1406-1407 (1959).
- 5988 R. Gomer, Adsorption and diffusion of argon on tungsten. *J. Phys. Chem.* 63, 468-472 (1959).
- 5989 M. V. C. Sastri, T. S. Viswanthan & T. S. Nagarjunan, The influence of a chemisorbed layer of carbon monoxide on subsequent physical adsorption. *J. Phys. Chem.* 63, 518-521 (1959).
- 5990 H. L. Pickering & H. C. Eckstrom, Heterogeneous reaction studies by infrared absorption. *J. Phys. Chem.* 63, 512-517 (1959).
- 5991 R. A. Pierotti & G. D. Halsey, Jr., The interaction of krypton with metals. An appraisal of several interaction theories. *J. Phys. Chem.* 63, 680-686 (1959).
- 5992 J. L. Shereshefsky & B. R. Mazumder, The adsorption of some gases on evaporated metal films and on oxidized films of nickel. *J. Phys. Chem.* 63, 1630-1638 (1959).
- 5993 S. J. Stephens, Surface reactions on evaporated palladium films. *J. Phys. Chem.* 63, 188-194 (1959).
- 5994 R. L. Stow, Titanium as a gettering material. *Nature* 184, Suppl. No. 8, 542-543 (1959).
- 5995 D. G. Bills & A. A. Evett, Glass, a disturbing factor in physical electronics measurements. *J. Appl. Phys.* 30, 564-567 (1959).
- 5996 Y. L. Sandler & M. Gazith, Surface properties of germanium. *J. Phys. Chem.* 63, 1095-1102 (1959).
- 5997 W. F. Wolff & P. Hill, Adsorption of inert gases by modified carbons. *J. Phys. Chem.* 63, 1161-1164 (1959).
- 5998 D. W. McKee, The sorption of hydrocarbon vapors by silica gel. *J. Phys. Chem.* 63, 1256-1259 (1959).
- 5999 R. Klein, Adsorption, diffusion and evaporation of carbon monoxide on tungsten. *J. Chem. Phys.* 31, 1306-1313 (1959).
- 59100 J. C. Boulassier, Vacuum outgassing of material at ambient temperature. *Le Vide* 14, 39-44 (1959).
- 59101 R. K. Burshtein & D. L. Kondrashov, Pirani gage for measuring pressure of corrosive gases. *Zhur. Fiz. Khim.* 33, 1653-1654 (1959).
- 59102 G. Carter & J. H. Leck, Bistable behavior of the Bayard-Alpert ionization gage. *Brit. J. Appl. Phys.* 10, 364-367 (1959).
- 59103 P. K. Dutt & S. K. Mukherjee, A palladium Pirani gage. In English. *Zt. angew. Phys.* 11, 470-474 (1959).
- 59104 A. M. Grigor'ev, Manometers for measuring ultra high vacuum. *Pribory i Tekh. Eksperimenta*, No. 6, 10-13 (1959). Translation, *Inst. & Exp. Tech. Inst. Soc. Am.* p. 870-872 (1960).
- 59105 Z. Knorr, Construction of vacuum apparatus. *Chem. Listy (Prague)* 53, 941-944 (1959).
- 59106 M. I. Menshikov, Development of the technique of obtaining vacuum. 49 references. *Pribory i Tekh. Eksperimenta* No. 4, 3-21 (1959).
- 59107 P. A. Redhead, Magnetron gage: a cold-cathode vacuum gage. *Can. J. Phys.* 37, 1260-1271 (1959).
- 59108 A. A. Sakovich, R. I. Grigor'eva, V. S. Grigor'ev & I. V. Blond, Titanium absorption pump. *Vestnik Electro-Prom* 30, No. 6, 13-16 (1959).

- 59109 E. F. Doil'nitsyn, A. I. Trubetskoi & M. Y. Shcherbakova, Miniature radio frequency mass spectrometer. *Pribery i fekh. Eksperimenta*. No. 2, 81-82 (1959). Translation, *Inst. Soc. Am., Inst. & Exp. Tech.* No. 2, 262-264 (1960).
- 59110 V. M. Gavriilyuk & Y. M. Kucherov, Ionization vacuum gage for measuring pressures of  $10^{-4}$  to  $10^{-10}$  mm Hg. *Pribery i Tekh. Eksperimenta*. No. 2, 83-85 (1959). Translation, *Inst. Soc. Am., Inst. & Exp. Tech.* No. 2, 264-266 (1960).
- 59111 I. O. Grishaev, B. A. Terekhov, L. K. M'yakushko & G. L. Fursov, A titanium pump. *Ukrain. Fiz. Zhur* 4, 750-754 (1959).
- 59112 I. Kanomata, T. Oguri, Y. Kaneko & T. Hayakawa, Mass spectrometer for static operation. *Oyo Butsuri* 28, 584-593 (1959).
- 59113 L. Pátý, Measuring of ultra high vacuum. 35 references. *Pribery i Tekh. Eksperimenta* 6, 3-10 (1959). Translation, *Inst. Soc. Am., Inst. & Exp. Tech.* No. 6, 863-869 (1960).
- 59114 J. Pollard, Progress in vacuum technology. 95 references. *Reports, Progress Phys.* 22, 33-73 (1959).
- 59115 K. Thiele, Electromagnetically controlled all-glass stop-cock for very high vacuum. *Vakuum-Tech.* 8, 223-226 (1959).
- 59116 N. N. Axelrod, Ultra high-vacuum valve. *Rev. Sci. Inst.* 30, 944-945 (1959).
- 59117 H. L. Caswell, Liquid helium trap for high pumping speed at low pressures. *Rev. Sci. Inst.* 30, 1054-1055 (1959).
- 59118 M. T. Dmitriev, A convection manometer. *Pribery i Tekh. Eksper.* No. 3, 148-149 (1959). Translation, *Instruments and Exp. Tech., Inst. Soc. Am.* No. 3, 495-496 (1960).
- 59119 I. P. S. Fish, Method for rapid determination of vacuum outgassing rates. *Rev. Sci. Inst.* 30, 889-890 (1959).
- 59120 C. M. Haaland, Metal bakeout valve for ultra high vacuum. *Rev. Sci. Inst.* 30, 947-948 (1959).
- 59121 A. Kogan, A sensitive two-liquid micromanometer. *Bull. Research Coun. Israel* C7, No. 1, 33-36 (1959).
- 59122 V. Mizushima & Z. Oda, Nonproportionality in Bayard-Alpert ionization gauge and the ultimate vacuum determination of diffusion pumps. *Rev. Sci. Inst.* 30, 1037-1041 (1959).
- 59123 I. E. Nakhutin & E. I. Sutyagina, Adsorption of hydrogen by palladium at low temperatures. *Fiz. metallov i Metallovedenie* 7, 459 (1959).
- 59124 N. W. Robinson, All-metal bakeable taps for high vacuum. *Electronic Engg.* 31, 759-760 (1959).
- 59125 G. Strotzer, On the electrical clean-up of gases in the high-vacuum pressure range. II. *Zt. angew. Phys.* 11, 223-234 (1959).
- 59126 R. M. Barrer & W. I. Stuart, Ion exchange and the thermodynamics of intercrystalline sorption. I. Energetics of occlusion of argon and nitrogen by Faujasite-type crystals. II. Entropy of same. *Proc. Roy. Soc., London*, A249, 464-497 (1959).
- 59127 P. Schuerer & L. Eckertova, Simple construction of glass titanium pump. *Czech. J. Phys.* 9, 753-754 (1959).
- 59128 J. Yarwood, Summarized proceedings of a symposium on current developments in the production of high vacua. *Brit. J. Appl. Physics* 10, 383-391 (1959).
- 59129 E. A. Ab, R. I. Plotnikov & L. A. Khutsishvili, Sorption of hydrogen by titanium and zirconium at low pressures. *Zh. Tekh. Fiz.* 29, No. 9, 1146-1151 (1959).
- 59130 Y. I. Belyakov & E. I. Agishev, The application of the pulse mass spectrometer to the study of gas evolution from metals. *Zh. Tekh. Fiz.* 29, No. 6, 796-798 (1959). Translation, *Soviet Physics-Technical Physics*, *Am. Inst. Phys.* 4, No. 6, 717-719 (1959).
- 59131 M. H. Green & K. H. Maxwell, Adsorption on clean germanium surfaces. *J. Phys. Chem. Solids* 11, 195-204 (1959).
- 59132 K. G. Guenther, Vacuum technology. Report on 1st Int. Cong. on Vacuum Technology, June 10-13, 1959, Namur. In German. 61 references. *Chem. Ing. Tech.* 31, 379-387 (1959).
- 59133 J. W. Wheeldon, Adsorption of sodium and argon by glass. *Brit. J. Appl. Phys.* 10, 295-298 (1959).
- 59134 A. J. Ahearn, Mass spectrographic studies of impurities on surfaces. *Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc.* (1959) 1-5. (Pergamon Press, New York, 1960).
- 59135 S. P. Wolsky & E. J. Zdanuk, The vacuum microbalance and omegatron spectrometer: study of the interaction of oxygen and clean germanium surfaces. 18 references. *Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc.* (1959) 6-11. (Pergamon Press, New York, 1960).
- 59136 P. A. Redhead, The desorption spectrometer as an analytic tool in ultra-high-vacuum investigations. *Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc.* (1959) 12-15. (Pergamon Press, New York, 1960).
- 59137 G. E. Moore, The ionization of adsorbed gas by impact of slow electrons. *Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc.* (1959) 16-19. (Pergamon Press, New York, 1960).

- 59138 R. E. Honig, Ultra-high vacuum studies with a small bakeable mass spectrometer. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 20-26. (Pergamon Press, New York, 1960).
- 59139 A. Klopfer, S. Garbe & W. Schmidt, Residual gases in vacuum systems. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 27-33. (Pergamon Press, New York, 1960).
- 59140 D. Charles & R. J. Warnecke, Jr., Experimental study of a omegatron type mass spectrometer. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 34-41. (Pergamon Press, New York, 1960).
- 59141 I. Farkass & G. F. Vanderschmidt, The production of ultra-high vacuum in metal systems larger than one thousand liters. 16 references. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 42-47. (Pergamon Press, New York, 1960).
- 59142 J. C. Simons, Jr., An ultra-high vacuum chamber for space simulation. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 48-54. (Pergamon Press, New York, 1960).
- 59143 M. Rivera & R. Le Riche, A differentially pumped ultra-high vacuum system. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 55-59. (Pergamon Press, New York, 1960).
- 59144 H. Schwarz, Ultra-high vacuum pumping by vibrating membrane. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 60-65. (Pergamon Press, New York, 1960).
- 59145 H. L. Caswell, An oil-free ultra-high vacuum system for the deposition of thin films. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 66-71. (Pergamon Press, New York, 1960).
- 59146 H. G. Noeller, G. Reich & W. Baechler, Diffusion pump and baffle system of large suction speeds for pressures lower than  $10^{-8}$  Torr. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 72-74. (Pergamon Press, New York, 1960).
- 59147 N. A. Florescu, New method for vacuum measurements in the molecular range of pressures. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 75-81. (Pergamon Press, New York, 1960).
- 59148 J. R. Roehrig & G. F. Vanderschmidt, Advances in the design of vacuum gauges using radioactive materials. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 82-84. (Pergamon Press, New York, 1960).
- 59149 R. L. Ramey, The theory and design of sub-miniature ionization gauge tubes. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 85-88. (Pergamon Press, New York, 1960).
- 59150 P. L. Vitkus, A multi-point vacuum measuring system for low pressure wind tunnels. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 89-93. (Pergamon Press, New York, 1960).
- 59151 J. L. Peters, An ultra-sensitive mass spectrometer leak detector and its application to vacuum technology. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 94-96. (Pergamon Press, New York, 1960).
- 59152 C. B. Bicknell, An improved helium-only sensitive method for calibrating silica membrane helium leaks. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 97-100. (Pergamon Press, New York, 1960).
- 59153 B. B. Dayton, Relations between size of vacuum chamber, outgassing rate, and required pumping speed. 45 references. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 101-119. (Pergamon Press, New York, 1960).
- 59154 D. J. Santeler, Pressure simulation of outer space. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 129-133. (Pergamon Press, New York, 1960).
- 59155 D. L. Stevenson, A new type of boiler that permits improvements in the performance of oil diffusion pumps. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 134-139. (Pergamon Press, New York, 1960).
- 59156 H. R. Smith, Relationship of diffusion pump performance to the thermodynamics of the pumping fluid. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 140-145. (Pergamon Press, New York, 1960).
- 59157 W. K. Huber & E. A. Trendelenburg, Recent developments of ultra-high vacuum systems using oil diffusion pumps. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 146-149. (Pergamon Press, New York, 1960).
- 59158 W. G. Henderson, J. T. Mark & C. S. Geiger, Evaluation of large diffusion pumps and traps for the ultra-high vacuum system of the Model C-Stellarator. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 170-175. (Pergamon Press, New York, 1960).
- 59159 G. E. Becker, Adsorption of gases on mercury at 77°K. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 197-203. (Pergamon Press, New York, 1960).
- 59160 T. Kraus, On the use of the pumping time equation in the vacuum technique. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 204-205. (Pergamon Press, New York, 1960).

- 59161 S. R. Mielczarek, D. C. Schubert & L. Marton, Apparatus for electron optical study of low-density gas flow. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 206-209. (Pergamon Press, New York, 1960).
- 59162 F. R. Gleason, J. H. Greiner & L. R. Yetter, Gas absorption by vacuum evaporated magnetic films. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 223-227. (Pergamon Press, New York, 1960).
- 59163 K. H. Behrndt, A demountable ultra-high vacuum glass system and its components. 28 references. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 255-260. (Pergamon Press, New York, 1960).
- 59164 H. Ehlers & J. Moll, Results with ultra-high vacuum metal system including windows, evaporators and lead-ins. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 261-264. (Pergamon Press, New York, 1960).
- 59165 T. H. Batzer, A large bakeable vacuum valve. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 265-267. (Pergamon Press, New York, 1960).
- 59166 H. R. Smith & P. B. Kennedy, Ultra-low temperature mechanical refrigeration systems for high-vacuum traps and baffles. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 271-277. (Pergamon Press, New York, 1960).
- 59167 J. A. Zollman, I. E. Martin & J. A. Powell, Ceramic, sapphire and glass seals for the model C-stellarator. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 278-282. (Pergamon Press, New York, 1960).
- 59168 F. A. Loughridge & W. S. Wong, Improved reliability of soft glass to metal vacuum tight seals. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 283-287. (Pergamon Press, New York, 1960).
- 59169 J. Morrison, The behavior of titanium in a high vacuum. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 291-296. (Pergamon Press, New York, 1960).
- 59170 A. Klopfer & W. Ermrich, Properties of a small titanium-ion pump. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 297-301. (Pergamon Press, New York, 1960).
- 59171 W. M. Brubaker, A method for greatly enhancing the pumping action of a Penning discharge. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 302-306. (Pergamon Press, New York, 1960).
- 59172 R. Zaphiropoulos & W. A. Lloyd, Design considerations for high speed getter-ion pumps. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 307-310. (Pergamon Press, New York, 1960).
- 59173 I. Ames & R. L. Christensen, Some studies of getter-ion pumped vacuum systems. 19 references. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 311-316. (Pergamon Press, New York, 1960).
- 59174 P. della Porta, Recent information on the gettering of gases by barium films. Trans. 6th Natl. Symp. on Vacuum Tech., Am. Vacuum Soc. (1959) 317-324. (Pergamon Press, New York, 1960).
- 59175 S. P. Wolsky, Studies of semiconductor materials using vacuum microbalance. Semiconductor Products 2, 36-41 (1959).
- 59176 G. Ehrlich, Molecular processes at the gas-solid interface. 160 references. Proceedings, Int. Conf. on Structure and Properties of Thin Films, Bolton Landing, N. Y. (Sept. 1959) 423-475. (Wiley & Sons, 1959).
- 59177 G. Thuronyi, Selected annotated bibliography on propagation of acoustic and explosion waves in the atmosphere. 122 references. Meteorological Abstracts and Bibliography, Am. Meteor. Soc. 10, 1072-1098 (1959).
- 59178 T. Punter, Methods of cleaning glass by vapour degreasing and ultrasonically agitated solvents. Brit. J. Appl. Phys. 10, 332-336 (1959).
- 6001 C. Y. Bartholomew & A. R. LaPadula, Penetration depth investigation of gas cleanup with radioactive tracers. J. Appl. Phys. 31, 445 (1960).
- 6002 T. W. Hickmott, Interaction of atomic hydrogen with glass. J. Appl. Phys. 31, 128-136 (1960).
- 6003 C. C. Leiby, Jr. & C. L. Chen, Diffusion coefficients, solubilities, and permeabilities for He, Ne, H<sub>2</sub>, and N<sub>2</sub> in vycor glass. J. Appl. Phys. 31, 268-274 (1960).
- 6004 B. J. Todd, J. L. Lineweaver & J. T. Kerr, Outgassing caused by electron bombardment of glass. J. Appl. Phys. 31, 51-55 (1960).
- 6005 H. D. Hagstrum & C. D'Amico, Production and demonstration of atomically clean metal surfaces. J. Appl. Phys. 31, 715-723 (1960).
- 6006 P. della Porta & F. Ricca, The gettering of carbon monoxide by barium films. 77 references. Le Vide 15, 3-27 (1960).
- 6007 M. Warnecke & P. C. Moutou, On a miniature titanium pump. Le Vide 15, 41-51 (1960).
- 6008 H. H. Reamer & B. H. Sage, High pressure manometer. Rev. Sci. Inst. 31, 337-341 (1960).

- 6009 W. G. Brombacher, D. P. Johnson & J. L. Cross, Mercury barometers and manometers. NBS Monograph No. 8, 59 p. (1960).
- 6010 J. M. Anderson, Thin vacuum-tight mica window suitable for baking at 500° C. Rev. Sci. Inst. 31, 898-899 (1960).
- 6011 L. A. Harris, Trapping with alumina in vacuum systems and its effect on cathode activity. Rev. Sci. Inst. 31, 903-904 (1960).
- 6012 G. Thomaes & R. Van Steenwinkel, Measurement of small differences in the second virial coefficient of gases below 0° C. Rev. Sci. Inst. 31, 825-827 (1960).
- 6013 N. A. Florescu, On the conductance of systems for molecular flow of gases. 12 references. Le Vide 15, 197-209 (1960).
- 6014 J. Herbert, New applications of glass in electronics. Le Vide 15, 268-285 (1960).
- 6015 W. Huber & E. A. Trendelenburg, Recent developments of ultra-high vacuum systems using oil diffusion pumps. Le Vide 15, 132-139 (1960).
- 6016 J. Pierre, Calibration systems in vacuum technique. Le Vide 15, 210-219 (1960).
- 6017 R. Rocherolles, Pumping of tubes on a double pumping unit. Le Vide 15, 112-119 (1960).
- 6018 W. Dahlke & H. J. Schuetze, Residual gas pressure in electron tubes. Method of measurement. Vacuum 10, 3-4 (1960).
- 6019 H. J. Schuetze & H. W. Ehlbeck, Residual gas in electron tubes. Experimental results. Vacuum 10, 5-6 (1960).
- 6020 A. Klopfer, S. Garbe & W. Schmidt, Residual gases in vacuum systems. Vacuum 10, 7-12 (1960).
- 6021 S. P. Wolsky & E. J. Zdanuk, The investigation of residual gases in vacuum systems. Vacuum 10, 13-21 (1960).
- 6022 J. C. Franken & J. Van Der Waal, Residual gases in picture tubes. Vacuum 10, 22-26 (1960).
- 6023 R. H. Collins & J. C. Turnbull, Evolution and absorption of gases in electron tubes. Vacuum 10, 27-30 (1960).
- 6024 W. Tretner, An electrostatic mass spectroscope. Vacuum 10, 31-34 (1960).
- 6025 G. Reich & F. Flecken, Analysis of partial pressures by means of omegatron and farvitron. Comparative view of the ranges of application. Vacuum 10, 35-39 (1960).
- 6026 J. P. Freytag, Use of a test diode as a means of controlling the materials of construction of electronic tubes. In French. 25 references. Vacuum 10, 40-48 (1960).
- 6027 R. J. Warnecke, Jr., Application of mass spectrometers in electron tube technology. In French. Vacuum 10, 49-57 (1960).
- 6028 F. A. Baker & T. A. Giorgi, The applicability of the omegatron to continuous analysis of residual gases. Vacuum 10, 58-63 (1960).
- 6029 G. Calvi, Double Pirani bridge leak detector. Vacuum 10, 64-67 (1960).
- 6030 A. Nasini, F. Ricca & G. Saini, Clean surfaces and sorption of gases. 29 references. Vacuum 10, 68-74 (1960).
- 6031 N. W. Robinson, The action of molybdenum, tungsten, tantalum and nickel on residual gases in a vacuum system. Vacuum 10, 75-80 (1960).
- 6032 S. Garbe, A. Klopfer & W. Schmidt, Some reactions of water in electron tubes. Vacuum 10, 81-85 (1960).
- 6033 S. H. Cross, System design and the choice of materials for the Nimrod vacuum system. Vacuum 10, 86-91 (1960).
- 6034 K. Hashimoto, H. Iwayanagi & H. Fukushima, Measurement of gas evolution and absorption from materials used in vacuum tubes. Vacuum 10, 92-99 (1960).
- 6035 R. W. Lawson, The influence of residual gas on the performance of the British Post Office submarine telephone repeater valve type 6P12. Vacuum 10, 100-105 (1960).
- 6036 N. W. W. Smith, Noise reduction in microwave tubes by getter-ion pumping. Vacuum 10, 106-109 (1960).
- 6037 T. H. Briggs & S. Nadeau, Effects of continuous gas clean-up upon cathode emission and cathode interface impedance. 10 references. Vacuum 10, 112-117 (1960).
- 6038 R. A. Haefler, On the use of metal-oil diffusion pumps when operating with discharge tubes sensitive to hydrocarbons. 14 references. Vacuum 10, 118-120 (1960).
- 6039 L. Malter & H. Mandoli, Electron tube processing with getter-ion pumps. Vacuum 10, 121-127 (1960).
- 6040 A. Klopfer & W. Ermrich, Properties of a small titanium-ion pump. Vacuum 10, 128-132 (1960).
- 6041 L. Holland & A. Harfe, The gas sorption characteristics of Penning pumps and titanium films. Vacuum 10, 133-140 (1960).
- 6042 J. Bailleul-Langlais, Barium getters in electronic receiving tubes. In French. 48 references. Vacuum 10, 143-150 (1960).
- 6043 K. Hashimoto & K. Kitagawa, Some barium getter problems on the vacuum tubes. Vacuum 10, 156-161 (1960).

- 6044 J. M. Sourdillon, Use of zirconium sintered getters. In French. *Vacuum* 10, 162-165 (1960).
- 6045 J. H. N. van Vucht, The Ceto getter--its chemical structure and hydrogen gettering properties. *Vacuum* 10, 170-177 (1960).
- 6046 S. Fukagawa, Gettering activity of Zr, Ti and Ba for oxygen gas under mercury vapour. *Vacuum* 10, 178-180 (1960).
- 6047 P. della Porta, Apparatus and techniques for measurement of the adsorption of gases by evaporated getters. 14 references. *Vacuum* 10, 181-187 (1960).
- 6048 M. G. Charlton, D. Newson & P. J. Whitchurch, An automatic apparatus for the testing of getter adsorption. *Vacuum* 10, 189-193 (1960).
- 6049 P. della Porta, S. Origlio & E. Argano, The influence of ionizing currents and hot filaments on the gas adsorption by barium films. 13 references. *Vacuum* 10, 194-198 (1960).
- 6050 J. J. B. Franssen & H. J. R. Perdijk, The absorption of gases by barium getter films applied as a tool. *Vacuum* 10, 199-203 (1960).
- 6051 H. J. R. Perdijk, Structure of barium getter films. *Vacuum* 10, 204-209 (1960).
- 6052 K. M. Yazawa, Study of the surface structure of barium getter deposited film by an electron microscope. *Vacuum* 10, 210-211 (1960).
- 6053 M. G. Charlton & F. H. Southam, The adsorption of methane by barium films in the presence of a thermionic current. *Vacuum* 10, 212-214 (1960).
- 6054 F. Ricca & P. della Porta, Carbon monoxide sorption by barium films. 26 references. *Vacuum* 10, 215-222 (1960).
- 6055 P. della Porta & E. Argano, Nitrogen sorption by barium films. *Vacuum* 10, 223-226 (1960).
- 6056 P. della Porta & S. Origlio, Hydrogen sorption by barium films. *Vacuum* 10, 227-230 (1960).
- 6057 J. Hejzlar & V. Horáček, Selective getters. 8 references. *Vacuum* 10, 231-233 (1960).
- 6058 S. Jerič & E. Kanský, A method of measuring of caesium vapour pressure in photoelectric tubes. *Vacuum* 10, 234-239 (1960).
- 6059 E. Kanský & S. Jerič, Some results of the measurement of caesium vapour pressure in photoelectric tubes during their manufacture and life. *Vacuum* 10, 240-244 (1960).
- 6060 N. A. Florescu, The theoretical development of the vapour vacuum pump. *Vacuum* 10, 250-259 (1960).
- 6061 R. N. Bloomer, On the general principles of chemical and ionic pumping. 20 references. *Vacuum* 10, 260-262 (1960).
- 6062 H. Batey, Carbon contamination of glassware used for vacuum purposes. *Vacuum* 10, 263-265 (1960).
- 6063 L. Ellsworth, Calibration factors of ionization gauges for hydrocarbon gas mixtures. *Vacuum* 10, 266-267 (1960).
- 6064 G. Hinzpeter, A hot cathode ionization gage for measuring pressures to  $10^{-1}$  Torr. In German. *Experimentelle Tech. Phys.* 8, 89-95 (1960).
- 6065 R. Gilmont, Improved McLeod gage. *Inst. and Control Systems* 33, 1350-1351 (1960).
- 6066 H. L. Eschbach & R. Jaeckel, Enamelled walls for ultra high vacuum containers. In German. *Zt. Naturforsch.* 15a, 268-269 (1960).
- 6067 T. & A. Roth, Nomographic design of vacuum installations. *Brit. Chem. Eng.* 5, 392-400 (1960).
- 6068 J. Siedlewski & K. Karpinski, Adsorption methods of determining the surface area of adsorbents and catalysts. 45 references. *Wiadomości Chemi.* 14, 279-294 (1960).
- 6069 L. A. Camby & C. J. Milner, Sensitivity of the omegatron. *Rev. Sci. Inst.* 31, 776 (1960).
- 6070 G. Barnes, New type of cold cathode vacuum gauge for the measurement of pressures below  $10^{-3}$  mm Hg. *Rev. Sci. Inst.* 31, 608-611 (1960).
- 6071 F. A. Baker, Nonproportionality in the Bayard-Alpert ionization gauge. *Rev. Sci. Inst.* 31, 911 (1960).
- 6072 N. A. Florescu, Design of glass oil-vapour vacuum pumps. *Lab. Practice* 9, 33-34 (1960).
- 6073 R. H. Goodall, Transparent electroconductive coatings on lead glass. *Rev. Sci. Inst.* 31, 344-345 (1960).
- 6074 B. Gorowitz, K. Moses & P. Gloersen, Magnetically driven fast-acting valve for gas injection into high vacua. *Rev. Sci. Inst.* 31, 146-148 (1960).
- 6075 N. R. Daly, High sensitivity mass spectrometer leak detector. *Rev. Sci. Inst.* 31, 720-723 (1960).
- 6076 O. M. Katz & E. A. Gulbransen, Permeability and diffusivity of hydrogen through a palladium tube. *Rev. Sci. Inst.* 31, 615-617 (1960).



- 6077 Westinghouse Mfg. Co., Measurement of ultra-low pressures. *Electronics* 33, 106 (Nov. 11, 1960).
- 6078 L. R. Linner, R. I. George & R. B. McQuistan, Automatic vacuum control in the 760 to  $1 \times 10^{-8}$  Torr range. *Rev. Sci. Inst.* 31, 650-652 (1960).
- 6079 P. A. Redhead, Modulated Bayard-Alpert gauge. *Rev. Sci. Inst.* 31, 343-344 (1960).
- 6080 D. E. Swets, Application of the RCA 1945 gauge to the analysis of hydrogen in metals. *Rev. Sci. Inst.* 31, 659 (1960).
- 6081 H. W. Drawin, The applicability of a capacity micromanometer as a vacuum gage. In German. *Zt. Instrumentenk.* 68, 1-8 (1960).
- 6082 D. D. Eley & P. R. Wilkinson, Adsorption and oxide formation on aluminum films. *Proc. Roy. Soc., London*, A254, 327-342 (1960).
- 6083 T. W. Hickmott, Interaction of hydrogen with tungsten. *J. Chem. Phys.* 32, 810-823 (1960).
- 6084 W. S. Kreisman, Methods of using a McLeod gauge to measure higher pressures. *Rev. Sci. Inst.* 31, 782-784 (1960).
- 6085 L. A. Noble, W. H. Sain & R. K. Waits, Compact palladium diffusion leak for hydrogen. *Rev. Sci. Inst.* 31, 789-790 (1960).
- 6086 L. Pátý, An experimental equipment for obtaining very low pressures. In Czech. *Slaboproudý Obzor* 21, 106-109 (1960).
- 6087 H. Schwarz, Forced periodic changes of kinetic energy of gas molecules as a means of vacuum measurement. *Rev. Sci. Inst.* 31, 433-439 (1960).
- 6088 P. Weulersse, M. Balkanski & P. Aigrain, Study of chemisorption and photodesorption on oxidized titanium. In French. *Compte Rend. Acad. Sci.* 250, 1246-1248 (1960).
- 6089 Y. I. Belyakov & N. I. Ionov, Pulsed mass-spectrograph investigation of desorption of hydrogen and deuterium from palladium. *Zh. Tekh. Fiz.* 30, No. 2, 216-222 (1960). Translation, *Soviet Physics, Technical Physics*, *Am. Inst. Physics*, 5 No. 2, 195-200 (1960).
- 6090 K. B. Blodgett & T. A. Vanderslice, Mechanism of inert gas cleanup in a gaseous discharge. *J. Appl. Phys.* 31, 1017-1023 (1960).
- 6091 R. K. Burshtein, L. A. Larin & G. F. Voronina, Chemisorption of oxygen on germanium. *Dokl. Akad. Nauk. SSSR* 130, No. 4, 801-803 (1960).
- 6092 K. W. T. Elliott, D. C. Wilson, F. C. P. Mason & P. H. Bigg, Primary standard barometer of range 0 to 1200 mb. *J. Sci. Inst.* 37, 162-166 (1960).
- 6093 M. Green & K. H. Maxwell, The adsorption of oxygen on clean silicon surfaces. *J. Phys. Chem. Solids* 13, 145-150 (1960).
- 6094 F. A. Lewis & W. H. Schurter, Absorption of hydrogen by palladium-silver alloys. *Naturwissenschaften* 47, 177-178 (1960).
- 6095 W. McGowan & L. Kerwin, Some sensitivities of ion gauges. *Can. J. Phys.* 38, 567-569 (1960).
- 6096 L. Pátý, Pumping effect of a gas discharge high-vacuum pump. *Nature* 185, 674-675 (1960).
- 6097 J. F. Sayers, Epoxy-resin joints for sealed-off high vacuum tubes. *J. Sci. Inst.* 37, 203-205 (1960).
- 6098 O. Sinanoğlu & K. S. Pitzer, Interactions between molecules adsorbed on a surface. *J. Chem. Phys.* 32, 1279-1288 (1960).
- 6099 F. G. Allen, T. M. Buck & J. T. Law, p Layers on vacuum heated silicon. *J. Appl. Phys.* 31, 979-985 (1960).
- 60100 R. N. Bloomer & W. C. Brooks, Simple detector for small leaks using a thoriated tungsten emitter with oxygen as a probe gas. *J. Sci. Inst.* 37, 306-307 (1960).
- 60101 P. Bouyer, C. Cassagnol & P. Lazeyras, An all-metal leak valve. *Le Vide* 15, 297-300 (1960).
- 60102 W. E. Danforth & D. L. Goldwater, Density of a thorium monolayer for maximum thermionic emission. *J. Appl. Physics* 31, 1715-1717 (1960).
- 60103 M. Green & K. H. Maxwell, Cut-off for the vacuum manipulation of chlorine. *J. Sci. Inst.* 37, 303-304 (1960).
- 60104 A. E. D. Heylen, Bakeable bellows-type differential pressure manometer. *J. Sci. Inst.* 37, 251-252 (1960).
- 60105 D. Lichtman, Use of the omegatron in the determination of parameters affecting limiting pressures in vacuum devices. *J. Appl. Phys.* 31, 1213-1221 (1960).
- 60106 G. Mesnard & R. Uzan, Temperature variations of oxide coated cathode produced by current flow. *Le Vide* 15, 301-312 (1960).
- 60107 J. Pierre, Fluid traps in vacuum technique. *Le Vide* 15, 313-323 (1960).
- 60108 P. Cannon, The submonolayer adsorption of argon and krypton on molybdenum disulphide; phenomenological comparison with studies on graphite. *J. Phys. Chem.* 64, 858-861 (1960).
- 60109 B. H. Clampitt & D. E. German, Adsorption on porous solids. *J. Phys. Chem.* 64, 284-286 (1960).

- 60110 G. L. Gaines, Jr., & P. Cannon, On the energetics of physically adsorbed films, with particular reference to the use of krypton for surface area measurement. *J. Phys. Chem.* 64, 997-1000 (1960).
- 60111 D. T. Peterson & D. G. Westlake, Diffusion of hydrogen in thorium. *J. Phys. Chem.* 64, 649-651 (1960).
- 60112 R. H. Mueller, Wide range electronic micro-manometer useful in research laboratory. *Anal. Chem.* 32, 103A-106A (Nov. 1960).
- 60113 G. Barnes, Erroneous readings of large magnitude in a Bayard-Alpert ionization gauge and their probable cause. 36 references. *Rev. Sci. Inst.* 31, 1121-1127 (1960).
- 60114 H. J. Bixler, A. S. Michaels & R. B. Parker, Use of McLeod gauges at room temperature for gases with high critical temperature. *Rev. Sci. Inst.* 31, 1155 (1960).
- 60115 A. O. Nier, Small general purpose double focusing mass spectrometer. 27 references. *Rev. Sci. Inst.* 31, 1127-1132 (1960).
- 60116 K. Hickman, Pump fluids for higher vacuums. *Nature* 187, 405-406 (1960).
- 60117 R. Schneiderreit, A vacuum gage for normal pressure to high vacuum in one range with continuous indication. In German. *Vakuum-Tech.* 9, 128-130 (1960).
- 60118 A. P. Flanick & J. Ainsworth, A thermistor pressure gauge. *Natl. Aero. Space Adm. Technical Note D-504*, 13 p. (1960).
- 60119 W. G. Van Dorn, A low frequency microbarograph. *J. Geophys. Res.* 65, 3693-3698 (1960).
- 60120 M. W. Roberts, High vacuum techniques. 44 references. *J. Roy. Inst. Chem.* 84, 275-282 (1960).
- 60121 W. B. Nottingham & F. L. Torney, Jr., A detailed examination of the principles of ion gauge calibration. MIT Research Lab. of Electronics Tech. Report 379, 10 p. (1960).
- 60122 L. H. Germer & C. D. Hartman, Oxygen on nickel. *J. Appl. Phys.* 31, 2085-2095 (1960).
- 60123 J. R. Friendly, Jr., Integration of current through getter-ion pumps. *Rev. Sci. Inst.* 31, 1350 (1960).
- 60124 S. Leefe & M. Liebson, Leveling system for liquid nitrogen. *Rev. Sci. Inst.* 31, 1353-1354 (1960).
- 60125 C. F. Robinson, Mass spectrometry, p. 463-544, in *Physical methods in chemical analysis*, edited by W. J. Ber1, 2d rev. edition, V1, Academic Press (1960).
- 60126 N. A. Florescu, Improvement in operation with McLeod gauge. *Vacuum* 10, 329-330 (1960).
- 60127 K. G. Guenther, A partial pressure gauge working according to the principle of the electrical mass filter. *Vacuum* 10, 293-309 (1960).
- 60128 R. Hawley, Vacuum as an insulator. 85 references. *Vacuum* 10, 310-318 (1960).
- 60129 G. Horikoshi & A. Miyahara, High speed ionization gauge. *J. Vacuum Soc., Japan* 3, 13-18 (1960).
- 60130 R. O. Jenkins & W. G. Trodden, Physical processes in small titanium ion pumps. *Vacuum* 10, 319-328 (1960).
- 60131 K. Kawasaki, T. Sugita, et al, An ultra-high vacuum mass spectrometer. *J. Vacuum Soc., Japan* 3, 96-103 (1960).
- 60132 P. Schwerdtfeger, A tetrode ionization gauge. *Vacuum* 10, 330-331 (1960).
- 60133 F. A. Baker & T. A. Giorgi, Sorption and desorption in a hot-cathode ionization gage. *Brit. J. Appl. Phys.* 11, 433-436 (1960).
- 60134 L. Holland & L. Laursen, Pumping characteristics of a titanium droplet getter-ion pump. *Brit. J. Appl. Phys.* 11, 401-407 (1960).
- 60135 H. J. Bomelburg, Miniature hot wire pressure gages for wind tunnel work. *Ballistic Res. Labs., Aberdeen Proving Ground, BRL Report No. 1095*, 25 p. (1960).
- 60136 W. S. Kreisman, A high vacuum gauge calibration system. *Geophysics Corp. of Am. Tech. Report 60-2*, 26 p. (1960). *Natl. Aero. Space Adm. Contract NAS 5-270*.
- 60137 H. R. Pass, A semi-automatic McLeod gauge. *Univ. So. Calif., Engineering Center, USCEC Report No. 56-211*, 36 p. (1960).
- 60138 L. H. Rovner, Ultra-high vacuum physics. Measurement of low pressures of oxygen. *Cornell Univ., Dept. Engineering Phys. Xerox Tech. Reprt No. 3*, 34 p. (1960). *Contract Nonr-401 (31)*.
- 60139 A. Klopfer & W. Schmidt, An omegatron mass spectrometer and its characteristics. *Vacuum* 10, 363-372 (1960).
- 60140 I. Morita, F. Kanematsu & S. Mito, Experiments on a simple getter-ion pump. *J. Vacuum Soc., Japan* 3, 263-268 (1960).
- 60141 H. H. Podgurski & F. N. Davis, A precision McLeod gage for volumetric gas measurement. *Vacuum* 10, 377-381 (1960).
- 60142 G. Schuchhardt, Ion movements in an omegatron. *Vacuum* 10, 373-376 (1960).
- 60143 E. J. Zdanuk, R. Bierig, L. G. Rubin & S. P. Wolsky, An omegatron spectrometer, its characteristics and application. *Vacuum* 10, 382-389 (1960).

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#### 4. SUBJECT INDEX

The subject index covers the material in the references as completely as possible, based mostly on a perusal of the reference, in some cases on an abstract and rarely only on the title.

The headings require some discussion. Out-gassing and degassing are indexed under "Degassing" for convenience, since the phenomena are in many cases too closely related to be easily separated. For the same reason, papers on permeability and diffusion are indexed under "Diffusion of gases".

Gettering action has been covered under five headings: "Getters," under which gettering materials are covered; "Ion pumps" and "Getter-ion pumps," under which specific designs are covered; "Gettering action, ionization gages," the importance of which seemed to warrant a separate heading; and last, "Clean-up of gases, electrical," under which gettering action not otherwise covered is indexed.

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instrumentation which it is desired to discuss. Two headings are used, "Micromanometers, liquid type" and "Mechanical pressure and vacuum gages." The latter heading is preferable to "Micromanometers" because many designs of mechanical micromanometers have possible application to the vacuum range.

Finally, a distinction has been made between gaskets and seals. Mainly the design or physical properties of the gaskets are covered under "Gaskets," and the application and assemblies under "Seals."

In using the index, note that under the heading "Pressure measurement" all types of vacuum gages and micromanometers are listed under the various nomenclatures in use, with a reference to the heading under which it may be located in the index. The same has been done for pumps under the heading "Pumps."

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## THE NATIONAL BUREAU OF STANDARDS

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### WASHINGTON, D.C.

**Electricity.** Resistance and Reactance. Electrochemistry. Electrical Instruments. Magnetic Measurements. Dielectrics. High Voltage.

**Metrology.** Photometry and Colorimetry. Refractometry. Photographic Research. Length. Engineering Metrology. Mass and Scale. Volumetry and Densimetry.

**Heat.** Temperature Physics. Heat Measurements. Cryogenic Physics. Equation of State. Statistical Physics.

**Radiation Physics.** X-Ray. Radioactivity. Radiation Theory. High Energy Radiation. Radiological Equipment. Nucleonic Instrumentation. Neutron Physics.

**Analytical and Inorganic Chemistry.** Pure Substances. Spectrochemistry. Solution Chemistry. Standard Reference Materials. Applied Analytical Research.

**Mechanics.** Sound. Pressure and Vacuum. Fluid Mechanics. Engineering Mechanics. Rheology. Combustion Controls.

**Organic and Fibrous Materials.** Rubber. Textiles. Paper. Leather. Testing and Specifications. Polymer Structure. Plastics. Dental Research.

**Metallurgy.** Thermal Metallurgy. Chemical Metallurgy. Mechanical Metallurgy. Corrosion. Metal Physics. Electrolysis and Metal Deposition.

**Mineral Products.** Engineering Ceramics. Glass. Refractories. Enameled Metals. Crystal Growth. Physical Properties. Constitution and Microstructure.

**Building Research.** Structural Engineering. Fire Research. Mechanical Systems. Organic Building Materials. Codes and Safety Standards. Heat Transfer. Inorganic Building Materials.

**Applied Mathematics.** Numerical Analysis. Computation. Statistical Engineering. Mathematical Physics. Operations Research.

**Data Processing Systems.** Components and Techniques. Digital circuitry. Digital Systems. Analog Systems. Applications Engineering.

**Atomic Physics.** Spectroscopy. Infrared Spectroscopy. Solid State Physics. Electron Physics. Atomic Physics.

**Instrumentation.** Engineering Electronics. Electron Devices. Electronic Instrumentation. Mechanical Instruments. Basic Instrumentation.

**Physical Chemistry.** Thermochemistry. Surface Chemistry. Organic Chemistry. Molecular Spectroscopy. Molecular Kinetics. Mass Spectrometry.

Office of Weights and Measures.

### BOULDER, COLO.

**Cryogenic Engineering.** Cryogenic Equipment. Cryogenic Processes. Properties of Materials. Cryogenic Technical Services.

**Ionosphere Research and Propagation.** Low Frequency and Very Low Frequency Research. Ionosphere Research. Prediction Services. Sun-Earth Relationships. Field Engineering. Radio Warning Services.

**Radio Propagation Engineering.** Data Reduction Instrumentation. Radio Noise. Tropospheric Measurements. Tropospheric Analysis. Propagation-Terrain Effects. Radio-Meteorology. Lower Atmosphere Physics.

**Radio Standards.** High Frequency Electrical Standards. Radio Broadcast Service. Radio and Microwave Materials. Atomic Frequency and Time Interval Standards. Electronic Calibration Center. Millimeter-Wave Research. Microwave Circuit Standards.

**Radio Systems.** High Frequency and Very High Frequency Research. Modulation Research. Antenna Research. Navigation Systems.

**Upper Atmosphere and Space Physics.** Upper Atmosphere and Plasma Physics. Ionosphere and Exosphere Scatter. Airglow and Aurora. Ionospheric Radio Astronomy.

