Chas A. Silberrad

3. 5. 02

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Month.	Page.	Column.	Line.	Description.
1901. February	146	1	16 from top	*For* "1899" *read* "1898," and *insert before* 1,148, the year "1899."
March	255	2	First equation	*For* "Co_2" in both cases, *read* "CO_2."
April	356	2	38 from top	*For* "igniting" *read* "diazotising."
May	423	1	32 from bottom	*For* "no" *read* "not."
,,	433	2	17 from top	*For* "Oakbark" *read* "Oakbark tannage."
,,	437	2	26 from top	*For* "sulphate" *read* "sulphide."
,,	437	2	20 from bottom	*For* "averagely" *read* "on the average."
,,	438	1	30 from top	*For* "aqneous" *read* "aqueous."
,,	445	2	30 from top	*After* "Ceylon" *insert* "graphite."
July	727	1	Middle	In title, *after* "Elect. Rev." *insert* "(U.S.)."
,,	727	1	23 from bottom	*Before* "Engineer" *insert* "Electr. World and."
September	902	1	27 from bottom	*For* "palæzoie" *read* "palæozoic."
,,	940	1	Table, col. 5, line 11 of figures.	*For* "99·4" *read* "99·0." Also in col. 1, *for* "Linseed III. after three weeks' exposure" *read* "Linseed II. after three weeks' exposure."
,,	940	2	First table, second heading.	*For* "Thermomter" *read* "Thermometer."
,,	940	2	Line 10 above second table.	*For* "strength of acids" *read* "strengths of acid."
October	1037	2	Table, line 14 under "*Exports.*"	*For* "Silver in ore, silver, and lead," *read* "Silver in silver and lead ores."
,,	1043	2	18, 10, and 4 from bottom, and next page.	*For* "ground nut" *read* "earth nut."
,,	1044	1 and 2		
December	1237	1	7 from bottom	*After* "In addition to" *insert* "other derivatives of."
,,	1237	1	6 from bottom	*For* "finds that" *read* "prepared."
,,	1237	1	5 and 4 from bottom	*Delete* "is also present."

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10,055	.. ..	Petolite Fuel Syndicate and Johnson ..	Material for Artificial Fuel	563
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No. of Patent.	Agent.	Inventor.	Short Title.	Page for Abstract.
1900.				
14,136	.. ..	Murphy, E. E.	Carbonating Apparatus	59
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No. of Patent.	Agent.	Inventor.	Short Title.	Page for Abstract.
1900.				
17,119	.. ..	Ludwig, A.	Artificial Production of Diamonds (Metallic Electrodes).	1034
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1900.				
21,376	.. ..	Kessler, J. L.	Apparatus for Concentration of Sulphuric Acid	807
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1900.				
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1901.				
6735	.. ..	Sasse, F.	Apparatus for Purifying Gas	564
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No. of Patent.	Agent.	Inventor	Short Title.	Page for Abstract.
1901.				
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1897. Ackermann, Eugene, 165, Cambridge Street, Warwick Square, S.W., Analytical Chemist and Civil Engineer.

1900. Ackroyd, Wm., Borough Laboratory, Halifax, Yorks, Analytical Chemist.

1892. Adams, Arthur, Kelvin House, Edgbaston Road, Smethwick, near Birmingham, Science Lecturer.

1884. Adams, M. A., Ashford Road, Maidstone, Kent, Public Analyst.

1897. Adams, Thos. H., Chemical Laboratory, Loco. Dept., Midland Railway, Derby, Assistant Analyst.

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1891. Adcock, S. R., St. Helen's Smelting Co., Pocket Nook, St. Helen's, Lancashire, Analytical Chemist.

1898. Adgate, M., c/o General Chemical Co., Syracuse, N.Y., U.S.A., Chemist.

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1896. Adler, Dr. Leon N., Adler Colour and Chemical Works, 100, William Street, New York, U.S.A., Manufacturing Chemist.

1888. Adriance, John S., 105, East 39th Street, New York, U.S.A., Analytical Chemist.

1899. Adrot, Léon, 51, Route d'Aubervillier, Pantin (Seine), France, Chemist.

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O.M. Affleck, Dr. J., Highfield, Woodend Park, Grassendale, near Liverpool, Alkali Inspector.

1884. Aikman, C. M., 128, Wellington Street, Glasgow, Analytical Chemist.

O.M. Aitken, Dr. A. P., 8, Clyde Street, Edinburgh, Consulting Chemist.

1886. Aitken, J. B., Gerard's Fold Chemical Works, Widnes, Chemical Manufacturer.

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1891. Alcock, Jno. W., Central Brewery, Mott Street, Birmingham, Maltster and Brewer.

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1900. Aldrich, Roger C., Erie Chemical Works, Erie, Pa., U.S.A., Mechanical Engineer.

1890. Aldrick, Edwin John, 53, Alpha Road, West Ferry Road, Millwall, E., Chemical Works Clerk.

1899. Alexander, D. Basil W., c/o American Oil and Asphalt Co., 2, Bryson Block, Los Angeles, Cal., U.S.A., Chemist.

1900. Alexander, Jerome, c/o National Gum and Mica Co., 502—510, West 45th Street, New York City, U.S.A., Chemist.

1883. Alexander, W. T., 20, Booth Street, Moseley Street, Manchester; and Crumnock Bank, Victoria Crescent, Eccles, Drysalter.

1891. Allan, F. H. Tielke, Portobello House, Wakefield, Analytical Chemist.

1898. Allan, John, 57, Mabfield Road, Fallowfield, Manchester, Chemist.

O.M. Alldred, C. H., 8, St. Margaret's Road, Plumstead Common, Kent, Analytical Chemist.

1898. Alleman, Dr. G., Washington University, St. Louis, Mo., U.S.A., Instructor in Chemistry.

O.M. Allen, A. H., Broomfield Road, Sheffield, Consulting Chemist.

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O.M. Allen, J., 164, Upper North Street, Poplar, London, E., Manufacturing Chemist.

1889. Allen, R. L., Newton Farm, Middlewich, Cheshire, Analytical Chemist.

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O.M. Allhusen, A., Gateshead-on-Tyne, Chemical Manufacturer.

1886. Allibon, G. H., c/o Richardson Bros. & Co., 30, Donegall Place, Belfast, Chemical Works Manager.

1900. Allingham, Jno., Minas Prietas Reduction Co., Torres, Sonora, Mexico, Assayer.

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1900. Allison, Thos. McGregor, 54, St. John's Road, Clifton, Bristol, Tanner.

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1899. Alpers, Wm. C., 45—47, West 36th Street, New York City, U.S.A., Pharmacist.

1889. Alpiar, Agop, Smyrna, Asia Minor, Morphia Manufacturer.

1899. Alsop, Wm. K., 30, Ferry Street, New York City, U.S.A., Chemist.

1899. Althouse, C. Scott, 315, North 6th Street, Reading, Pa., U.S.A., Student.

1898. Ambler, Chas. Taaffe, Jamalpur, E.I. Ry., Bengal, India, Mine Owner and Contractor.

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1899. Anderson, Gilbert L., London Portland Cement Works, Northfleet, Kent, Works Manager.

1900. Anderson, Jas. W., 1, Preston Villas, Halling, near Rochester, Kent, Analytical Chemist.

1889. Anderson, Robt. T. R., 80, Seedhill Road, Paisley, Technical Chemist.

1894. Anderson, Dr. W. Carrick, 2, Florentine Gardens, Hillhead, Glasgow, University Lecturer.

1895. Anderson, Wm., 19—21, Blackfriars Street, Edinburgh, Drysalter.

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O.M. Anderton, G. H., Howendyke, Howden, Yorks, Chemical Manufacturer.
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1889. Andrews, C. W., c/o The John Crerar Library, Wabash Avenue and Washington Street, Chicago, Ill., U.S.A., Librarian.
O.M. Angell, J., 6, Beaconsfield, Derby Road, Withington, Manchester, Chemical Lecturer.
1892. Annandale, C. J. R., The Briary, Shotley Bridge, Co. Durham, Paper Maker.
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1894. Ansbacher, L. A., P.O. Box 1934, New York, U.S.A., Colour Manufacturer.
O.M. Ansdell, G., 3, Cross Lane, St. Mary-at-Hill, E.C., Analytical Chemist.
O.M. Ansdell, T. C., Kearsley Cottage, Farnworth, Bolton, Manufacturing Chemist.
1899. Appleby, C. W., Farnworth, near Widnes, Lancashire, Pith and Size Manufacturer.
1895. Appleby, Prof. W. R., 911, 5th Street, S.E., Minneapolis, Minn., U.S.A., Professor of Mining and Metallurgy.
1894. Appleton, H. A., 42, Crosfield Street, Warrington, Analytical Chemist.
1897. Appleton, Jno. Howard, 209, Angell Street, Providence, R.I., U.S.A., Professor of Chemistry.
1900. Appleyard, Geo. H., Wilmington Oil Mills, Hull, Chemist.
O.M. Archbutt, L., The Yews, Madeley Street, Derby, Analytical Chemist.
1899. Archdale, T. Henry, 77, Queen's Road, Blackburn, Manager of Tar and Ammonia Works.
1900. Ardern, Edw., 2, Atkinson Road, Urmston, near Manchester, Chemist.
1901. Argall, Philip, P.O. Box 843, Denver, Colo., U.S.A., Manager (Gold Extraction Works).
1899. Armstrong, Richard, Saul Street Soap Works, Preston, Lancashire, Soap Manufacturer.
1899. Arnott, G. W. Campbell, c/o Campbell, Johnston and Co., 4, Cedar Street, New York City, U.S.A.
1900. Ashley, Harrison E., West Wareham, Mass., U.S.A., Chemical Engineer (Tremont Nail Co.).
1890. Ashton-Bost, W. D., Cartvale Chemical Works, Paisley, N.B., Chemical Manufacturer.
1900. Ashton, Jas., Hacken Sewage Works, Moses Gate, Bolton, Chemist and Manager.
1885. Ashwell, H., 91, Waterloo Crescent, Nottingham, Bleacher and Dyer.
1885. Ashwell, J. H., 91, Waterloo Crescent, Nottingham, Bleacher and Dyer.
1894. Ashworth, Arthur, Fernhill Chemical Works, Bury, Lancashire, Chemical Manufacturer.
1898. Aspinall, Thos., 42, Gilnow Road, Bolton, Analytical and Manufacturing Chemist.
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1900. Aston, Bernard C., Agricultural Department, Wellington, New Zealand, Chemist.
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1891. Atkins, C. E., Teignngrace, Bycullah Park, Enfield, N., Chronometer Maker.
1885. Atkinson, A. J., 44, Loudoun Square, Cardiff, Analytical Chemist.
1900. Atkinson, Jno. W., Betteravia, Cal., U.S.A., Chemist.
O.M. Atkinson, R. W., 44, Loudoun Square, Cardiff, Technical Chemist.
1899. Atteaux, F. E., 176, Purchase Street, Boston, Mass., U.S.A., Importer of Dyestuffs and Chemicals.
O.M. Attfield, Dr. J., F.R.S., Ashlands, Watford, Hertfordshire, Chemical Consultant and Analyst.
1900. Atwood, Frank W., 98, Commercial Street, Boston Mass., U.S.A., Chemist.
1895. Auchterlonie, Wm., jun., c/o Burgess, Ledward and Co., Walkden, near Manchester, Chemist.
1887. Auer, Dr. H., V. Nagy Korona Utca 2, Budapest, Hungary, Technical Chemist.
1897. Auger, Chas. L., 425, Park Avenue, Paterson, N.J., U.S.A., Silk Dyer.
1887. Austen, Prof. Peter T., 218, St. John's Place, Brooklyn, N.Y., U.S.A., Professor of Chemistry.
1901. Austin, Herbert, c/o George Scott and Son, Ltd., 67, Lord Street, Liverpool, Engineer.
1890. Aykroyd, H. E., Glen Rosa, The Grove, Ilkley, Yorks, Dyer.
1899. Aylsworth, Jonas W., 223, Midland Avenue, East Orange, N.J., U.S.A., Chemist.

B

1892. Bachke, A. Anker, Ringoe, pr. Trondhjem, Norway, Metallurgical Engineer.
1895. Bacon, Nathaniel T., Peace Dale, Rhode Island, U.S.A., Chemical Engineer.
1897. Bacon, Wm., 4, New Court, Lincoln's Inn, W.C., Chemist.
1897. Badock, Stanley H., 41, Downleaze Road, Stoke Bishop, near Bristol, Smelter.
1898. Baekeland, Dr. Leo, Snug Rock, North Broadway, Yonkers, N.Y., U.S.A., Manufacturing Chemist.
1885. Bailey, Edwin M., 6, Pumpherston, Midcalder, N.B., Technical Chemist.
1883. Bailey, Dr. G. H., Marple Cottage, Marple, Cheshire, Chemical Lecturer.
1898. Bailey, Henry, 18, Lavender Sweep, Lavender Hill, S.W., Analytical Chemist.
1888. Bailey, Dr. T. L., University College, Brownlow Street, Liverpool, Lecturer on Technological Chemistry.
1888. Bailey, Sir W. H., Albion Works, Salford, Manchester, Chemical Engineer.
1888. Bailey, Walter P., Fabrica de Productos Amoniacales, 2A, Aguada, Cadiz, Spain, Manufacturing Chemist.
1890. Baird, H. Harper, 14, Cross Street, Hatton Garden, London, E.C., Laboratory Furnisher.
1891. Baird, Wm., c/o Lewis Berger and Sons, Ld., Homerton, N.E., Technical Chemist.
1895. Baird, W. Raymond, 271, Broadway, New York, U.S.A., Patent Lawyer.
1890. Bairstow, John, Burley, Queen's Park, Chester, Chemical Works Manager.
1901. Baker, F. Guy Stirling, Marryatt's Lodge, The Forest, Snaresbrook, Essex, Student.
1883. Baker, Harry, Epworth House, Moughland Lane, Runcorn, Analytical Chemist.
1899. Baker, H. Fenimore, c/o General Chemical Co., 32, Liberty Street, New York, U.S.A., Chemist.
1892. Baker, Julian L., Stamford, Hendham Road, Upper Tooting, S.W., Sugar Chemist.
1886. Baker, Theodore, c/o G. Henry, Pompton Lakes, N.J., U.S.A., Analytical Chemist.
1900. Ball, Arthur, 37, Tufnell Park Road, London, N., Manufacturing Chemist.
1900. Balbach, Wm., 100, William Street, New York City, U.S.A., Chemical Merchant.
1898. Baldwin, Abram T., Solvay Process Co., Syracuse, N.Y., U.S.A., Alkali Manufacturer.
1889. Ballantyne, H., 75, Chancery Lane, London, W.C., Analytical Chemist.
1899. Ballantyne, Jno. C., 47, Gorst Road, Wandsworth Common, S.W., Analytical Chemist.
1892. Ballard, Ernest, Colwall, Great Malvern, Malt Vinegar Brewer.
O.M. Ballard, E. G., Greenfield Cottage, Hoole Road, Chester, Alkali Works Inspector.
1891. Ballinger, Jno., Free Library, Cardiff, Librarian.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1890. Baly, E. C. C., University College, Gower Street, W.C., Analytical Chemist.
O.M. Bamber, H. K., 9, Victoria Street, London, S.W., Consulting Chemist.
1894. Bamber, H. K. G., Ingress House, Greenhithe, Kent, Cement Works Chemist and Manager.
1898. Bamford, Harry, 1, Farcliffe Place, Bradford, Yorks, Dyer.
O.M. Banister, H. C., Elmhurst, Blundellsands, near Liverpool, Chemical Works Manager.
1890. Banks, Jno. H., c/o Ricketts and Banks, 104, John Street, New York, U.S.A., Mining Engineer.
1895. Bannan, John F., North Andover, Mass., U.S.A., Chemist (Woollen Mill).
1885. Banner, Samuel, 4, Ivanhoe Road, Liverpool, Petroleum Merchant.
O.M. Bannister, R., 59, Tregunter Road, South Kensington, S.W., Analytical Chemist.
O.M. Bannister, W., Victoria Lodge, Cork, Ireland, Manufacturing Chemist.
1884. Barclay, H., Calder Ironworks, Coatbridge, N.B., Ironworks Manager.
1892. Barden, Alf., Far Bank, Shelley, near Huddersfield, Glue and Size Maker.
1894. Barden, Sam, Woodhouse Mills, Shelley, near Huddersfield, Glue and Size Manufacturer.
1886. Bardsley, Robt., Messrs. Jewsbury and Brown, Ardwick Green, Manchester, Mineral Water Manufacturer.
1895. Bardwell, Fred. L., Massachusetts Institute of Technology, Boston, Mass., U.S.A., Assistant Professor of Chemistry.
1895. Barlow, Clinton W., 103—105, Greene Street, New York City, U.S.A., Merchant.
1901. Barlow, John J., 177, Manchester Road, Accrington, Calico Printer's Chemist.
1900. Barlow, Walter H., 152, Osbaldeston Road, Stoke Newington, N., Analytical Chemist.
1899. Barlow, Wm., 311, Market Street, Droylsden, near Manchester, Analytical Chemist.
1891. Barnes, Edw. A., Technical Chemist.
1884. Barnes, H. J., Phœnix Chemical Works, Hackney Wick, E., Manufacturing Chemist.
O.M. Barnes, Jos., Rock Mount, Whalley Road, Accrington, Lancashire, Analytical Chemist.
1884. Barnes, Jonathan, 301, Great Clowes Street, Manchester, Analytical Chemist.
1897. Barnett, Robt. E., Leeds Technical School, Cookridge Street, Leeds, Headmaster.
1898. Barnicott, Jas. A., Messrs. May and Baker, Ltd., Garden Wharf, Battersea, S.W., and (Journals) Fetcham, near Leatherhead, Chemical Manufacturer.
O.M. Barr, J., Dinting Vale, Dinting, Derbyshire, Chemical Manager.
1890. Barraclough, Wm. H., Mortomley, near Sheffield, Analytical Chemist.
1900. Barralet, Edgar S., 2, Green Street, Bethnal Green, London, E., Chemist.
1896. Barratt, J. Treeby, Bronheulog, Mostyn, North Wales, Chemist and Manager.
1890. Barrett, Arthur A., 5, Strada del Pozzo Leone, Messina, Sicily, Manufacturer of Essential Oils.
1898. Barrett, Jesse M., 618, Packard Street, Kansas City, Kansas, U.S.A., Chemist (G. H. Hammond Co.).
1890. Barrie, D. McLaurin, Analytical Chemist.
1900. Barrow, Jos., 1, Townfield Lane, Bebington, Cheshire, Chemist.
1898. Bartlett, Saml. A., c/o The Commercial Development Corporation, 34, Castle Street, Liverpool, Secretary.
1893. Barton, G. E., c/o Whitall, Tatum, and Co., Flint Glass Works, Millville, N.J., U.S.A., Technical Chemist.
1900. Barton, L. Edward, 283—285, Broadway, Albany, N.Y., U.S.A., Chemist.
1895. Baskerville, Dr. Chas., University of North Carolina, Chapel Hill, N.C., U.S.A., Professor of Chemistry.
1884. Bassett, H., 26, Belitha Villas, Barnsbury, N.
1897. Bassett, Lewis L., 4013, Baring Street, Philadelphia, Pa., U.S.A., Analytical Chemist.
1899. Bassett, Wm. H., c/o New Jersey Zinc Co., Passaic Avenue, Newark, N.J., U.S.A., Chemist.
1890. Bate, William, c/o National Explosives Co., Ld., Hayle, Cornwall, Technical Chemist.
1884. Bateson, Percy, Cuckoo Lane, Gateacre, near Liverpool, Technical Chemist.
1885. Batty, R. B., Wharncliffe, Erdington, near Birmingham, Nickel Works Manager.
1900. Battye, Charles, Swanston Street, South Geelong, Victoria, Australia, Woollen Manufacturer.
1900. Baur, Jacob, 76—82, Illinois Street, Chicago, Ills., U.S.A., Liquid Carbonic Acid Manufacturer.
1890. Bavay, Aug de, Foster's Brewery, Collingwood, Melbourne, Australia, Brewer.
1898. Baxter, John G., 130, Windmill Street, Gravesend, Kent, Chemist.
O.M. Baxter, W. H., 11, High Road, Streatham, S.W., Brewery Director.
1899. Bayly, Francis W., 8, Royal Mint, London, E., Assayer.
O.M. Baynes, J., Royal Chambers, Scale Lane, Hull, County and Borough Analyst.
1891. Beach, E. J., 1183, Locust Street, Dubuque, Iowa, U.S.A., Soap Manufacturer.
1897. Beadle, Alec A., Greenheys, Granville Road, High Barnet, Herts, Electro-Chemist.
1886. Beadle, Clayton, Melrose, Hatherley Crescent, Sidcup, Kent, Consulting Chemist.
1890. Bealey, Adam C., c/o R. Bealey & Co., Radcliffe, Lancashire, Bleacher and Alkali Manufacturer.
O.M. Beanes, E., Moatlands, Paddock Wood, Kent, Manufacturing Chemist.
1883. Beaven, E. S., 5, Boreham Terrace, Warminster, Wilts, Maltster.
1897. Beaver, Chas. J., Fern Bank, Marsland Road, Sale, Cheshire, Chemist.
1895. Bechi, G. de, The General Metal Reduction Co., Ltd., 85, Gracechurch Street, E.C., Chemical Engineer.
1898. Beck, Herbert H., 105, South Queen Street, Lancaster, Pa., U.S.A., Chemist.
O.M. Beckett, G. H., c/o Mrs. Tait, Shore Road, Stevenston, Ayrshire, Analytical Chemist.
O.M. Beckett, J. H., Corbar Hall, Buxton, Manufacturing Chemist.
1898. Beckett, Jos. H., The Cottage, Glascoed, Wrexham, North Wales, Analytical Chemist.
1889. Becnel, Lezin A., 721, Herman Building, New Orleans, Louisiana, U.S.A., Sugar Engineer.
1899. Bedford, Alf. C., 26, Broadway, New York, U.S.A., Chemical Merchant.
1891. Bedford, Chas. S., Broomleigh, Chapel Lane, Headingley, Leeds, Manufacturing Chemist.
1891. Bedford, Jas. E., Messrs. Wood and Bedford, Kirkstall Road, Leeds, Manufacturing Chemist.
O.M. Bedson, Prof. P. P., Durham College of Science, Newcastle-on-Tyne, Professor of Chemistry.
1899. Behr, Dr. Arno, Pasadena, Cal., U.S.A., Chemist.
O.M. Beilby, G., St. Kitts, Slateford, N.B., and (Journals) 8, University Gardens, Glasgow, Chemical Engineer.
1900. Belden, Arthur W., c/o Tennessee Coal and Iron Co., Birmingham, Ala., U.S.A., Chemist.
1884. Bell, C. Lowthian, Free Library, Middlesbrough-on-Tees, Soda and Iron Manufacturer.
O.M. Bell, Sir Lowthian, Bart., F.R.S., (Journals) Rounton Grange, Northallerton; and (subs.) c/o Bell Bros., Middlesbrough, Iron and Chemical Manufacturer.
1900. Bell, Hugh P., 30, Egerton Crescent, London, S.W., Chemist.
O.M. Bell, J. Carter, Bank House, The Cliff, Higher Broughton, Manchester, Public Analyst.
1886. Bell, J. Ferguson, Derby Gas Light and Coke Co., Derby, Gas Engineer.

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1884. Bell, T. Hugh, Middlesbrough-on-Tees, Soda and Iron Manufacturer.

O.M. Bendix, D., The British Alizarin Co., Limited, Silvertown, Victoria Docks, E.; Journals to 371, Romford Road, Forest Gate, E., Managing Chemist.

1898. Bendixen, Julius C., 61, Trafalgar Road, Old Kent Road, S.E., Leather Manufacturer.

1897. Benfey, Dr. Hans, 2, Sunnyside Terrace, Clayton, Manchester, Manufacturing Chemist.

O.M. Benger, F. B., The Grange, Knutsford, Cheshire, *Manufacturing Chemist.*

O.M. Benjamin, Dr. M., Smithsonian Institution, Washington, D.C., U.S.A., Consulting Chemist, A.M.

1899. Bennett, Alex. H., 61, London Road, Bromley, Kent, Works Chemist.

1884. Bennett, Thos., Birch Vale, near Stockport, Calico Printer.

1886. Bennie, J. W., Mountain Copper Co., Keswick, Shasta Co., Cal., U.S.A., Metallurgist.

1899. Bent, Edw., 11, Dulverton Road, Leicester, Manager (Pickle Manufactory).

1901. Bentley, Wm. H., 3, Woodbine Terrace, Irlam, near Manchester, Technical Chemist.

1890. Bentz, Ernest, 5, Demesne Road, Whalley Range, Manchester, Lecturer on Dyeing.

1897. Berg, Julius, Elsaesischer Petroleum Gesellschaft, Waburg, Elsass, Germany, Oil Refinery Manager.

1884. Beringer, J. J., Basset Road, Camborne, Cornwall, Metallurgist.

1893. Berk, Fred. W., 1, Fenchurch Avenue, London, E.C., Chemical Manufacturer.

1900. Bermingham, Jno., jun., California Powder Works, 2572, California Street, San Francisco, Cal., U.S.A., Powder Works Superintendent.

1889. Bernard, Jas., jun., Casal das Rolas, Olivaes, Lisbon, Chemical Works Manager.

O.M. Bernays, J., 96, Newgate Street, London, E.C., Civil Engineer.

1900. Berolzheimer, D. D., 317, South 18th Street, Philadelphia, Pa., U.S.A., Chemist.

1897. Berry, Albert E., c/o Boake, Roberts, and Co., Chemical Works, Stratford, E., Works Manager.

1883. Berry, E. E., Casa Balestra, Bordighera, Italy, Technical Chemist.

1889. Berry, G. F., Atlas Chemical Works, West Ferry Road, Millwall, E., Chemical Works Manager.

1898. Berwick, D. C., 62, Trinity Road, West Bromwich, Electro-Metallurgist.

1900. Best, Alf. W., Cia. do Assucar de Moçambique, Zambesi River, Chinde, East Africa, Sugar Planter.

1898. Best, Dr. Otto, 16, Mastick Terrace, Alameda, Cal., U.S.A., Chemist.

1886. Best, Dr. T. T., Hardshaw Brook Chemical Works, St. Helens, Lancashire, Technical Chemist.

O.M. Bevan, E. J., 4, New Court, Lincoln's Inn, London, W.C., Public Analyst and Consulting Chemist.

1900. Bevan, Jno. W., Risedale, St. James' Crescent, Swansea, Manager of Metallurgical Works.

O.M. Beveridge, J., 159, Brockley Road, London, S.E., Pulp and Paper Manufacturer.

1900. Bevington, Col. S. B., 42, St. Thomas Street, Southwark, S.E., Leather Dresser.

1897. Bevington, Richard G., Metallurgist.

1893. Bhaduri, Prof. K., Canning College, Lucknow, India, Professor of Chemistry.

1898. Bhattacharyya, Haripada, Foundry and Shell Factory, Cossipore, Calcutta, India, Chemist.

1896. Bibby, John, c/o J. Bibby & Sons, Formby Street, Liverpool, Student.

O.M. Bickerdike, W. E., Bryer's Croft, Wilpshire, near Blackburn, Manufacturing Chemist.

1895. Bicknell, G. Arthur, 839, East Madison Avenue, Cleveland, Ohio, U.S.A., Analytical Chemist.

1884. Biggart, J. Wm., 29, Cathcart Street, Greenock, N.B., Analytical Chemist.

1891. Biggart, Wm. L., Public Analyst.

O.M. Biggs, B., 110, Cannon Street, London, E.C., Chemical Merchant.

1883. Bihn, G. F., Pennsylvania Salt Manufacturing Co., Philadelphia, U.S.A., Chemical Manufacturer.

O.M. Billing, H. S., 11, Devon Terrace, Ford Park, Plymouth, Analytical and Managing Chemist.

1896. Billings, Edgar F., 404, Atlantic Avenue, Boston, Mass., U.S.A., Manufacturing Chemist.

1896. Billington, Chas., jun., Studleigh, Longport, Staffordshire, Metallurgist.

O.M. Bindschedler, Dr. R., Villa Flora, Basle, Switzerland, Colour Manufacturer.

1898. Binney, Harold, Bank of Commerce Building, 31, Nassau Street, New York, Patent Lawyer.

O.M. Binney, H. A., Rainhill, near Liverpool, Glass Manufacturer.

1897. Birchmore, Dr. W. H., 341, Adelphi Street, Brooklyn, N.Y., U.S.A.

1896. Bird, Arthur W., 10, Norfolk Square, London, W., Works Engineer.

1898. Bird, Frank W., Vinegar Works, Cambridge, Vinegar Brewer.

1897. Bird, Fred. C. J., 52, Cambridge Gardens, Notting Hill, W., Chemist.

1888. Bird, Henry, Bencoolen, Bude, North Cornwall, Metallurgist.

1896. Bird, Jno. B., Minver House, Bateman Street, Cambridge, Manure Manufacturer.

1885. Bird, R., Ellerslie, Roath, Cardiff, Tar Distiller.

1895. Bird, Wm. R., 12, Gordon Road, New Swindon, Wilts, Analytical Chemist.

1885. Birley, R. K., Chas. Macintosh & Co., Cambridge Street, Manchester, India-rubber Manufacturer.

1884. Bischof, Gustav, 9, Hythe Road, Willesden Junction, N.W., Technical Chemist.

1895. Bischoff, Dr. Ernst, 227, East 19th Street, New York, U.S.A., Chemist.

1883. Bishop, A. Conway, Three Mills Lane, Bromley-by-Bow, London, E., Manufacturing Chemist.

1884. Bishop, Fred, c/o Burmah Oil Co., Rangoon, Burmah, Technical Chemist.

O.M. Bishop, G. A., Gartverrie Fireclay Works, Glenboig, N.B., Mining Engineer.

1894. Blackmore, H. S., 206, South Ninth Avenue, Mount Vernon, N.Y., U.S.A., Chemist (Pure Aluminium and Chemical Company).

1899. Blackwell, G. G., 44–47, The Albany, Liverpool, Mineral and Metal Merchant.

1896. Blagden, Victor, 50–51, Lime Street, London, E.C., Chemical Merchant.

1883. Blagden, W. G., 4, Fenchurch Avenue, London, E.C., Chemical Merchant.

1897. Blair, Andrew A., 406, Locust Street, Philadelphia, Pa., U.S.A., Analytical Chemist.

1884. Blake, Jas., Thames Sugar Refinery, Silvertown, London, E., Sugar Refinery Manager.

1890. Blakey, A. J., Dudbridge Mills, Stroud, Gloucestershire, Dyer.

1891. Blass, Edw., Essen (Ruhr), Germany, Civil Engineer.

1893. Blears, John, c/o Langworthy Bros. and Co., Lim., Greengate Mills, Salford, Dyer and Calico Printer.

O.M. Bles, A. J. S., 32, Chorlton Street, Manchester, Chemical Merchant.

1889. Bloede, Victor G., Station D., Baltimore, Md., U.S.A., Manufacturing Chemist.

1891. Bloomer, Fred. J., 15, Broderick Road, Tooting, S.W., Technical Chemist and Nickel Works Manager.

1886. Blount, Bertram, Chemical Laboratory, Broadway, Westminster, S.W., Analytical Chemist.

1888. Bloxam, A. G., Birkbeck Bank Chambers, Chancery Lane, W.C., Analytical Chemist.

1890. Bloxam, W. Popplewell, Laboratories of the Royal Colleges of Physicians and Surgeons, Victoria Embankment, London, W.C.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1886. Blundstone, E. R., 14, Great Smith Street, Westminster, S.W., and (Journals) Heathfield, Hampton Hill, Middlesex, Consulting and Analytical Chemist.
O.M. Blyton, J.,
O.M. Boake, A., Warton Road, Stratford, E., Manufacturing Chemist.
1888. Boake, Edmund J., Aberffraw, Nursery Road, Loughton, Essex, Manufacturing Chemist.
1885. Board, J. T., Distillery, Cheese Lane, Bristol, Distiller.
1899. Boehm, Fred., 16, Jewry Street, London, E.C., Chemical Agent and Merchant.
1900. Böhm, Dr. L. K., 320, Broadway, New York City, U.S.A., Expert in Patent Law.
1895. Böhm, Jos. A., c/o Actien Gesellschaft für Chemische Industrie, Rheinau bei Mannheim, Germany, Manager.
1898. Bogert, Marston T., Department of Organic Chemistry, Columbia University, New York, U.S.A., Instructor in Organic Chemistry.
1901. Bolton, E. Richards, South Shore Works, Gateshead-on-Tyne, Manufacturing Chemist.
1892. Bookman, Dr. S., 9, East 62nd Street, New York, U.S.A., Chemist.
1888. Boor, Leonard G., 1 and 2, Artillery Lane, London, E.C., Chemical Merchant.
1896. Boot, John C., Klatten, Java, Netherlands Indies, Chemist.
1884 Booth, Geo., Irk Vale Dyeworks, Middleton, near Manchester, Yarn Dyer.
1894. Booth, Robt., 110, Cannon Street, London, E.C., Engineer.
1891. Boothby, Chas., Woolnough, Vicarage Road, Lea Bridge Road, London, E., Analytical Chemist.
1897. Borland, C. R., Oakland, Bergen Co., N.J., U.S.A., Chemist (Powder Works).
O.M. Borland, W. D., Beacon Lodge, Green Street Green, near Dartford, Kent, Explosives Chemist.
1900. Boseley, L. K., c/o J. Keiller and Son, Ltd., Tay Wharf, Silvertown, E., Analytical Chemist.
1898. Boss, Julian St. L., 45, Lupus Street, St. George's Square, London, S.W., Engineer.
O.M. Bothamley, C. H., Otterwood, Beaconsfield Road, Weston-super-Mare, Somerset, County Director of Technical Instruction.
1890. Bott, Dr. Wm. N., The Vicarage, Sleaford, Lincolnshire, Science Lecturer.
1884. Böttinger, Dr. H. T., Elberfeld, Germany; and (subs.) c/o The Bayer Co., Ltd., 19, St. Dunstan's Hill, E.C., Colour Manufacturer.
O.M. Bottle, Alex., 4, Godwyne Road, Dover, Pharmaceutical Chemist.
O.M. Boulton, H. E., 64, Cannon Street, London, E.C., Chemical Manufacturer.
1890. Boulton, James, Crayford Mills, Stratford, E., Manufacturing Chemist.
O.M. Boulton, S. B., 64, Cannon Street, London, E.C., Chemical Manufacturer.
1883. Boulton, T. S., 14, Freegrove Road, Caledonian Road, N., Manager.
1900. Bourcoud, Agustin E., Gijon, Spain, Civil Engineer.
1884. Bow, R. H., 7, South Gray Street, Edinburgh, Civil Engineer.
1885. Bowen, S. B., Brickfield Chemical Works, Llanelly, South Wales, Chemical Manufacturer.
1899. Bowen, W., Woodend Road, Erdington, Birmingham, Chemist.
1888. Bower, Frank, Truman's Brewery, Spitalfields, E., Analytical Chemist.
1897. Bowar, Wm. H., 29th Street and Gray's Ferry Road, Philadelphia, Pa., U.S.A., Chemical Manufacturer.
1892. Bowes, Harry, 53, Moss Bank, Higher Crumpsall, Manchester, Analytical Chemist.
1889. Bowing, Jno., Fuel Works, Tilbury, Essex, Consulting Chemist.
1883. Bowley, Jos. John, Wellington Works, Battersea Bridge, London, S.W., Chemical Manufacturer.
1899. Bowley, J. Plunkett, 1, Wellington Road, Battersea, S.W., Varnish Manufacturer.
1883. Bowman, Dr. F. H., Mayfield, Knutsford, Cheshire, Chemical Manufacturer.
1894. Bowman, Jas. H., Canada Chemical Manufacturing Co., London, Ont., Canada, Professor of Chemistry.
1884. Bowman, R., Bowman and Co., Ltd., Victoria Chemical Works, Widnes, Chemical Manufacturer.
1896. Bowman, Walker, 538, West 14th Street, New York City, U.S.A., Chemist.
1899. Bowtell, Norman E., 13, Hollow Way, Runcorn, Cheshire, Works Chemist.
1893. Boyce, Frank, c/o Goodall, Backhouse, and Co., White Horse Street, Leeds, Technical Chemist.
1884. Boyd, Pythagoras, 6, Union Street, North Adams, Mass., U.S.A., Print Works Superintendent.
O.M. Boyd, W., Technical Chemist.
1899. Boyes, Herb. J., 9, Rua Episcopal, Sao Paulo, Brazil, Chemist.
1899. Brackett, E. R., 116, Haverhill Street, Lawrence, Mass., U.S.A., Chemist (International Paper Co.).
1885. Bradburn, J. A., 401, Lowell Avenue, Syracuse, N.Y., U.S.A., Chemical Engineer.
1883. Bradbury, A., Queen Buildings, 11, Dale Street, Liverpool, Chemical Broker.
1898. Bradford, Ernest, Ohio State University, Columbus, Ohio, U.S.A., Metallurgical Chemist.
1895. Bradford, Henry, c/o W. H. Gorringe, Woodcote, Chichester, Analytical Chemist.
1894. Bradley, Edw. F., The Star Brush Co., Ld., Eden Grove, Holloway, N., Engineer.
1896. Bragg, Everett B., 489, Sibley Street, Cleveland, Ohio, U.S.A., Manufacturing Chemist.
1891. Braithwaite, Isaac, Kendal, Westmoreland, Drysalter.
1897. Braithwaite, Jno. O., Hilika, Warren Road, Chingford, Essex, Pharmaceutical Research Chemist.
1897. Brakes, Jas., c/o Chateaugay Ore and Iron Co., Lyon Mountain, N.Y., U.S.A., Analytical Chemist.
O.M. Bramham, W., 115, Bow Road, London, E., Chemical Engineer.
O.M. Bramwell, Major E., Felsberg, Hoylake, Cheshire, Chemical Manufacturer.
1883. Bramwell, Sir F., Bart., F.R.S., 5, Great George Street, Westminster, London, S.W., Civil Engineer.
O.M. Bramwell, G. H., Cowley Hill, St. Helens, Lancashire, Alkali Manufacturer.
1900. Brandwood, John, 175, Walshaw Road, Bury, Lancashire, Dyeworks Manager.
O.M. Branson, F. W., Wynneholme, Far Headingley, Leeds, Pharmaceutical Chemist.
1888. Breffitt, Wm., Glasshoughton, Castleford, Yorks, Glass Manufacturer.
1900. Breneman, Harry C., 320, Manhattan Avenue, New York City, U.S.A., Chemical Student.
1888. Bressey, Edw., 209, Romford Road, Stratford, E., Gold and Silver Refiner.
1900. Brewis, E. Theodore, 7, Cowper Street, Finsbury, E.C., Chemist.
1894. Breyer, Theodor, 105, Main Street, Peoria, Ill., U.S.A., Chemist (American Glucose Co.).
1885. Briant, L., 24, Holborn Viaduct, London, E.C., Analytical Chemist.
1899. Bridge, Geo. E., 123, Old Christchurch Road, Bournemouth, Chemist and Druggist.
1890. Brierley, J. T., 249, Bolton Road, Chorley, Lancashire, Analytical Chemist.
1894. Briggs, J. Burnett, Vauxhall Soap Works, 6, Blackstock Street, Liverpool, Soap Manufacturer.
1893. Briggs, J. F., Brooklyn, Wimbledon Park Road, Wandsworth, S.W., Sugar Works Chemist.
1885. Briggs, T. Lynton, P.O. Box 533, Ridgewood, N.J., U.S.A., Technical Chemist.
1886. Briggs, W., 4, Erskine Terrace, Dundee, Manufacturing Chemist.
1890. Brindley, G. F., c/o Niagara Electro-Chemical Co., Niagara Falls, N.Y., U.S.A., Chemical Engineer.
1894. Bristed, John, Eton House, Margate, Manager.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1886. Bristow, G. W., Worcester House, 35, Eastcheap, London, E.C., Chemical Manager.
1837. Broadbent, H., c/o Goodall, Backhouse, & Co., Sovereign Street, Leeds, Chemist.
1896. Broadhurst, W. Homer, 294, Lafayette Avenue, Brooklyn, N.Y., U.S.A., Chemist.
1889. Brock, Arthur, Messrs. C. T. Brock & Co., South Norwood, S.E., Firework Manufacturer.
O.M. Brock, J., Gwern-Tyno, Colwyn Bay, North Wales, Chairman of United Alkali Co., Ld.
1896. Brooke, C. B., jun., Colne House, Brantham, near Manningtree, Xylonite Manufacturer.
1900. Brooke, Jno. R., 36-37, Mincing Lane, London, E.C., Chemist.
1884. Brookes, E. A., c/o Thos. Boyd & Co., Levenshulme Printworks, near Manchester, Analytical Chemist.
1895. Brookman, Fred. W., 176, Ramsay Street, Rochdale, Manure Works Manager.
1893. Broome, F. J., Leaholme, near Matlock Bath, Derbyshire, Assayer.
1901. Broome, Jos., 38, West 35th Street, Bayonne, N.J., U.S.A., Chemical Engineer.
1893. Brothers, H. E., Highfield House, Goldenhill, Stoke-on-Trent, Analyst.
O.M. Brotherton, E. A., Commercial Buildings, Leeds, Ammonia Distiller.
1884. Brown, Prof. A. Crum, F.R.S., 8, Belgrave Crescent, Edinburgh, Professor of Chemistry.
1891. Brown, Cæsar R., Anglo-Continental Guano Works, Victoria Docks, E., Works Foreman.
O.M. Brown, D., 93, Abbey Hill, Edinburgh, Chemical Manufacturer.
O.M. Brown, D., Donaghmore, Tyrone, Ireland, Soap Manufacturer.
1890. Brown, Edw. Hilton, Tannin Extract Works, Zelonie-Dol Station, Moscow-Kazan Railway, Russia, Analytical Chemist.
O.M. Brown, F. W., 56, Grange Park, Ealing, Science Tutor.
1894. Brown, G. E., 8, Palace Terrace, Palace Gates Road, Wood Green, N., Chemist.
O.M. Brown, H., Cannon Brewery, Watford, Herts, Brewing Chemist.
1899. Brown, Dr. Henry C., The Chemical Works, King's Lynn, Chemical Manufacturer.
O.M. Brown, Dr. Horace T., F.R.S., 52, Nevern Square, Kensington, S.W., Brewing Chemist.
O.M. Brown, Dr. J. Campbell, 8, Abercromby Square, Liverpool, Professor of Chemistry.
1891. Brown, J. Henry, Minas d'Aljustrel Alemtejo, Portugal, Technical Chemist.
1899. Brown, Lucius P., 32-36, Cole Building, Nashville, Tenn., U.S.A., Analytical Chemist.
1892. Brown, Reginald B., 3, Alexandra Terrace, Headingley, Leeds, Dyer's Chemist.
1889. Brown, Robt., The Firs, Hartford, Northwich, Engineer.
1890. Brown, R. J., Technical School, Stockport, Principal.
O.M. Brown, T., The Chemical Works, King's Lynn, Chemical Manufacturer.
O.M. Brown, Walter, c/o Jas. H. Dennis and Co., Ltd., Widnes, Technical Chemist.
1900. Brown, Walter B., c/o Nelson, Morris, and Co., U.S. Yards, Chicago, Ill., U.S.A., Chemist.
1897. Brown, Wm., The Firs, Urmston, near Manchester, Engineer.
1899. Brown, Wm. J., Linksview Villa, Leven, Fife, N.B., Chemist.
O.M. Browning, W., Broad Oak, Accrington, Calico Printer.
1890. Bruce, Jas., Vauxhall Distillery, Liverpool, Distiller.
1900. Bruce, Wm. T., c/o Hugh Wallace and Co., Ltd., 5, Fenchurch Street, London, E.C., Director.
1892. Bruckmann, G. T., 192, 18th Street, Brooklyn, N.Y., U.S.A., Chemical Engineer.
O.M. Brunner, H., Holly Mount, Tarbock Road, Huyton, near Liverpool, Chemical Manufacturer.
1894. Brunner, H. Bertram, Winnington Park, Northwich, Chemist and Electrician.
1887. Brunner, J. F. L., 23, Wetherby Gardens, London, S.W., Chemical Manufacturer.
O.M. Brunner, Sir J. T., Bart., M.P., Druid's Cross, Wavertree, Liverpool, Chemical Manufacturer.
1894. Brunton, J. Dixon, Wire Mill, Musselburgh, N.B., Wire Manufacturer.
1901. Bryan, A. Heugh, c/o Indianapolis Rubber Co., Indianapolis, Ind., U.S.A., Chemist.
1890. Bryce, John Annan, Messrs. Wallace Bros., 8, Austin Friars, London, E.C., Merchant.
1894. Bryce, Thos., Tharsis Mines, Huelva, Spain, Chemist.
1887. Bryce-Smith, N. J., Oakfield, Barrow, Whalley, near Blackburn, Calico Printer.
1897. Bryson, Jas., Pumpherston Oil Works, Midcalder, N.B., Oil Works Manager.
1892. Buchanan, D. G., Mount Vernon House, Glasgow, Analyst.
1888. Buchanan, Jas., jun., Caledonia Foundry, Brasenose Road, Liverpool, Engineer.
1897. Bucher, John E., Rhode Island College of Agriculture, Kingston, R.I., U.S.A., Assistant Professor.
1897. Buck, Chas. A., 521, Locust Street, South Bethlehem, Pa., U.S.A., Chief Chemist (Bethlehem Iron Co.).
1897. Bucknill, Jno. A. S., 3, Crown Office Row, Temple, E.C., Barrister-at-Law.
O.M. Budden, E. R., 28, Church Row, Hampstead, N.W., Consulting Chemist.
1900. Bull, Benjamin S., 21, Lambard Terrace, Ashburnham Road, Greenwich, S.E., Technical Chemist.
1892. Bull, Johannes C., Erith, Kent, Chemical Engineer.
O.M. Bullock, J. L., 3, Hanover Street, Hanover Square, London, W., Manufacturing Chemist.
1899. Bult, Herbert J., 18, Billiter Street, London, E.C., Chemist.
O.M. Bumby, H., Coltness Ironworks, Newmains, N.B., Ironworks Manager.
O.M. Bunker, H. E., 1, Deanley Terrace, St. Mary's Road, Newton Heath, Manchester, Technical Chemist.
1894. Bunting, W. Lightfoot, Quarry Hill, Accrington, Calico Printer.
1893. Burbridge, Jas., India-rubber Mills, Tottenham, N., India-rubber Manufacturer.
1886. Burdekin, G., jun., Park Villa, Prescot Road, St. Helens, Chemical Works Manager.
1896. Burford, Samuel F., The Firs, Kirby Muxloe, near Leicester, Analytical Chemist.
1898. Burge, Chas. H., Government Laboratory, Clement's Inn Passage, Strand, W.C., Analyst.
1889. Bürger, Dr. J., 1, Birch Avenue, Talbot Road, Old Trafford, Manchester, Technical Chemist.
1889. Burgess, Geo., Hale Road, Ditton, Widnes, Chemist.
1897. Burgess, G. E., Thornbank, Ellesmere Park, Eccles, Manchester, Dyer.
1894. Burgess, Herb. E., The London Essence Co., George Street, Camberwell Green, S.E., Chemist.
1889. Burgess, Wm. T., 46, Portland Road, Holland Park, London, W., Analytical Chemist.
O.M. Burghardt, Dr. C. A., Fern Cottage, Alderley Edge, Cheshire, Consulting Chemist.
1899. Burkhardt, Dr. A., Luiseuplatz, Pforzheim, Germany, Chemist.
1897. Burland, Lt.-Col. Jeffrey H., 824, Sherbrooke Street, Montreal, Canada, Paper and Card Manufacturer.
1896. Burland, Richard O., Bishopgate, Wigan, Manufacturing Chemist.
1900. Burleigh, Wm. F., c/o West Bergen Steelworks, Jersey City, N.J., U.S.A., Technical Chemist.
1897. Burls, Frank B., 20, Wellesbourne Grove, Stratford-on-Avon, Chemist.
1898. Burls, Herbert T., 206, Lewisham High Street, St. John's, S.E., Mechanical Engineer.
O.M. Burnard, R., Plymouth Chemical Works, Plymouth, Chemical Manufacturer.
1891. Burnet, Henry K., North Brook Vitriol Works, Bradford, Yorks, Vitriol Maker.
1897. Burnet, Jno. Jas., 18, University Avenue, Glasgow, Architect.
1893. Burnham, J. C., 6, Brownhill Gardens, Catford, S.E., Analytical Chemist.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1900. Burnside, Chas. F., c/o International Smokeless Powder Co., South Amboy, N.J., U.S.A., Chemist.
1890. Burn-Murdoch, J. V., Neuck, Larbert, N.B., Assayer.
1900. Burr, Edmund C., 1722, Vallejo Street, San Francisco, Cal., U.S.A., Manufacturer.
1900. Burr, E. Willard, Alvarado, Alameda Co., Cal., U.S.A., Sugar Manufacturer.
O.M. Burrell, B. A., 5, Mount Preston, Leeds, Analytical Chemist.
1897. Burrell, Loomis, Little Falls, Herkimer Co., N.Y., U.S.A., Manufacturer.
1892. Burrough, Horace, jun., c/o Burrough Bros. Manufacturing Co., Baltimore, Md., U.S.A., Technical Chemist.
1888. Burrows, Edw., Belle Vue Road, Low Fell, Gateshead-on-Tyne, Alkali Works Manager.
1889. Burton, Wm., Clifton Junction, near Manchester, Potter's Chemist.
1899. Burtt, Stratford, 840, Halsey Street, Brooklyn, N.Y., U.S.A., Analytical Chemist.
1897. Burwell, A. W., 208, Superior Street, Cleveland, Ohio, U.S.A., Consulting Chemist.
1899. Bury, Ernest, Wharton Hall, Little Hulton, Bolton-le-Moors, Analytical Chemist.
1885. Bury, J. H., Church Chemical Works, near Accrington, Chemical Manufacturer.
1898. Busch, Dr. Albert, 2, Blücherstrasse, Brunswick, Germany, Chemist.
O.M. Bush, Baron W. de, c/o W. J. Bush and Co., Ltd., Ash Grove, Hackney, E., Chemical Manufacturer.
1897. Bush, J. M., 7, Hyde Park Street, London, W., Manufacturing Chemist.
1897. Butler, David B., 41, Old Queen Street, Westminster, S.W., Cement Expert.
1890. Butler, Paul, Lowell, Mass., U.S.A., Ammunition Manufacturer.
1885. Butler, Samuel, Compton, Wolverhampton, Brewer.
1886. Butler, W. W., Southfield, Norfolk Road, Edgbaston, Birmingham, Brewer.
O.M. Butterfield, J. C., 79, Endlesham Road, Balham, S.W., Analytical Chemist.
1892. Butterfield, W. J. A., Overdale, Bletchingley, Surrey, Analytical Chemist.
1883. Butt, E. N., 77, Hamilton Terrace, Maida Vale, W., Pharmaceutical Chemist.
1897. Butters, Charles, 20, Bishopsgate Street Within, London, E.C., Metallurgist.
1900. Butterworth, Elwell R., c/o Reversible Collar Co., 111, Putnam Avenue, Cambridge, Mass., U.S.A., Chemist.
1900. Butterworth, Jas., P.O. Box 54, Newark, N.J., U.S.A., Manufacturing Chemist.
1892. Buttfield, Horace V., 13, Wellington Road, Bush Hill Park, Enfield, N., Chemical Demonstrator.
O.M. Byard, A. G., c/o Burt, Boulton, and Heywood, Apartado 8, Bilbao, Spain, Technical Chemist.
1899. Byrnes, Eugene A., U.S. Patent Office, Washington, D.C., U.S.A., Examiner in Electro-Chemistry.
1893. Byrom, T. H., Laboratory, Wigan Coal and Iron Co., Wigan, Analytical Chemist.
1887. Bythway, M., 44, Lloyd Street, Albert Street, Manchester, Drysalter.

C

1884. Cabot, Godfrey L., 82, Water Street, Boston, Mass., U.S.A., Chemist.
1889. Cadett, Jas., Ashtead, Surrey, Photographic Dry Plate Maker.
1901. Cady, Wm. H., 13, North Water Street, Philadelphia, Pa., U.S.A., Colour Chemist.
1891. Caines, G. S. A., 7, Rochester Terrace, Camden Road, London, N.W., Analytical Chemist.
1900. Cairns, And., Thistle Rubber Mills, Commerce Street, Glasgow, Manager.
1896. Cairns, F. Irvan, Anaconda, Montana, U.S.A., Metallurgist.
1897. Cairns, Wm., 5, Carlton Place, Glasgow, Plumber.
1891. Caldecott, Arthur, Metallurgist.
1897. Calder, W. A. S., The Hollies, South Road, Smethwick, Chemical Manufacturer.
O.M. Calderwood, J., Gowanlea, Spencer Park, Wandsworth, S.W.; and Price's Patent Candle Co., Battersea, Candle Manufacturer.
1900. Caldwell, Thos. O., Virginia City, Montana, U.S.A., Assayer and Chemist.
1888. Caldwell, Wm., Murray Street, Paisley, N.B., Drysalter.
1891. Calkin, Wm. S., Spring Forge, Pa., U.S.A., Paper Pulp Works Chemist.
1899. Calvert, Sidney, State University, Columbia, Mo., U.S.A., Professor of Chemistry.
1895. Cambier, Jacob, 910, Spruce Street, Pueblo, Colo., U.S.A., Chemist.
1894. Cameron, Alex., Kronthal im Taunus, Germany, Chemical Engineer.
1891. Cameron, Jas., 36, Mersey Lane South, Rock Ferry, near Birkenhead, Chemist.
1888. Cameron, Peter, Bath Bridge Colour Works, Bristol, Colour Works Manager.
O.M. Cammack, J., 51, Denton's Green Lane, St. Helens, Technical Chemist.
1886. Campbell, Andrew, c/o Burmah Oil Co., Ltd., Rangoon, Burmah, Analytical Chemist.
O.M. Campbell, Archibald, 1, Anson Street, Rugeley, Staffordshire, Technical Chemist.
1899. Campbell, J. Eunyce, 11, Woodland Street, Cheetham Hill, Manchester, Chemical Engineer.
1886. Campbell, John, 75, Hudson Street, New York City, U.S.A., Dye Manufacturer.
1897. Canfield, F. D. jun., c/o National Sugar Refining Co., New York Refinery, Long Island City, N.Y., U.S.A., Sugar Refiner.
1893. Cannon, J. C., c/o Forbes, Abbott, and Lennard, Kingston Wharf, near Brighton, Analyst.
O.M. Cannon, M., Chemical Works, Wickersley Road, Lavender Hill, S.W., Vinegar Works Manager.
1891. Canziani, Enrico, 3, Palace Green, Kensington, W., Civil Engineer.
1891. Carden, Albert J., Lea Valley Distillery, Warton Road, Stratford, E., Distiller.
1893. Carey, Arthur, Grange Cottage, Gateacre, near Liverpool, Chemist.
O.M. Carey, E., 20, Alexandra Drive, Sefton Park, Liverpool, Chemical Manufacturer.
O.M. Carlile, T., 23, West Nile Street, Glasgow, Chemical Manufacturer.
1895. Carlsson, Hugo, c/o Dominion Iron and Steel Co., Sydney, B.C., Canada, Analytical Chemist.
1893. Carmichael, Dr. H., 12, Pearl Street, Boston, Mass., U.S.A., Analytical Chemist.
1896. Carmichael, Herbert, Bureau of Mines, Victoria, British Columbia, Public Analyst and Assayer.
1884. Carmody, Prof. Patrick, Government Laboratory, Port of Spain, Trinidad, Analytical Chemist.
1897. Carnell, Wm. C., 3232, Wabash Avenue, Chicago, Ill., U.S.A., Chemist.
1899. Carney, Jas. A., Beardstown, Ills., U.S.A., Division Master Mechanic, C. B. & Q. Railroad.
O.M. Caro, Dr. H., Mannheim, Germany, Technical Chemist.
1900. Carp, B. M. A., Seragi Sugar Estate, Pekalongan, Java, N.E.I., Manager.
1893. Carpenter, C. C., South Metropolitan Gas Co., 709A, Old Kent Road, London, S.E., Civil Engineer.
1900. Carpenter, Frank B., Crenshaw Building, Richmond, Va., U.S.A., Chemist.
1900. Carpenter, Harry B., c/o Lister's Agricultural Chemical Works, Newark, N.J., U.S.A.
O.M. Carpenter, R. F., Prestwich, Greencroft Gardens West Hampstead, N.W., Alkali Works Inspector.
1885. Carruthers, J. G., Burnbrae House, Milngavie, N.B., Dyeworks Manager.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

O.M. Carteighe, M., 180, New Bond Street, London, W., Pharmaceutical Chemist.
1895. Carter, Stewart F., Windsor Printworks, North, Adams, Mass., U.S.A., Technical Chemist.
1886. Carter, W. C., 19, Short Strand, Belfast, Ireland Analytical Chemist.
1889. Carulla, F. J. R., 84, Rose Hill Street, Derby, Chemical Manufacturer.
1894. Case, W. T., 7, Cedar Street, New York, U.S.A., Chemist.
1900. Cates, Wm. A., Lynmouth, Vicarage Road, Leyton, E., Chemist.
1900. Cathcart, Dr. Wm. R., c/o Schaefer Alkaloid Works, Maywood, N.J., U.S.A., Chemist.
1895. Catlin, Chas. A., 133, Hope Street, Providence, R.I. U.S.A., Chemist (Rumford Chemical Works).
1900. Catt, Arthur E., The Tannery, Lingfield, Surrey, Tanner.
1896. Caven, Robt. M., University College, Nottingham, Lecturer in Chemistry.
O.M. Cawley, G., 29, Great George Street, Westminster, S.W., Chemical Engineer.
O.M. Cawley, J., 278, Passaic Street, Newark, N.J., U.S.A., Analytical Chemist.
1897. Cawley, Thos. A., British Gelatin Works, Luton, Beds., Gelatin Manufacturer.
1900. Cayvan, Llewellyn L., 294, West Monroe Street, Chicago, Ills., U.S.A., Chemist.
1891. Chadwick, Walter M., 24, West 3rd Street, Bayonne, N.J., U.S.A., Chemical Works Manager.
1897. Challen, Matthew B., School of Mines, Daylesford, Victoria, Australia, Assayer.
O.M. Chaloner, G., 30, Weston Park, Crouch End, N., Chemical Lecturer.
1894. Chaloner, G. W., 26, Eagle Wharf Road, Hoxton, N., Chemical Manager.
O.M. Chance, A. M., Chemical Works, Oldbury, near Birmingham, Chemical Manufacturer.
1883. Chance, J. F., New University Club, St. James' Street, London, S.W., Chemical Manufacturer.
O.M. Chandler, Dr. C. F., Columbia University, Department of Chemistry, Havemeyer Hall, New York, U.S.A., Professor of Chemistry.
1900. Chandler, Prof. W. H., Lehigh University, South Bethlehem, Pa., U.S.A., Professor of Chemistry.
1893. Chaplin, Dr. Edw. M., 60, Westgate, Wakefield, Yorks, Analytical Chemist.
1890. Chapman, Alf. C., East India Chambers, 23, Leadenhall Street, E.C., Analytical Chemist.
O.M. Chapman, S., 36, Mark Lane, E.C., Chemical Manufacturer.
1894. Charlier, A. C. J., Sussex House, Hill Street, Glasgow, General Manager and Chemist.
1900. Chase, March F., c/o Mineral Point Zinc Co., Mineral Point, Wis., U.S.A., Chemist.
1889. Chase, R. L., Arnold Printworks, North Adams, Mass., U.S.A., Printworks Chemist.
1894. Chatard, Dr. T. M., 1714, Rhode Island Avenue, Washington, D.C., U.S.A., Chemical Engineer.
1900. Chattaway, Wm., Apothecaries' Hall, London, E.C., Consulting Chemist.
1898. Chattock, Herbert E., 23, Apsley Road, Clifton, Bristol, Oilcake Manufacturer.
1894. Cheney, J. P., c/o Cheney Bros., South Manchester, Conn., U.S.A., Silk Manufacturer's Chemist.
1900. Chevassus, Philip, Melrose, Catford Hill, S.E., Chemical Student.
1885. Cheyne, A. M., c/o Messrs. Burgoyne, 16, Coleman St., E.C., Analytical Chemist.
1899. Child, Josiah F., The London Essence Co., George Street, Camberwell Green, S.E., Technical Chemist.
1893. Cholerton, A. F., Beech Leigh, Narboro' Road, Leicester, Manufacturing Chemist.
1890. Chorley, Jno. C., Lodge Lane, Bewsey, Warrington, Analytical Chemist.
O.M. Christie, J., Levenfield, Alexandria, N.B., Dyer and Printer.
1898. Christison, Geo., Cremona, Kelvinside North, Glasgow, Engineer.
1883. Christy, Thos., The Manor House, Wallington, Surrey; and 4, 10, and 12, Old Swan Lane, London, E.C.; Chemical Botanist.
O.M. Chrystal, W. J., Shawfield Works Rutherglen, near Glasgow, Chemical Manufacturer.
O.M. Church, Professor A. H., F.R.S., Shelsley, Kew, Surrey, Professor of Chemistry in the Royal Academy.
1890. Church, Elihu D., jun., 65, Wall Street, New York City, U.S.A., Soda Manufacturer.
1896. Claflin, Alan, Littleton, Mass., U.S.A., Manufacturing Chemist.
1900. Clamer, Guilliam H., 46, Richmond Street, Philadelphia, Pa., U.S.A., Chemist.
1885. Clanahan, H. C., 88, King Street, Manchester, Chemical Merchant.
1891. Clapp, Ralph R., c/o Standard Ammonia Co., Ltd., Iceland Wharf, Old Ford, E., Ammonia Works Manager.
1889. Clapperton, J., jun., c/o British Aluminium Co., Ltd., Larne Harbour, Co. Antrim, Ireland, Analytical Chemist.
1896. Clark, Donald, Bairnsdale, Victoria, Australia, Director of School of Mines.
O.M. Clark, Dr. J., 138, Bath Street, Glasgow, Analytical Chemist.
1900. Clark, Jno., 34, Fitzjohn's Avenue, Hampstead, N.W., Manufacturing Chemist.
1891. Clarke, Goddard, Fairlawn, 157, Peckham Rye, S.E., Drysalter.
1898. Clarke, J. F. Wyllie, Messrs. J. and R. Tennent, Wellpark Brewery, Glasgow, Brewery Proprietor.
1897. Clarke, Wm. B., Edison-Swan Electric Works, Ponders End, N., Electro-Chemist.
1898. Clarkson, Thos., Usine du Meglin, Buxière-les-Mines, Allier, France, Chemist.
O.M. Claudet, A. C., 6, Coleman Street, E.C.; and (Journals) 9, Daleham Gardens, Hampstead, N.W., Metallurgist.
O.M. Claudet, F. G., 6, Coleman Street, E.C.; and (Journals) Ennismore, Willesden Lane, N.W.; Assayer and Metallurgist.
1889. Claus, Wm. H., c/o Claus and Ree, Clayton, Manchester, Manufacturing Chemist.
O.M. Clayton, E. G., Chemical Laboratory, 32, Holborn Viaduct, London, E.C., Analytical Chemist.
1895. Clayton, Dr. G. C., Maldon Lodge, Wavertree, Liverpool.
1899. Clayton, Harold, 17, Woodville Road, Chorley, Lancashire, Colourist and Chemist.
1891. Clayton, J. W., Bentfield, Hunt's Cross, Liverpool, Pharmaceutical Chemist.
1894. Clayton, Robt. H., 12, Park Avenue, Southport, and (Journals), 37, George Street, Cheetham Hill, Manchester, Chemist.
1893. Clemes, J. H., The Bracken, Newquay, Cornwall.
1886. Cleminshaw, E., Alkali Works, Oldbury, near Birmingham, Technical Chemist.
1883. Clemons, G. H., Cudbear Street, Hunslet Road, Leeds, Dyeware Manufacturer.
1896. Clennell, J. E., c/o V. Marcenaro and Co., La Union, Salvador, Central America, Analytical Chemist.
1899. Clergue, Francis H., Sault Ste. Marie, Ontario, Canada, Chemical Manufacturer.
1884. Clerk, Dugald, 18, Southampton Buildings, Chancery Lane, W.C., Engineer.
1899. Cleveland, D. B., Struthers, Ohio, U.S.A., Chemist.
1884. Cliff, Stephen, Wortley, near Leeds, Firebrick Maker.
1900. Clifford, Wm., Glenhurst, Avondale Road, Riches Street, Wolverhampton, Sewage Works Manager.
1885. Clifton, C. D., Royal Oak Brewery, Stockport, Brewer.
1896. Clinch, Jno. W., Eartfield House, Douglas, Isle of Man, Brewer.
O.M. Cloud, T. C., Wallaroo Smelting Works, Wallaroo, South Australia, Metallurgist and Manager.
O.M. Clowes, Dr. F., 18, Bedford Court Mansions, Bedford Square, W.C.; and 40, Craven Street, Strand, W.C.: Chief Chemist (L.C.C.).

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1886. Clowes, G. A., Needham Market, Suffolk, Brewer and Maltster.
1891. Clutton, J. H., Goring Villas, Burry Port, R.S.O., Carmarthenshire, Assayer.
1900. Clymer, Wm. R., 2012, Detroit Street, Cleveland, Ohio, U.S.A., Chemist.
1899. Coates, Chas. E., jun., Louisiana State University, Baton Rouge, La., U.S.A., Professor of Chemistry.
1888. Coats, Jno. T., 105, Broughton Street, Edinburgh, Manufacturing Chemist.
1893. Cobb, Jno. W., Farnley Ironworks, near Leeds, Technical Assistant to Managing Director.
1894. Coblentz, Dr. Virgil, College of Pharmacy, 115, West 68th Street, New York, U.S.A., Chemical Lecturer.
1899. Cochran, Alfred, 559, Madison Street, Brooklyn, N.Y., U.S.A., Chemist.
1898. Cochrane, A. Lynde, 55, Kilby Street, Boston, Mass., U.S.A., Clerk (Cochrane Chemical Co.).
1895. Cochrane, Jno., Watford Bridge, New Mills, via Stockport, Calico Printer.
1901. Cockburn, John A., Ardeer, Stevenston, Ayrshire, Analytical Chemist.
1887. Coghill, P. de G., Borax Works, Old Swan, Liverpool, Technical Chemist.
1884. Cogswell, W. B., Syracuse, New York, U.S.A., Chemical Engineer.
1899. Cohen, Dr. Hermann, 4, Lütticherstrasse, Köln a/Rhein, Germany, Organic Chemist.
O.M. Cohen, Dr. J., Yorkshire College, Leeds, Analytical Chemist.
1900. Cohen, R. Waley, 11, Hyde Park Terrace, London, W., Chemist.
1897. Cohn, Alfred J., c/o Merck and Co., 13–19, University Place, New York, U.S.A., Chemist.
1891. Colby, Albert L., c/o Bethlehem Steel Co., South Bethlehem, Pa., U.S.A., Metallurgical Engineer.
1899. Colby, E. A., Baker Platinum Works, Newark, N.J., U.S.A., Metallurgical Chemist.
O.M. Colby, W. H., Carreg-wen, Aberystwith, Wales.
1895. Colchester, G. H., Burwell, near Cambridge, Manure Manufacturer.
1893. Colefax, Dr. Arthur, (Journals) 26, Ashgrove, Bradford, Yorks; and (notices and subs.) 4, Brick Court, Temple, E.C.; Barrister-at-Law.
1899. Coleman, Gurney F., 4244, Cook Avenue, St. Louis, Mo., U.S.A., Chemist and Paint Merchant.
1885. Coleman, Jas. B., 40, Whitehead Grove, Chelsea, S.W., Analytical Chemist.
1893. Coleman, W. H., 303, Ashton New Road, Clayton, Manchester, Tar Works Chemist.
O.M. Collens, E., Vinegar Works, Stourport, Worcestershire, Vinegar Works Manager.
1887. Collett, J. M., Guy's Cliff, Wotton, Gloucester, Chemical Manufacturer.
1893. Collin, Dr. C. A., Ferguslie Threadworks, Paisley, N.B., Textile Chemist.
1898. Collingridge, Frank, Glen Roy, Heathfield Park, Willesden Lane, N.W., Chemist.
1885. Collins, H. S., c/o Davy, Hill and Son, Yates, and Hicks, 64, Park Street, Southwark, S.E., Analytical Chemist.
1883. Collins, J. H., 14—15, Broad Street Avenue, London, E.C., Technical Chemist.
1899. Collins, S. Hoare, Durham College of Science, Newcastle-on-Tyne, Agricultural Chemist.
1888. Collins, W. Hepworth, 26, Coupland Street, Oxford Road, Manchester, Analytical Chemist.
1899. Collis, Walter T., Swinford House, Stourbridge, Worcestershire, Chemist.
1891. Colman, Dr. H. G., 23, Stirling Road, Edgbaston, Birmingham, Analytical Chemist.
1887. Colquhoun, D., Maulesbank, Carnoustie, N.B., Chemical Works Manager.
1892. Colquhoun, Lewis, c/o Nobel's Explosives Co., Ltd., Perranporth, R.S.O., Cornwall, Analytical Chemist.
1894. Colquhoun, W., 6, Grove Road, Wrexham, North Wales, Engineer.
1900. Comey, Arthur M., 54, Concord Avenue, Cambridge, Mass., U.S.A., Technical Chemist.
1899. Conant, Francis M., Mathieson Alkali Works, Niagara Falls, N.Y., U.S.A., Chemical Engineer.
1883. Connor, C. C., 4, Queen's Elms, Belfast, Ireland, Chemist.
1900. Conolly, David A., c/o Mountain Copper Co., Keswick, Shasta Co., Cal., U.S.A., Chemist.
1891. Conradson, Pontus H., Galena Oilworks, Franklin, Pa., U.S.A., Analytical Chemist.
1889. Conroy, Dr. Jas. T., 13, Howard Drive, Cressington, Liverpool, Chemist.
1887. Constable, W. H., Australian Alum Works, Runcorn, Analytical Chemist.
1891. Coode, J. Charles, 19, Freeland Road, Ealing, W., Civil Engineer.
O.M. Cook, H. J., The Firs, Woodford Green, Essex, Soap Manufacturer.
1888. Cook, Jno. J., Atlas Foundry, St. Helens, Lancashire, Ironfounder.
1899. Cook, R. Anderson, New Brunswick, N.J., U.S.A., Chemist.
1898. Cook, Thos. Alex., East London Soap Works, Bow, E. Soapmaker.
1899. Cook, Walter G., 9, Hendon Lane, Finchley, N., Analytical Chemist.
1894. Cook, Wm. Martyn, 142, Highbury New Park, London, N., Analytical Chemist.
1891. Cooke, Arthur W., c/o Brotherton and Co., Holmes Street, Dewsbury Road, Leeds, Analytical Chemist.
O.M. Cookson, N. T., Newcastle-on-Tyne, White Lead Manufacturer.
1891. Cooper, Harry J., Drinagh, Wexford, Ireland, Cement Manufacturer.
1891. Cooper, Walter J., c/o South Wales Cement Co., Penarth, Cardiff, Cement Works Manager.
1897. Cooper, Wm. R., Carisbrooke, Upper Tulse Hill, S.W., Electrical Engineer.
1890. Corcoran, Bryan, 31, Mark Lane, London, E.C., Chemical Engineer.
1887. Cordner-James, J. H., Finsbury House, Blomfield Street, London, E.C., Mining Engineer.
1899. Cornelison, Dr. Robt. W., Bloomfield, N.J., U.S.A., Consulting Chemist.
1887. Cornett, Jas. P., Ford Paper Works, Hylton, near Sunderland, Paper Maker.
1889. Corrie, David, c/o Nobel's Explosives Co., Ltd., Polmont Station, N.B., Technical Chemist.
1898. Cosby, C. D., Radford House, Home Park Road, Saltash, Cornwall, Mining Engineer.
1894. Coste, J. H., 40, Craven Street, W.C.; and (Journals) 206, Amhurst Road, Hackney, E., Analytical Chemist.
1883. Cotterill, Thos., The Poplars, West Bromwich, Chemical Agent.
1891. Cotton, W. F., Hollywood Roebuck, Co. Dublin, Gas Works Manager.
1898. Coupe-Annable, H. W., Keadby, Doncaster, Chemical Assistant.
1894 Court, Heywood, 67, Surrey Street, Sheffield, Analytical Chemist.
1898. Courtney, Samuel, 37, The Mount, Belfast, Ireland, Manager.
1894. Cousins, W. J., 11 and 12, Southampton Buildings, Chancery Lane, W.C., Consulting Chemist and Director.
1893. Cowan, W. J., 12, Park Avenue, Wood Green, N., Fine Colour Manufacturer.
1894. Coward, Percy, Sewage Disposal Works, Deighton, Huddersfield, Chemist.
1897. Cowburn, Arthur W., Fernroyd, St. Margaret's Road, Bowdon, Cheshire, Chemical Merchant and Analytical Chemist.
1894. Cowburn, W. H., Fernroyd, St. Margaret's Road, Bowdon, Cheshire, Chemical Merchant.
1891. Cownley, A. J., 13, Fenchurch Avenue, London, E.C., Analytical Chemist.
1891. Cowper-Coles, Sherard Osborn, Grosvenor Mansions, Victoria Street, Westminster, S.W., Metallurgical Engineer.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1884. Craig, G., 9, Hampden Terrace, Mount Florida, Glasgow, Technical Chemist.
1895. Craig, Thos. J., c/o Messrs. Peter Spence and Sons, Manchester Alum Works, Manchester, Chemist.
1886. Crake, Wm., 397, Staniforth Road, Sheffield, Analytical Chemist.
1898. Cranfield, Wm., 5, Second Avenue, Halifax, Yorks, Teacher of Chemistry.
1889. Craven, Chas. E., Hawthorne Cottage, White Cote Hill, Bramley, near Leeds, Dyer.
1899. Craven, Jas., The Netherlands, Broughton Park, Manchester, Chemist.
1891. Craven, Jno., jun., 6, Halliwell Lane, Cheetham Hill, Manchester, Chemist.
1885. Craw, John, 15, Cadogan Street, Glasgow, Drysalter.
1896. Crawford, Alex., 113, Fenchurch Street, London, E.C., Chemical Merchant.
O.M. Crawford, D., Langdale's Chemical Manure Co., Lim., St. Laurence, Newcastle-on-Tyne, Manager.
1884. Crawford, D., 12, Abbey Grove, Eccles, Manchester, Dyer and Printer.
1897. Crawford, Walter W., Imperial Chambers, 91, Pitt Street, Sydney, N.S.W., Mechanical Engineer.
1890. Crawshaw, E., 25, Tollington Park, London, N., Dye Merchant.
1900. Crayen, Dr. Gustav, 446, West 23rd Street, New York City, U.S.A.
1895. Cremer, John H., 24, Superior Street, Cleveland, Ohio, U.S.A., Chemist and Metallurgist.
O.M. Cresswell, C. G., Ermyngarth, Ashtead, Surrey; and 9, Bridge Street, Westminster, S.W., Chemist.
1886. Crichton, Donald G. (Journals), Nundle, via Tamworth, New South Wales; (subs.) Logan Bank, Cupar, Fife, N.B., Analytical Chemist.
1898. Crichton, Jas., Raeburn, Stonebridge Park, Willesden, N.W., Merchant.
1890. Criper, Wm. R., Cossipore Chemical Works, Cossipore, Calcutta, India, Manufacturing Chemist.
1899. Crombie, Jos. A., 1105, Metropolitan Avenue, Brooklyn, N.Y., U.S.A., Essential Oils Manufacturer.
1898. Crompton, Benj. F., Church Street, Adlington, Lancashire, Printworks Manager.
1885. Crompton, Percy R., Elton Paper Mills, near Bury, Lancashire, Paper Maker.
1889. Cronquist, Prof. A., Werner, 5, Malmtorgsgatan, Stockholm, Sweden, Consulting Chemist.
O.M. Crookes, Sir Wm., F.R.S., 7, Kensington Park Gardens, Notting Hill, London, W., Analytical Chemist.
1899. Crosbie, Adolphe, Walsall Street Chemical Works, Wolverhampton, Chemical and Colour Manufacturer.
1896. Crosby, Thos., Briton Ferry Steelworks, Briton Ferry, Glamorganshire, Metallurgist.
O.M. Crosfield, A. L., 46, Bidston Road, Oxton, Birkenhead, Analytical Chemist and Assayer.
1896. Crosfield, George R., Walton Lea, Warrington, Soap Manufacturer.
1884. Cross, C. F., 4, New Court, Lincoln's Inn, London, W.C., Analytical Chemist.
1900. Crosskey, Alex., N., c/o Alloys Syndicate Ltd., New Dock, Llanelly, South Wales, Chemist.
1894. Crossley, Dr. Arthur W., Chemical Laboratory, St. Thomas' Hospital, London, S.E., Organic Chemist.
1900. Crossley, Frank, Duchy Bank, Seedley Road, Pendleton, Manchester, Analytical Chemist.
1892. Crossman, Tom, Albion Brewery, Coldhurst Street, Oldham, Brewing Chemist.
1884. Crow, Dr. J. K., Tressillian, Ulundi Road, Blackheath, S.E., Technical Chemist.
1894. Crow, Henry W., 94, Romford Road, Stratford, E., Tar Distiller.
O.M. Crowder, W., Eden Vale, 177, Lower Addiscombe Road, East Croydon, Chemist and Assayer.
1893. Crowther, Edw., Woodland Dyeworks, Headingley, Leeds, Dyer.
1883. Crowther, Horace W., 21, Beeches Road, West Bromwich, Technical Chemist.
1899. Crowther, J., Municipal Technical School, Swansea, Metallurgist.
1884. Crowther, W. M., Field House, Gomersal, near Leeds, Manufacturing Chemist.
1884. Crumbie, W. D., 146, Washington Street, East Orange, N.J., U.S.A., Analytical Chemist.
1892. Cullen, Wm., Bronte Villa, Gravesend, Kent, Chemist.
1897. Culmann, Dr. Julius, 843, Front Avenue, Buffalo, N.Y., U.S.A., Chemist and Colourist.
1883. Cuming, James, jun., Chemical Works, Yarraville, Melbourne, Australia, Manure Manufacturer.
1897. Cunliffe, Albert J., Kern Mill Printworks, Whittle-le-Woods, Lancashire, Calico Printer.
1884. Cunliffe, E. T., The Parsonage, Handforth, near Manchester.
1893. Cunningham, Edw., 70, Kilby Street, Boston, Mass., U.S.A., Chemical Engineer.
O.M. Curphey, W. S., Borva, Lenzie, N.B., Alkali Works Inspector.
O.M. Curry, W. A., Giltbrook Chemical Works, Awsworth, Notts, Manager.
1898. Curtis, Marvin, 123, California Street, San Francisco, Cal., U.S.A., Wine Merchant.
1884. Cuthbertson, Sir J. N., 29, Bath Street, Glasgow, Chemical Broker.
1899. Cutler, Fred F., 17, Spruce Street, New York, U.S.A., Publisher.

D

O.M. Dacie, J. C., Soap Works, Putney, London, S.W., Soap Manufacturer.
1897. Dains, Hebert H., Vizianagram Cantonment, Madras Presidency, India, Analytical Chemist.
1897. Dakin, Henry D., 9, Beech Grove Terrace, Leeds, Assistant Analyst.
1887. Dale, Jas., The Towers, Wallington, Surrey, Coppersmith.
1897. Dancer, Wm., 466, Chester Road, Old Trafford, Manchester, Analytical Chemist.
1884. Daniell, Louis C., (Journals) Royal Standard Brewery, Tamworth, New South Wales; and (subs.) c/o W. T. Allen & Co., 132, Queen Victoria Street, London, E.C., Brewer.
1885. Darby, J. H., Pen-y-Garth, near Wrexham, Ironmaster.
1901. Darke, Jesse M., Steel Foundry, General Electric Co. Lynn, Mass., U.S.A., Chemist.
1894. Darling, G. A., 59, Cornwall Road, Bayswater, W., Metallurgical Chemist.
O.M. Darling, W. H., 126, Oxford Street, Manchester, Analytical Chemist.
1887. Davenport, Dr. B. F., 161, Tremont Street, Boston, Mass., U.S.A., Consulting, Sanitary, and Toxicological Chemist.
1900. Davidson, Alex., jun., 1, Almond Bank Terrace, East Merchiston, Edinburgh, Analytical Chemist.
1899. Davidson, Charles, 37, Heriot Street, Pollokshields, Glasgow, Analytical Chemist.
1883. Davidson, J. E., 40, Percy Gardens, Tynemouth, Chemical Manufacturer.
1891. Davidson, Richard, 44, High Street, Dundee, Oil Merchant's Clerk.
O.M. Davidson, R. Holden, c/o United Alkali Co., Ltd., Golding Davis Works, Widnes, Works Manager.
1897. Davies, Charles T., 405, Elm Street, Reading, Pa., U.S.A., Chemist.
1889. Davies, G. W., 8, Spring Hill, Stockport, Chemical Lecturer.
1898. Davies, Herbert E., The Laboratory, 28, Chapel Street, Liverpool, Analytical Chemist.
1898. Davies, Leyshon, Kames, Kyles of Bute, by Greenock, N.B., Gunpowder Mills Manager.
1896. Davies, Llewellyn J., Bute Chambers, Bute Road, Cardiff, Analytical and Consulting Chemist.
1886. Davies, M. Lloyd, North American Chemical Co., Bay City, Mich., U.S.A., Alkali Works Manager.

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1897. Davies, Saml. H., c/o H. S. Rowntree and Co., Cocoa Works, York, Research Chemist.
O.M. Davis, A. R., Derby Lodge, Wellington Road, Heaton Chapel, Stockport, Analytical Chemist.
1900. Davis, Arthur C., Saxon Portland Cement Co., Cambridge, Cement Maker.
1885. Davis, Chas., 15, Goldsmith Avenue, Manor Park, Essex, Analytical Chemist.
1893. Davis, Fred., 51, Imperial Buildings, Ludgate Circus, E.C., Analytical and Consulting Chemist.
O.M. Davis, George E., Sandilands, Knutsford, Cheshire, Chemical Engineer.
1898. Davis, G. Keville, Sandilands, Knutsford, Cheshire, Chemical Engineer.
1893. Davis, Herbert J., 65, Wall Street, New York, U.S.A., Merchant.
O.M. Davis, H. W., Government Laboratory, Clement's Inn Passage, Strand, W.C., Analytical Chemist.
O.M. Davis, T. Sebastian, 199, South Lambeth Road, London, S.E., Vinegar Works Chemist.
1897. Davis, Wm. A., Central Technical College, South Kensington, Chemist.
1893. Davis, W. Walley, Virginia Iron Coal and Coke Co., Bristol, Tenn., U.S.A., Analytical Chemist.
1900. Daw, Fred W., Eureka Place, Ebbw Vale, Mon., Metallurgical Chemist.
O.M. Dawson, C. A., 40, Russell Road, Sefton Park, Liverpool, Technical Chemist.
1896. Dawson, Geo., Reddish Chemical Works, near Stockport, Technical Chemist.
1894. Dawson, Jas., 27, St. Vincent Place, Glasgow; and (Journals) Eglinton Dyewood Mills, Alloa, N.B., Drysalter.
1886. Dawson, W. Haywood, British Alizarin Co., Limited, Silvertown, Victoria Dock, E.; and (Journals), 187, Eglinton Road, Woolwich, S.E., Technical Chemist.
O.M. Deacon, H. W., 8, Ullet Road, Liverpool, Alkali Manufacturer.
1896. Deakin, E. C., Ryecroft House, Belmont, near Bolton, Dyer.
O.M. Deakin, H. T., Dewhurst House, Egerton, near Bolton, Dyer.
1899. Deane, Leopold M., Davington House, Faversham, Kent, Analytical Chemist.
1892. Deaville, B., Hyson Green Works, Nottingham, Manufacturing Chemist.
1899. De Castro, J. Paul, Ford House, Redruth, Cornwall, Principal (Redruth School of Mines).
1893. De Clerck, Maurice, Heule-lez-Courtrai, Belgium.
1884. Deering, W. H., Chemical Department, Royal Arsenal, Woolwich, S.E., Analytical Chemist.
1900. Deerr, Noel, Albion, Demerara, B.G., Analytical Chemist.
1893. Delahaye, Philibert, 65, Rue de Provence, Paris, Gas Engineer.
1899. Delano, Warren, jun., 1, Broadway, New York, U.S.A., Mine Operator.
1896. De Lessing, G. C., 147, East 81st Street, New York, U.S.A., Manufacturing Chemist.
1898. Deming, Edw. D., 143, Federal Street, Boston, Mass., U.S.A., Editor of "The Leather Manufacturer."
1883. Dempsey, Geo. C., 165, Market Street, Lowell, Mass., U.S.A., Chemist.
1899. Denham, Wm. S., 9, Holyrood Crescent, Glasgow, Chemist.
1891. Denison, Joseph R., 1, Park View Terrace, Manningham, Bradford, Analytical Chemist.
1897. Dennis, John, Brixwold, Bonnyrigg, Midlothian, Contractor.
1898. Dent, Dr. Frankland, 93, Holly Avenue, Newcastle-on-Tyne, Consulting Chemist.
1901. Devas, Ernest W., 274, Upper Brook Street, Manchester, Technical Chemist.
1890. De Velling, F. W., Higher Grade Board School, The Boulevard, Hull, Head Master and Science Lecturer.
1898. Dewar, Alex. H., Russian Steam Oil Mills, 32, Kourlandsky Street, St. Petersburg, Chemist.
O.M. Dewar, Prof. J., F.R.S., Royal Institution, Albemarle Street, W. (for Journals); and 1, Scroope Terrace, Cambridge, Professor of Chemistry and Physics.
1891. Dewar, Jno. A., M.P., Murrayshall, Perth, N.B., Distiller.
1889. Dewey, Fred. P., 702, 9th Street Northwest, Washington, D.C., U.S.A., Metallurgist.
1899. Dewez, Eugène, jun., Herve, Belgium, Tanner.
1891. De Wilde, Prof. P., 339, Avenue Louise, Brussels, Belgium, Professor of Chemistry.
1886. Dey, Preo Lall, 4, Beadon Street, Calcutta, Manufacturing Chemist.
O.M. Dibdin, W. J., Edinburgh Mansions, Howick Place, S.W.; and (Journals) Mayfield, Grange Road, Sutton, Surrey; Analytical Chemist.
O.M. Dick, A., 110, Cannon Street, London, E.C., Chemical Engineer.
1896. Dick, F. Burnett, 8, Disraeli Gardens, Putney, S.W., Chemist.
1897. Dick, Jno., 14, Bay Street, Toronto, Ont., Canada, Manufacturer.
1898. Dickenson, Frank, 48, Bignor Street, Cheetham Hill, Manchester.
1896. Dickenson, F. M., c/o Broken Hill Proprietary Co., 3, Great Winchester Street, E.C., Secretary.
1893. Dickerson, E. N., 15, Wall Street, New York, U.S.A., Lawyer.
O.M. Dickinson, A. J., Neptune Tar and Chemical Works, Deptford, S.E.; and (Journals) 4, Shardeloes Road, New Cross, S.E., Tar Distiller.
1887. Dickson, Jno., 54, Brown Street, Broomielaw, Glasgow, Oil Merchant.
1898. Dickson, Samuel, 2, Broadway, Westminster, S.W., Analytical Chemist.
1899. Dieckmann, Dr. Otto, 1182, Harrison Avenue, Cincinnati, Ohio, U.S.A., Chemist.
1894. Diestel, Wm., 77, William Street, New York, U.S.A., Dyestuff Importer.
1898. Dillon, Wm., 7, Laurel Place, Armley, Leeds, Oil, Colour, and Varnish Manufacturer.
O.M. Divers, Dr. E., F.R.S., 9, Rugby Mansions, Addison Bridge, Kensington, W., Professor of Chemistry.
1899. Dixon, Fred. W., P.O. Box 390, Providence, R.I., U.S.A., Dyer.
1888. Dixon, Prof. Harold B., F.R.S., Owens College, Manchester, Professor of Chemistry.
1885. Dixon, Jos., Spring Grove, near Sheffield, Paper Maker.
1884. Dixon, Wm., 102, Spring Street, Bury, Lancashire, Science Master.
1892. Dobb, Thos., Audrey Cottage, Union Road, Sharrow, Sheffield, Pharmaceutical Chemist.
O.M. Dobbie, Dr. J. J., University College of North Wales, Bangor, Professor of Chemistry.
O.M. Dobbin, Dr. L., Chemical Laboratory, University, Edinburgh, Professor of Chemistry.
1890. Dodd, A. J., River View, Belvedere, Kent, Oil Refiner.
1892. Dodd, Archelaus, 135, Coleman Street, Whitmorereans, Wolverhampton, Electro-Chemical Foreman.
1889. Dodd, W. R., Oak Dene, Bush Hill Park, Enfield, N., Chemical Works Manager.
1900 Dodge, Dr. Francis D., c/o Dodge and Olcott, 137, Water Street, Brooklyn, N.Y., U.S.A., Chemist.
1897. Doerflinger, Wm. F., 85, Lafayette Avenue, Brooklyn, N.Y., U.S.A., Research Chemist.
1897. Dohme, Dr. Alf. R. L., Messrs. Sharp and Dohme, Baltimore, Md., U.S.A., Manufacturing Chemist.
1885. Doidge, H., 112, Loop Street, Pietermaritzburg, Natal.
1897. Dolge, Carl B., Westport, Conn., U.S.A., Manufacturer of Instruments and Antiseptics.
1886. Domeier, A., Thriffwood, Silverdale, Sydenham, S.E., Chemical Merchant.
1884. Donald, Jas., 5, Queen's Terrace, Glasgow, Manufacturing Chemist.
1890. Donald, Samuel, Corporation Gasworks, Dundee, Analytical Chemist.

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O.M. Donald, W., Saltcoats, N.B., Analytical Chemist.
1900. Donald, Wm., Ridgefield Park, Bergen Co., N.J., U.S.A., Assayer and Chemist.
1886. Doolittle, Orrin S., 445, Oley Street, Reading, Pa., U.S.A., Chemist, Philadelphia and Reading Railroad.
1890. Dore, Jas., Copper Works, High Street, Bromley-by-Bow, E., Distiller's Engineer.
1896. Doremus, Dr. Chas. A., 59, West 51st Street, New York, U.S.A., Professor of Chemistry.
O.M. Dott, D. B., c/o J. F. Macfarlan & Co., 93, Abbey Hill, Edinburgh, Analytical Chemist.
O.M. Dougall, A., 271, Beverley Road, Hull, Gas Engineer.
1883. Dougall, Archibald, Gasworks, Kidderminster, Gas Engineer.
1897. Douglas, Geo., Heather Bank, Bingley, Yorks, Dyer.
1894. Douglas, London M., Baltic Wharf, Putney, S.W., Chemical Manufacturer.
1884. Douglas, William, Diamond Plantation, Demerara, British Guiana, Chemical Engineer.
1900. Doulton, H. Lewis, Lambeth Pottery, London, S.E., Potter.
1900. Dow, Allan W., 2016, Hillyer Place, Washington, D.C., U.S.A., Chemist (District Engineer's Dept.)
1898. Dow, Herbert H., Midland, Mich., U.S.A., Manufacturing Chemist.
1897. Dowling, Walford R., Chemist.
1885. Dowson, J. Emerson, 39, Old Queen Street, Westminster, S.W., Civil Engineer.
1885. Drake, Chas. A., Three Mills Distillery, Bromley-by-Bow, E., Brewer.
1886. Dreaper, W. P., Clifton Villa, Coggeshall Road, Braintree, Essex, Technical Chemist.
O.M. Drew, D., Lower House Printworks, near Burnley, Calico Printer.
1896. Drewsen, Dr. Viggo B., c/o F. Barbuch & Co., 308, Temple Court Building, New York City, U.S.A., Wood Pulp and Paper Expert.
O.M. Dreyfus, Dr. C., Clayton Aniline Co., Limited, Clayton, Manchester, Dye Manufacturer.
1893. Dreyfus, S., Clayton Aniline Co., Ltd., Clayton, Manchester, Chemist.
1899. Dreyfus, Dr. Wm., c/o The West Disinfecting Co., 208, E. 52nd Street, New York, U.S.A., Chemist.
1898. Driessen, Dr. P. A., Leyden, Holland, Colour Chemist.
O.M. Driffield, V. C., Appleton, Widnes, Chemical Engineer.
1899. Drobegg, G., 81, Maiden Lane, New York City, U.S.A., Superintending Chemist.
1887. Drown, Prof. T. M., The Lehigh University, South Bethlehem, Pa., U.S.A., Professor of Analytical Chemistry.
1889. Drummond, Hon. G. A., Montreal, Canada.
1898. Drummond, Isaac W., 436, West 22nd Street, New York City, U.S.A., Chemist.
1899. Ducas, B. P., 13–15, Coenties Slip, New York, U.S.A., Chemical and Dyestuff Importer.
1897. Duckham, Alex., The Red House, Blackheath, S.E., Works Chemist.
1899. Dudderidge, Frank R., 55, Northumberland Street, Newcastle-on-Tyne, Teacher of Chemistry.
1890. Dudley, Dr. C. B., 1219, 12th Avenue, Altoona, Pa., U.S.A., Analytical Chemist.
1887. Dudley, Prof. W. L., Vanderbilt University, Nashville, Tenn., U.S.A., Professor of Chemistry.
1899. Duff, Wm. S., Woodland View, Cleveland Road, South Woodford, Essex, Manufacturing Chemist.
O.M. Duggan, T. R., Sunnybank, Vanbrugh Hill, Blackheath, S.E., Analytical Chemist.
1898. Duguid, Jas., 46, Sotheby Road, Highbury, N., Journalist.
1858. Duisberg, Dr. Carl, The Bayer Co., Ltd., (Journals), Elberfeld, Germany, (Subscriptions), 19, St. Dunstan's Hill, E.C., Chemist.
1888. Dukes, T. William, Merchant.
1889. Duncan, Arthur W., 42, Trevelyan Street, Eccles, Manchester, Analytical Chemist.
O.M. Duncan, J., 9, Mincing Lane, London, E.C., Sugar Refiner.
1898. Dunham, Edw. K., 338, East 26th Street, New York City, U.S.A., Professor of Bacteriology and Hygiene.
1889. Dunlop, Robt., Orepuki, Southland, New Zealand, Oil Works Manager.
1892. Dunn, Fred., 193, Collins Street, Melbourne, Victoria, Analytical Chemist.
O.M. Dunn, J., 53, Brown Street, Manchester, Chemical Manufacturer.
1890. Dunn, John, Morgan Academy, Dundee, Science Teacher.
O.M. Dunn, Dr. J. T., Northern Polytechnic, Holloway Road, London, N., Headmaster.
O.M. Dunn, P., 53, Brown Street, Manchester, Chemical Merchant.
1893. Dunn, W. H., jun., c/o Messrs. Reckitt and Sons, Lim., Hull, Analyst.
O.M. Dupré, Dr. A., F.R.S., Edinburgh Mansions, Howick Place, S.W., Consulting Chemist.
1897. Durant, H. T., Butter's Salvador Mines, Ltd., Sta. Rosa, La Union, Salvador, C. A., Chemist.
1900. Durbrow, Wm., c/o Mountain Copper Co., Keswick, Shasta Co., Cal., U.S.A., Chemist.
1897. Durkee, Frank W, Tuft's College, Mass., U.S.A., Assistant Professor of Chemistry.
1899. Duryea, Chester B., 34, Gramercy Park, New York City, U.S.A., Starch Manufacturer.
1891. Duttson, W. H., Southwood, Silverdale, Sydenham, S.E., Merchant.
1899. Du Vivier, Ernest H., 441, West 21st Street, New York City, U.S.A., Chemist.
1891. Dvorkovitch, Dr. P., 6, Willow Bridge Road, Canonbury, N., Technical Chemist.
O.M. Dyer, Dr. B., 17, Great Tower Street, London, E.C., Analytical and Consulting Chemist.
O.M. Dyson, C. E., Flint, North Wales.
1892. Dyson, Septimus, 8, Belmont Avenue, Harrogate, Manufacturing Chemist.

E

1895. Earle, Vavasour, Franks Hall, near Dartford, Kent, Merchant.
1899. Earnshaw, Edward H., 22nd and Filbert Streets, Philadelphia, Pa., U.S.A., Chemist (Gas Improvement Co.).
O.M. Earp, W. R., Halton Road, Runcorn, Cheshire, Chemical Manufacturer.
1884. Eastick, C. E., Martineau's Refinery, King Edward Street, Mile End New Town, Sugar Works Manager.
O.M. Eastick, J. J., Millaquin Refinery, Bundaberg, Queensland, Sugar Works Manager.
1890. Eastlake, A. W., Caenwood House, Grove Road, Clapham Park, S.W., Petroleum Works Manager.
1891. Eastwick, Jos. H., 2216, North 51st Street, Philadelphia, Pa., U.S.A., Chemist.
1885. Eastwood, Edw., c/o Lever Brothers, Ltd., Port Sunlight, Birkenhead, Soapmaker.
1898. Eavenson, Alban, 2013 Vine Street, Philadelphia, Pa., U.S.A., Soap Works Chemist.
1892. Eddy, Harrison P., Sewage Purification Works, Worcester, Mass., U.S.A., Superintendent.
1894. Ede, Henry E., 251, School Road, Crookes, Sheffield, Analytical Chemist.
1885. Edge, Anthony, Readville, Mass., U.S.A., Chemist.
1900. Edgerley, Daniel W., Chilton Manufacturing Co., College Point, Long Island, N.Y., U.S.A., Chemist.
1893. Edwards, Henry W., Mountain Copper Co., Iron Mountain, Shasta Co., Cal., U.S.A., Metallurgist.
1885. Ehrenfeld, Prof. Chas. H., York Collegiate Institute, York, Pa., U.S.A., Professor of Chemistry.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1896. Ehrhardt, Ernest F., Badische Anilin und Soda Fabrik, Ludwigshafen a/Rhein, Germany, Research Chemist.
1895. Ekenberg, Dr. M., Gothenburg, Sweden, Technical Chemist.
O.M. Ekman, C. D., Paper Mills, Northfleet, Kent, Technical Chemist.
1885. Elborough, T., 59, Mark Lane, London, E.C., Manure Manufacturer.
1900. Elliot, Harry T., Elliot's Buildings, Falkirk, N.B., Chemical Student.
1892. Elliot, John, Free Library, Wolverhampton, Librarian.
1884. Elliott, Dr. A. H., Consolidated Gas Co., 4, Irving Place, New York, U.S.A., Analytical Chemist.
1896. Elliott, Dr. J. F., c/o Grimwade and Co., 82, Bishopsgate Street, E.C.; and (Journals), O'Connel Street, Sydney, N.S.W., Manufacturing Chemist.
1891. Ellis, Alex., Victoria Terrace, South Shields, Pharmaceutical Chemist.
1885. Ellis, C. J., 13, West Scotland Street, Kinning Park, Glasgow, Technical Chemist.
1893. Ellis, E. Victor, 21, Castle Street, Edinburgh, Analytical Chemist.
1894. Ellis, G. Beloe, 56, Chancery Lane, W.C., Patent Agent.
O.M. Ellis, H., 112, Regent Road, Leicester, Chemical Merchant.
1891. Ellis, Prof. W. Hodgson, 74, St. Alban Street, Toronto, Canada, Professor of Applied Chemistry.
1891. Ellison, Henry, Flatt Lane, Cleckheaton, Yorks, Manufacturing Chemist.
O.M. Elmore, A. S., Oak Lawn, Blackheath, S.E., Electro-Metallurgist.
1885. Elworthy, H. S., 239, Dashwood House, New Broad Street, E.C., Sugar Works Chemist.
1899. Emery, E. G., 677, Avenue C., Bayonne, N.J., U.S.A., Chemist.
O.M. Endemann, Dr. H., 23, William Street, New York City, U.S.A., Analytical Chemist.
1897. Enequist, Erik W., North 8th and Roebling Streets, Brooklyn, N.Y., U.S.A., Chemist.
1894. Enequist, John, 556, Greene Avenue, Brooklyn, N.Y., U.S.A., Chemical Engineer.
1899. Engledue, Col. W. J., Petersham Place, Byfleet, Surrey, Colonel (late) Royal Engineers.
1895. English, Frank H., Manchester Road, Hapton, Lancashire, Analytical Chemist.
1899. Enright, Bernard, 330, East 4th Street, South Bethlehem, Pa., U.S.A., Analytical Chemist.
1886. Ermen, F., jun., Nassau Mills, Patricroft, Manchester, Dyer and Bleacher.
1885. Ernst, Adolf, Oberlangenbielau, Schlesien, Germany, Chemist.
1888. Erskine, J. K., Analytical Chemist.
1897. Escher, Paul, c/o The Acker Process Co., Niagara Falls, N.Y., U.S.A., Chemist.
1884. Esilman, A., 25, Roe Lane, Southport, Lancashire, Analytical Chemist.
O.M. Estcourt, C., 20, Albert Square, Manchester, Consulting Chemist.
1883. Evans, Enoch, 181, Herbert Road, Small Heath, Birmingham, Accountant.
1898. Evans, Ernest D., The Western Tanning Co., Bedminster, Bristol, Tanner.
1900. Evans, J. Eric, Casilla 250, San José, Costa Rica, C.A., Chemist and Assayer.
1883. Evans, Sir John, K.C.B., F.R.S., Nash Mills, Hemel Hempstead, Herts, Paper Maker.
1889. Evans, R. E., 3, Glencoe, Stratford-on-Avon, Brewing Chemist.
1898. Evans, S. Lavington, Sittingbourne, Kent, Tanner.
1896. Evans, Dr. Thos., University of Cincinnati, Ohio, U.S.A., Instructor in Technical Chemistry.
1898. Evans, Wm. Perceval, Christ's College, Christchurch, New Zealand, Science Master.
O.M. Evershed, F., Atlas Works, Hackney Wick, London, E., Colour Chemist.
1894. Ewan, Dr. Thos., 30, Lansdowne Crescent, Kelvinbridge, Glasgow, Chemist (Aluminium Co.).
1896. Ewen, Eric D., c/o West Indian Tobacco Co., Ltd., Port of Spain, Trinidad, B.W.I., Chemist.
1900. Eyssen, Lorenz, Guatemala, C.A., Coffee and Ramie Planter.
1892. Exley, Arthur, 13, Woodbine Terrace, Headingley, Leeds, Tanner.

F

1898. Fade, Louis, c/o Roessler and Hasslacher Chemical Co., Perth Amboy, N.J., U.S.A., Chemist and Director.
O.M. Fahlberg, Dr. C., Saccharin Fabrik, Salbke-Westerhüsen a/Elbe, Germany, Manufacturing Chemist.
O.M. Fairley, T., 17, East Parade, Leeds, Analytical Chemist.
O.M. Fairlie, H. C., Camelon Chemical Works, Falkirk, N.B., Chemical Manufacturer.
1894. Fairweather, Wallace, 62, St. Vincent Street, Glasgow, Patent Agent.
1898. Falding, F. J., Aldrich Court, 45, Broadway, New York, U.S.A., Chemical Engineer.
1891. Fallon, J. H. M., 61, Birdhurst Rise, South Croydon, Fertiliser Expert.
1897. Farmer, John E., Beddington Farm, near Croydon, Assistant Manager (Sewage Works).
O.M. Farrant, N., c/o J. Nicholson and Sons, Chemical Works, Hunslet, Leeds, Analytical and Metallurgical Chemist.
1897. Farrell, Frank, 82, Deodar Road, Putney, S.W., Analytical Chemist.
O.M. Farries, T., 16, Coleman Street, London, E.C., Manufacturing Chemist.
O.M. Farrington, T., 5, Summerhill Terrace, Cork, Ireland, Chemical Engineer.
1900. Faulenbach, C., 118, Portland Street, Manchester, Chemist and Merchant.
O.M. Faulkner, F., The Laboratory, Bath Row, Birmingham, Consulting Brewer's Chemist.
1891. Fawcett, Jas. H., Federal Metal Agency, Ltd., 1, Leadenhall Street, London, E.C., Metallurgist.
1884. Fawsitt, C. A., Atlas Chemical Works, East Nelson Street, Glasgow, Chemical Manufacturer.
1900. Fehrlin, H. C., Fink and Fehrlin Chemical Co., Milwaukee, Wis., U.S.A.
1892. Feld, Walther, Chemische Fabrik, Linz a/Rhein, Germany, Chemical Works Director.
1897. Felix, Dr. Lorenz, 86, Heidenkampsweg, Hamburg, Germany, Technical Chemist.
1899. Ferguson Geo., Gleniffer Soap Works, Paisley, N.B., Soap Manufacturer.
1900. Ferguson, Geo. A., College of Pharmacy, 115, West 68th Street, New York City, U.S.A., Professor of Analytical Chemistry.
1896. Ferguson, J. Hart, Loch Katrine Distillery, Camlachie, Glasgow, Distillery Manager.
O.M. Ferguson, Prof. J., The University, Glasgow, Professor of Chemistry.
1892. Ferguson, Wm. B., 3, Plowden Buildings, Temple, E.C., Barrister-at-Law.
1883. Fergusson, H., Prince Regent's Wharf, Victoria Docks, E., Technical Chemist.
1893. Fiebing, John H., 644, 28th Street, Milwaukee, Wis., U.S.A., Leather Trade Chemist.
1885. Field, E. W., Cloud House, Sandiacre, near Nottingham, Brewer.
1887. Field, S. S., 1, Bell Rock Villas, Mycenæ Road, Westcombe Park, S.E., Manufacturing Chemist.
1891. Field, Wm. Eddington, 65, Sutherland Road, Armadale, Melbourne, Victoria, Analytical Chemist.
1886. Fielding, A., George Street, Salford, Manchester, Drysalter.
1897. Fielding, Frank E., Cons. Cal. and Virginia Mining Co., Virginia City, Nevada, U.S.A., Assayer and Chemist.
1884. Filcock, P., Cumberland House, Cumberland Street, Macclesfield, Analytical Chemist.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1900. Fillis, Frank, Fairlight, Rhoose, near Cardiff, Cement Works Chemist.
1899. Fingland, Jno. J., Minas de Aznalcollar, Prov. de Sevilla, Spain, Analytical Chemist.
1892. Finlay, Kirkman, c/o Milne & Co., 123, Bishopsgate Street, London, E.C., East India Merchant.
1899. Finley, Norval H., 6638, Deary Street, Sta. A., Pittsburg, Pa., U.S.A., Chemist.
1900. Fisher, Henry, 108, East 70th Street, New York City, U.S.A., Teacher of Chemistry.
O.M. Fisher, W. W., 5, St. Margaret's Road, Oxford, Chemical Lecturer.
1895. Fison, Jno., Messrs. Jas. Fison and Sons, Thetford, Norfolk, Chemical Manufacturer.
O.M. Fitzbrown, G., Ditton Copper Works, Widnes, Metallurgist.
1897. Fitzgerald, Francis A. J., c/o International Acheson Graphite Co., Niagara Falls, N.Y., U.S.A., Chemical Engineer.
1900. Fitz-Randolph, Raymond B., Hoagland Laboratory, Henry and Pacific Streets, Brooklyn, N.Y., U.S.A., Bacteriologist and Chemist.
1896. Flammer, E., Heilbronn a/N., Würtemberg, Manufacturing Chemist.
1892. Flanagan, Chas. A., 54, Gorse Street, Stretford, Manchester, Manufacturing Chemist.
1896. Fleisher, Saml., 25th and Hamilton Streets, Philadelphia, Pa., U.S.A., Woollen Manufacturer.
1892. Fleming, J. Arnold, 136, Glebe Street, Glasgow, Potter.
1898. Fleming, Wm. P., 17, Prince's Road, Jamalpur, E.I.R., Bengal, India, Analytical Chemist.
O.M. Fletcher, A. E., Coombe Lea, Dorking, Surrey, Ex-Chief Inspector Alkali, &c. Works.
1895. Fletcher, Eli, Park House, Aked's Road, Halifax, Yorks, Master Dyer.
1893. Fletcher, E. Morley, 73, Victoria Road, Headingley, Leeds, Alkali Works Inspector.
O.M. Fletcher, F. W., Beauchamp Lodge, Enfield, Manufacturing Chemist.
1891. Fletcher, R. Jaques, North Geelong, Victoria, Manufacturing Chemist.
1892. Flintoff, R. J., Haxby, Crumpsall Lane, Manchester, Chemist.
1885. Flower, Major Lamorock (Lee Conservancy Board), 12, Finsbury Circus, E.C., Sanitary Engineer.
1899. Focht, Louis, State Board of Assessors, Trenton, N.J., U.S.A., Civil Engineer.
1890. Foden, Alfred, 19, Lancaster Avenue, Sefton Park, Liverpool, Metallurgical Chemist.
1900. Foersterling, Dr. H., c/o The Roessler and Hasslacher Chemical Co., Perth Amboy, N.J., U.S.A., Chemist.
1900. Fogetty, Lucien, c/o And. Jergens and Co., Spring Grove Avenue, Cincinnati, Ohio, U.S.A., Chemist.
1895. Fogg, Chas. A., 39, Park Road, Bolton-le-Moors, Lecturer in Chemistry.
1901. Folsom, Herbert A., 5, Brighton Street, Providence, R.I., U.S.A., Textile Chemist.
1900. Forbes, Eli, Lancaster Mills, Clinton, Mass., U.S.A., Chemist.
1895. Forbes, Paul R., 614, Years Building, Boston, Mass., U.S.A., Chemist and Assayer.
1893. Ford, J. B., jun., Michigan Alkali Co., Wyandotte, Mich., U.S.A., Secretary and Treasurer.
1894. Ford, Jno. Humphrey, Holyrood Glass Works, Edinburgh, Flint Glass Manufacturer.
1889. Ford, Jno. S., Abbey Brewery, Edinburgh, Analyst.
1899. Forel, Geo., 6, Am Roseneck, Strasburg, Alsace, Chemist.
1898. Forgie, Jas. T., Viewfield, Bothwell, N.B., Civil and Mining Engineer.
1885. Formoy, J. Arthur, Chestham, Grange Road, Sutton, Surrey, Oil Expert.
1898. Forrest, J. Kerr, 97, Jeffcott Street, Melbourne, Victoria, Australia, Manufacturing Chemist.
1890. Forrester, Albert, Ranipettai, North Arcot, Madras, India, Chemist and Distiller.
1890. Forrester, A. M., Port Dundas Chemical Works, 20, Canal Bank, Glasgow, Analytical Chemist.
1899. Forster, Dr. Martin O., Royal College of Science, South Kensington, S.W., Demonstrator of Chemistry.
1884. Forster, Ralph C., c/o Messrs. Bessler, Waechter, & Co., 18 and 19, Fenchurch Street, E.C., Chemical Merchant.
1889. Fort, Jas., 16, Adelphi Bank Chambers, South John Street, Liverpool, Chemical Merchant.
1884. Forth, Henry, Meadowcroft, Marple, near Stockport, Drysalter.
1898. Foster, Dr. Arthur M., Canal Glue and Size Works, Verney Road, London, S.E., Chemist.
1895. Foster, Jas., 11, St. Andrew's Drive, Pollokshields, Glasgow, Engineer.
O.M. Foster, R. Le Neve, Harrytown Hall, Bredbury, near Stockport, Manufacturing Chemist.
1888. Foster, Wm., Esholt House, Chapeltown, Leeds, Manufacturing Chemist.
1884. Foulis, Wm., 2, Montgomerie Quadrant, Kelvinside, Glasgow, Gas Engineer.
1901. Fowle, Arthur, E., c/o Cia. Industrial Jabonera de la Laguna, Gomez Palacio, Durango, Mexico, Chemical Engineer.
1891. Fowler, Gilbert J., Broad Oak, Urmston, near Manchester, Superintendent and Chemist (Manchester Corporation Sewage Works).
1898. Fowler, Theo. V., P.O. Box 168, Buffalo, N.Y., U.S.A., Chemical Works Manager.
1896. Fox, A. Stanley, 23, South Road, Faversham, Kent, Chemist (Cotton Powder Co., Ltd.).
1898. Fox, Jno., 76, Butler Street, Oldham Road, Manchester, Analyst.
1888. Fox, J. Wesley, 115, Lower Thames Street, London, E.C., Salt Merchant.
O.M. Fox, T., jun., Tonedale, Wellington, Somerset, Wool Manufacturer.
O.M. France, G. T., Friar's Goose Works, Gateshead-on-Tyne, Alkali Works Manager.
O.M. France, H. C. D., Avondale, Salford Friors, near Evesham, Chemical Engineer.
1899. Franchot, Stanislaus P., Niagara Falls, N.Y., U.S.A., Manufacturing Chemist.
1885. Francis, E., Ivy Bank, Park Valley, Nottingham, Chemical Lecturer.
O.M. Francis, E. G., c/o Manbré Saccharine Co., Hammersmith, W., Glucose Works Manager.
O.M. Francis, G. B., 38, Southwark Street, London, S.E., Wholesale Druggist.
O.M. Francis, W. H., 38, Southwark Street, London, S.E., Wholsale Druggist.
1894. Frank, Jerome W., 29, Broadway, New York, U.S.A., Chemist.
1889. Frankel, Dr. L. K., 103, North Front Street, Philadelphia, Pa., U.S.A., Chemical Demonstrator.
1886. Frankenburg, Isidor, Greengate Rubber Works, Salford, Manchester, India-rubber Manufacturer.
1895. Frankforter, Dr. G. B., University of Minnesota, Minneapolis, Minn., U.S.A., Professor of Chemistry.
O.M. Frankland, Prof. P. F., F.R.S., The University, Birmingham, Professor of Chemistry.
O.M. Frankland, H., Streonshalh House, The Crescent, Linthorpe, Middlesbro', Analytical Chemist.
1900. Frasch, Herman, 681, Euclid Avenue, Cleveland, Ohio, U.S.A., Oil Refiner.
1891. Fraser, Leslie McG., 98, Commercial Road East, London, E., Chemical Engineer.
1886. Fraser, W. J., 98, Commercial Road East, London, E., Mechanical Engineer.
O.M. Free, R., The Elms, Mistley, Essex, Maltster.
1885. Freear, H. M., Hardwick Road, Woburn Sands, Beds., Analytical Chemist.
1897. Freestone, Jos. T., Fenestrella, Egerton Park, Rock Ferry, Cheshire, Manufacturing Chemist.
1899. French, Alf., 67, Mayton Street, Holloway, N., Dispenser.
1899. French, H. Hutchins, Florenceville, Grove Road, Sutton, Surrey, Produce Broker.
1900. French, Thos., 1, Kelvinside Terrace West, Glasgow, Chemist.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1898. French, Wm., 135, Walmersley Road, Bury, Lancashire, Science Teacher.
1888. Frew, Dr. Wm., Laboratory, Wellpark Brewery, Glasgow, Brewing Chemist.
1898. Frick, O. O'D., c/o Sanitary Block and Tile Pavement Co., Ltd., Briton Ferry, South Wales, Manager.
1856. Fries, Dr. Harold H., 92, Reade Street, New York, U.S.A., Chemical Manufacturer.
O.M. Friswell, R. J., Bound Reed, Higham, Kent, Colour Manufacturer.
1898. Frith, J. Mason, Sunnyside, Norman Road, Runcorn, Lime Burner.
1899. Fritzche, Carl, c/o Schimmel and Co., 7, Berliner Strasse, Leipzig, Germany, Manufacturer of Essential Oils.
1890. Frost, Dr. Howard V., 3958, Drexel Boulevard, Chicago, Ill., U.S.A., Professor of Chemistry.
1884. Frost, Joe, Mold Green, Huddersfield, Manufacturing Chemist.
1899. Frusher, Tom, c/o Farbenfabriken of Elberfeld Co., 40, Stone Street, New York, U.S.A., Colourist.
1899. Fry, Henry E., Suffolk House, Cannon Street, London, E.C., Metallurgist.
O.M. Fryer, Dr. A. C., 13, Eaton Crescent, Clifton, Bristol, Alkali Works Inspector.
1894. Fuerst, Dr. Alex. F., c/o Wood Street Smelting Works, 30, Wood Street, London, E.C., Chemist.
1889. Fuerst, Jos. F., 17, Philpot Lane, London, E.C., Chemical and Oil Merchant.
1895. Fuerst, W. F., 2, Stone Street, New York, U.S.A., Chemical Merchant.
1894. Fuller, Chas. J. P., L. and Y. Railway Works, Horwich, near Bolton, Analytical Chemist.
1899. Fuller, Robt. F., Neston Park, Corsham, Wilts, Rubber Manufacturer.
1899. Fuller, W. M., (Journals) Bryn Tigid, Gold Tops, Newport, Mon.; and (subscription) c/o Morris & Griffin, Lim., Maindee, Newport, Mon., Chemical Manufacturer.
O.M. Fuller, Wm., 8, Orchard Road, Blackheath, S.E., Chemist.
1898. Fulmer, Elton, Pullman, Wash., U.S.A., Professor of Chemistry.
O.M. Fulton, H. B., 353, Mansion House Chambers, London, E.C., Metallurgist.
1896. Fulton-Smith, J., Bancroft House, Penketh, Warrington, Brewer.
1885. Fyfe, Jno., 7, West George Street, Glasgow, Oil Works Director.
1896. Fyson, G. A., Leagrave Road, Luton, Beds, Dyer.

G

1898. Gabain, Chas. E., Messrs. Gabain Frères, Havre, France, Manufacturer of Edible Fats.
O.M. Gabbett, E. R., Prince Regent's Wharf, Victoria Docks, London, E., Chemical Engineer.
1890. Gajjar, T. K., Techno-chemical Laboratory, Girgaum, Bombay, India, Consulting Chemist.
O.M. Galbraith, Wm., Rose Lea, Beeston, Leeds, Technical Chemist.
1898. Galewsky, Dr. Paul, c/o L. Cassella and Co., Mainkur, bei Frankfort a/Main, Germany, Colour Chemist.
1884. Gall, Henry, Société d'Electrochimie, 2, Rue Blanche, (Place de la Trinité), Paris, France, Technical Chemist.
1897. Galletly, J. C., 101, Armadale Street, Dennistoun, Glasgow, Assistant to Professor of Metallurgy.
1901. Gallup, W. Arthur, Arnold Printworks, North Adams, Mass., U.S.A., Printer.
1891. Galt, Hugh Allen, Columbia Chemical Co., Barberton, Ohio, U.S.A., Works Manager.
O.M. Gamble, Sir David, Bart., Windlehurst, St. Helens, Chemical Manufacturer.
1887. Gamble, Jas. N., The Laboratory, Procter and Gamble Co., Ivorydale, Ohio, U.S.A., Soap Manufacturer and Oil Refiner.
O.M. Gamble, J. C., Haresfinch, St. Helens, Chemical Manufacturer.
O.M. Gamble, W., Briars Hey, Rainhill, near Liverpool, Chemical Manufacturer.
1894. Gane, Eustace H., 95, Fulton Street, New York, U.S.A., Pharmaceutical Chemist.
1888. Gans, Adolf, Farbenfabrik von L. Cassella & Co., Frankfort o/Main, Germany, Dye Works Manager.
1896. Gardair, Aimé, 51, Rue St. Ferréol, Marseilles, France, Director of Chemical Co.
1893. Gardiner, H. J., 22, Chatham Place, Hackney, N.E., Chemical Manufacturer.
1891. Gardner, Walter M., Municipal Technical College, Bradford, Director of Chemistry and Dyeing Department.
1897. Garfield, Jos., 7, Apsley Villas, Bradford, Yorks, Civil Engineer.
1888. Garibaldi, Joachim A., 21, Church Place, Gibraltar, Analytical Chemist.
1893. Garner, D. C., 40, Nichols Street, Leicester, Manufacturing Chemist.
1890. Garrett, F. C., Durham College of Science, Newcastle-on-Tyne, Teacher of Science.
1900. Garrigues, Wm. E., 1123, Broadway, New York City, U.S.A., Chemical Engineer.
1899. Garroway, Wm., Netherfield, Duke Street, Glasgow, Chemical Manufacturer.
1898. Garry, H. Stanley, St. John Street, Mansfield, Notts, Manure Works Manager.
O.M. Garton, R. (Hill, Garton & Co.), Southampton Wharf, Battersea, S.W., Glucose Manufacturer.
1893. Garton, Rd. S., c/o Dr. P. Naef, Woody Crest Avenue, Highbridge, New York, U.S.A., Chemist.
1886. Gascoyne, Dr. W. J., 36, South Holliday Street, Baltimore, Md., U.S.A., Analytical Chemist.
O.M. Gaskell, H., jun., Clayton Lodge, Aigburth, near Liverpool, Alkali Manufacturer.
O.M. Gaskell, Holbrook, Woolton Wood, Liverpool, Alkali Manufacturer.
1897. Gaster, Leon, 37, Maida Vale, W., Electrical Engineer.
1895. Gate, Tom Erskine, Messrs. Howroyd and Oldroyd, Dewsbury, Yorks, Manufacturing Chemist.
O.M. Gatheral, G., 174, Soho Hill, Handsworth, Birmingham.
1891. Geisler, Dr. Jos. F., New York Mercantile Exchange Building, 6, Harrison Street, New York, U.S.A., Consulting Chemist.
1897. Gent, Wm. T., Springfield, Misterton, near Gainsboro', Metallurgical Chemist.
1896. Genth, Fred. A., jun., 103, North Front Street, Philadelphia, Pa., U.S.A., Chemist.
1894. Georgi, Carl, 77, John Street, New York, U.S.A., Aniline Colour Importer.
O.M. Gerland, Dr. B. W., 8, Queen's Terrace, Accrington, Consulting Chemist.
1891. Gibb, Thos., Hunt's Cross, Liverpool, Metallurgist.
O.M. Gibbins, H. B., 177, Redland Road, Bristol.
1883. Gibbs, D. Cecil, 16, Finsbury Circus, London, E.C., Soap Manufacturer.
O.M. Gibbs, W. P., c/o Dominion Pulp Co., Ltd., Chatham, New Brunswick, Canada, Analytical Chemist.
1893. Gibbs, W. T., Buckingham, Prov. Quebec, Canada, Manufacturing Chemist.
O.M. Gibson, Dr. J., 20, George Square, Edinburgh, Chemical Lecturer
O.M. Gibson, J. M., c/o Buckley Brick and Tile Co., Buckley, *viâ* Chester, Brick and Tile Manufacturer.
1898. Gies, Wm. J., College of Physicians and Surgeons, 437, W. 59th Street, New York City, U.S.A., Instructor in Physical Chemistry.
1899. Gifford, Wm. E., 69, 6th Street, Long Island City, N.Y., U.S.A., Chemist.
1892. Gilbard, Francis, The Laboratory, 17, Great Tower Street, E.C., Analytical Chemist.
O.M. Gilbert, Sir Jos. H., F.R.S., Harpenden, near St. Albans, Agricultural Chemist.
1897. Gilbody, Dr. Alex. W., Owens College, Manchester, Research Chemist.

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O.M. Gilchrist, P. C., F.R.S., Frognal Bank, Finchley New Road, London, N.W., Metallurgist.

1884. Gilchrist, Peter S., Charlotte, N.C., U.S.A., Chemical Engineer.

1900. Gildersleeve, W. H., Flintstone Tannery, Flintstone, Ga., U.S.A., Chemist.

O.M. Giles, W. B., The Grange, Leyton, E., Chemical Manufacturer.

1886. Gill, Dr. Aug. H., Massachusetts Institute of Technology, Boston, Mass., U.S.A., Assistant Professor of Gas Analysis.

1900. Gill, J. Arthur, Dalton Hall, Victoria Park, Manchester, Analyst.

1901. Gilles, Wm. T., Bradford Street, Bocking, near Braintree, Essex, Technical Chemist.

1888. Gillman, Gustave, A.M.I.C.E., Ferro-carril de Murcia á Granada, Aguilas, Prov. de Murcia, Spain, Civil Engineer.

1892. Gilmour, J. D., 190, Butterfiggins Road, Glasgow, Chemist.

1891. Gimingham, Edw. A., Stamford House, Northumberland Park, Tottenham, N. (Edison Swan United Electric Light Co., Lim.), Technical Adviser.

1900. Ginder, Wm. H., c/o American Sheet Steel Co., Vandergrift, Pa., U.S.A., Analytical Chemist.

1886. Girdwood, Dr. G. P., 111, University Street, Montreal, Canada, Professor of Chemistry.

O.M. Gladstone, Dr. J. H., F.R.S., 17, Pembridge Square, London, W., Professor of Chemistry.

1886. Glaeser, F. A., Carpenter's Road, Stratford, E., Varnish Manufacturer.

1889. Glaser, Chas., 21, South Gay Street, Baltimore, Md., U.S.A., Analytical and Consulting Chemist.

1889. Glatz, Jos., Riverside Chemical Works, 485—493, Kent Avenue, Brooklyn, N.Y., U.S.A., Chemical Manufacturer.

1901. Glegg, Robt., Marischal College, Aberdeen, Analytical Chemist.

1894. Glen, Chas., Glengowan Printworks, Caldercruix, N.B., Calico Printer.

1890. Glen, J., jun., Glengowan Printworks, Caldercruix, N.B., Calico Printer.

1900. Glendenning, Arthur, 31, Bright Street, Middlesbrough, Analytical Chemist.

1884. Glendinning, H., Mount House, The Hill, Sandbach, Cheshire, Technical Chemist.

1895. Glenn, Wm., Baltimore Chrome Works, 1348, Block Street, Baltimore, Md., U.S.A., Chrome Manufacturer.

1888. Gloag, Robt. F., Grove Hill, Middlesbrough, Secretary.

O.M. Glover, G. T., Corbys, Hoylake, Cheshire, Chemical Works Manager.

1896. Glover, H., East Falls, Schuylkill, Philadelphia, Pa., U.S.A., Chemical Works Superintendent.

O.M. Glover, John, 20, Holly Avenue, Newcastle-on-Tyne, Chemical Engineer.

O.M. Glover, T., Messrs. Mort, Liddell & Co., Widnes, Technical Chemist.

O.M. Glover, W., Rio Tinto Mines, Huelva, Spain, Technical Chemist.

1896. Goetz, Isidore, c/o Rio Negro Mines, Ltd., 6, Suffolk Street, Pall Mall, London, S.W., Mine Manager.

1898. Golding, Jno., Midland Agricultural and Dairy Institute, Kingston, Derby, Agricultural Chemist.

O.M. Goldschmidt, Dr. S. A., 43—51, Sedgwick Street, Brooklyn, N.Y., U.S.A., Chemical Manufacturer.

1897. Goldschmiedt, Dr. Guido, Laboratory, Salmgasse 1, Prag, Austria, Professor in Imperial German University.

1895. Goldsmith, Byron B., 19, East 74th Street, New York, U.S.A., Vice-President (American Lead Pencil Co.).

1899. Goldsmith, Jno. N., British Xylonite Co., Ltd., Manningtree, Essex, Chemist.

1887. Goodall, Thos., Hendon Grange, Sunderland, Paper Manufacturer.

1900. Goodchild, Wm. H., Rosslyn, Haslemere Road, Crouch End, N., Chemical Student.

1898. Goode, J. Archibald, 16, Crampton Street, London, S.E., Analytical Chemist.

1899. Goodhue, Francis A., 32, India Street, Boston, Mass., U.S.A., Aniline Colour Importer.

1898. Goodrich, Chas. G., Akron, Ohio, U.S.A., Rubber Manufacturer.

1884. Goodwin, C. C., The White House, St. John's Road, Bowdon, Cheshire, Soapmaker.

1894. Goodwin, Dr. W. L., The School of Mining, Kingston, Canada, Professor of Chemistry.

O.M. Goppelsroeder, Dr. F., Leimenstrasse 51, Basel, Switzerland, Professor of Chemistry.

1898. Gordon, Colin, Storer's Wharf, Cubitt Town, E., and (Journals) 8, College View, North Greenwich, E., Chemical Engineer.

1884. Gordon, J. G., Queen Anne's Mansions, Westminster, S.W., Steel Manufacturer.

1883. Gore, Dr. G., F.R.S., 20, Easy Row, Birmingham, Metallurgist.

1900. Gormly, Sam. J., P.O. Box 1041, Butte, Montana, U.S.A., Assayer.

1901. Gornall, Frank H., 256, Park Road, Crouch End, N., Chemist.

1891. Gorvin, Jno. C., English Crown Spelter Co., Ltd., Swansea, Works Manager.

O.M. Gossage, F. H., Widnes, Alkali Manufacturer.

1897. Gossage, W. Winwood, Widnes, Lancashire, Soap Manufacturer.

1890. Goulding, Wm. Joshua, 25, Eden Quay, Dublin, Manure Manufacturer.

O.M. Gow, R. J., Ivy Lea, Hough Green, near Widnes, Metallurgical Chemist.

O.M. Gowland, W., 13, Russell Road, Kensington, W., Assayer and Metallurgist.

1886. Goyder, G. A., Ootalinka, Hawker's Road, Medindie, near Adelaide, South Australia, Chemist (Adelaide School of Mines).

1890. Grabfield, Dr. J. P., 1915, Indiana Avenue, Chicago, Ill., U.S.A., Chemist.

1900. Grabill, Clarence A., c/o Mountain Copper Co., Keswick, Shasta Co., Cal., U.S.A., Chemist.

1897. Graesser, Franz A., The Wrexham Lager Beer Co., Wapping Station, Liverpool, Manager.

1883. Graesser, R., Cefn, near Ruabon, North Wales; and Argoed Hall, Llangollen, North Wales, Manufacturing Chemist.

O.M. Graham, Prof. C., The Reculvers, Hastings, Consulting Chemist.

O.M. Graham, C. C., Highmoor, Benthydding Road, Ilkley, Yorks, Technical Chemist.

1883. Grandage, H., Low Royd Dyeworks, Thornton Road, Bradford, Dyer.

1897. Granger, Dr. J. Darnell, 25, All Saints Street, Nottingham, Analytical Chemist.

1900. Granja, Rafael, c/o The Palen Co., Kingston, N.Y., U.S.A., Chemist.

1893. Gratama, Dr. W. D., Huize Kraayenburg, Ryswyk, Z.H., Holland, Professor of Chemical Technology.

1896. Graves, Geo. H., c/o General Chemical Co., Bridgeport, Conn., U.S.A., Manufacturing Chemist.

1896. Graves, Walter G., 555, Sibley Street, Cleveland, Ohio, U.S.A., Chemist.

1895. Gray, Elisha B., New Brighton, Richmond Co., N.Y., U.S.A., Oil Inspector and Chemist.

1884. Gray, G. Watson, 8, Inner Temple, Dale Street, Liverpool, Consulting Chemist and Assayer.

1886. Gray, Jno., 13, Queen's Road, Rock Ferry, near Birkenhead, Oil Works Chemist.

1896. Gray, Dr. Thos., Technical College, 204, George Street, Glasgow, Lecturer in Chemistry.

1891. Greaves, I. A. R., Morton, Gainsborough, Brewer.

1894. Greaves, Wm., Powell Duffryn Steam Coal Co., Aberaman, Aberdare, South Wales, Chemical Engineer and Chemist.

1894. Greeff, R. W., 20, Eastcheap, London, E.C., Chemical Agent.

1890. Green, Alfred H., Oaklands, Lowton, Newton-le-Willows, Lancashire, Manufacturing Chemist.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

O.M. Green, A. G., 13, King's Drive, Heaton Moor, near Stockport, Colour Chemist.
O.M. Green, H., Hayle Mill, Maidstone, Paper Manufacturer.
1888. Green, Jno. Edw., Grafton House, Talbot Street, Southport, Soap Works Manager.
1896. Green, Jno. Wilberforce, 36, Crystal Palace Park Road, Sydenham, S.E., Technical Chemist.
O.M. Green, L., Lower Tovil, Maidstone, Paper Manufacturer.
1891. Green, Samuel, 28 and 29, St. Swithin's Lane, London, E.C., Chemical Auctioneer.
O.M. Greenaway, A. J., Frognal, Hampstead, N.W., Sub-Editor of Chemical Society's Journal.
1884. Greenhalgh, J. Herbert, Whitekirk, Green Mount, near Bury, Assistant Manager of Printworks.
O.M. Greenhough, D. W., 5, Rood Lane, London, E.C., Chemical Broker.
O.M. Greenway, T. J., Second Avenue, St. Peter's, Adelaide, South Australia, Metallurgist.
O.M. Greenwood, H., Peel Bank, Church, Lancashire, Technical Chemist.
1897. Gref, Anthony, 40, Stone Street, New York, U.S.A., Patent Lawyer.
O.M. Greville, H. L., Diersheim, Churchfields, Woodford, Essex, Gas Examiner.
1900. Griffin, Dr. Jno. J., Catholic University of America, Washington, D.C., U.S.A., Professor of Chemistry.
1890. Griffin, John R., 20—26, Sardinia Street, Lincoln's Inn Fields, W.C., Chemical Apparatus Maker.
1886. Griffin, Martin L., Mechanicville, Saratoga Co., N.Y., U.S.A., Analytical Chemist (and Consulting) (Fibre, Paper, Clays).
O.M. Griffith, R. W. S., Eyeworth Lodge, Lyndhurst, Hants, Gunpowder Manufacturer.
1894. Griffiths, Thos., The Cedars, Clapham Common, S.W., Manufacturing Chemist.
1886. Grime, J., Rosebank Cottage, Busby, near Glasgow, Calico Printer.
O.M. Grimshaw, H., Sunnyside, Clayton, Manchester, Chemical Manufacturer.
O.M. Grimwood, R., 41, Lady Margaret Road, London, N.W., Analytical Chemist.
1900. Grimwood, Robt. G., 17, Dagmar Road, Stroud Green, N., Analytical Chemist.
O.M. Grindley, J., Upper North Street, Poplar, London, E., Tar Distiller.
1888. Gripper, Harold, Great Central Railway, Gorton, Manchester, Analytical Chemist.
1897. Gronemeyer, Herman H., 731, Giddings Avenue, Cleveland, Ohio, U.S.A., Chemical Superintendent.
1900. Gross, Abraham, 341, Oakland Avenue, Pittsburg, Pa., U.S.A., Technical Chemist.
O.M. Grossmann, Dr. J., Harpurhey Chemical Works, Manchester, Chemical Manufacturer.
1896. Grosvenor, Wm. M., jun., P.O. Box 183, Englewood, N.J., U.S.A., Electro-Chemist.
O.M. Groves, C. E., F.R.S., 352, Kennington Road, London, S.E., Chemist (Thames Conservancy).
1899. Gudemann, Dr. Edw., 4319, Vincennes Avenue, Chicago, Ill., U.S.A., Chemist.
1898. Guess, Harry A., c/o Ottawa G. M. Co., Keewatin, Ont., Canada, Chemist.
1899. Guest, Edw. Graham, Laboratory, Macvitties, Guest and Co., Ltd., Orwell Terrace, Edinburgh, Cereals Chemist.
1900. Guggenheim, Murry, Guggenheim Smelting Co., Perth Amboy, N.J., U.S.A., Smelter.
1899. Guild, Frank N., University of Arizona, Tucson, Arizona, U.S.A., Professor of Chemistry.
1900. Guitermann, Edw. W., Passaic, N.J., U.S.A., Chemist.
1894. Gulliver, Geo. W., c/o Burt, Boulton, and Haywood, Selzaete, Belgium, Chemist.
1883. Gunn, W. L., Broad Plain Soap Works, Bristol, Analytical Chemist.
1900. Günther, Chas. E., 9, Fenchurch Avenue, London, E.C., Merchant.
1894. Gurney, J. Clare, Fabrica Roma, La Union, Prov. de Murcia, Spain, Analytical Chemist.
1899. Gutcher, Wm., Singapore Oil Mills, Singapore, S.S., Superintendent Engineer.
1892. Guthrie, John, 34, Prospect Terrace, Hunslet Moor, Leeds, Chemical Works Manager.
1892. Guttmann, Oscar, 18, Aberdare Gardens, South Hampstead, N.W., Explosives Engineer.

H

O.M. Habirshaw, W. M., Glenwood Works, Yonkers, N.Y., U.S.A., Chemical Engineer.
1883. Hacking, W. H., The Grange, Clayton-le-Moors, near Accrington.
1900. Haddock, Arthur G., c/o Castner Kellner Alkali Co., Ltd., 13, Abchurch Lane, London, E.C., Technical Chemist.
1898. Haddow, Geo., Nobel's Explosive Co., Perranporth, R.S.O., Cornwall, Chemist.
1887. Hadfield, R. A., Newhall Road, Attercliffe, Sheffield, Steel Founder.
1884. Hadkinson, F., Pamphila Oil and Soap Works, Mitylene, Mediterranean, Oil Refiner and Soap Manufacturer.
O.M. Hadkinson, R., Smyrna, Asia Minor, Oil Refiner.
1894. Hadley, Walter S., Millersdale, Sutton, St. Helens, Lancashire, Plate Glass Maker.
1899. Haenlein, Dr. Fried. H., Director der Deutschen Gerberschüle, Freiberg in Sachsen, Leather Chemist.
1887. Haig, Robert, Mechanical Retorts Co., Limited, Murray Street, Paisley, N.B., Chemical Engineer.
1896. Haigh, De Lagnel, Avenue A and 13th Street, Bayonne City, N.J., U.S.A., Chemist.
1898. Haigh, Fred., 677, East 24th Street, Paterson, N.J., U.S.A., Chemist (Flax Spinning Co.).
1898. Haigh, Percy, c/o J. and J. Lonsdale and Co., Longford, Ireland, Analytical Chemist.
1888. Hailes, A. J. de, 15, Red Lion Square, W.C., Analytical Chemist.
1889. Haines, Reuben, 201, South 5th Street, Philadelphia, Pa., U.S.A.; and (Journals) Haines Street, near Chew Street, Germantown, Philadelphia, Pa., U.S.A., Analytical Chemist.
O.M. Hake, C. N., Department of Trade and Customs, Melbourne, Victoria, Inspector of Explosives.
1900. Hale, Albert C., 551, Putnam Avenue, Brooklyn, N.Y., U.S.A., Teacher of Chemistry.
1888. Hale, Edw. P., c/o Wakefield & Co., Gatebeck, Kendal, Analytical Chemist.
1887. Hall, Allan T., c/o Sissons Bros. & Co., Ltd., Hull, Oil Refiner and Varnish Manufacturer.
1886. Hall, Archibald D., 34, Bishopsgate Street, London, E.C., Analytical Chemist.
1898. Hall, Clarence A., 3220, Powelton Avenue, Philadelphia, Pa., U.S.A., Chemist.
O.M. Hall, Edgar, Tenterfield, N.S.W., Australia, Technical Chemist.
1898. Hall, Frederick W., 25, Oak Bank, Harpurhey, Manchester, Dyer.
1896. Hall, Henry J., 51, Malmesbury Road, Bow, E., Coca Wine Purveyor.
1893. Hall, Jas. W., 5, High Terrace, Darlington, Linseed Oil Mills Manager.
1885. Hall, Jno. A., Victoria Chemical Works, Victoria, British Columbia, Analytical Chemist.
1900. Hall, Jos. J., c/o G. H. Hammond Co., Hammond, Ind., U.S.A., Chemist.
1900. Hall, Prof. Robt. W., Havemeyer Laboratory, University Heights, New York, U.S.A., Professor of Analytical Chemistry.
O.M. Hall, S., East London Soap Works, Bow, London, E., Soap Manufacturer.
1896. Hall, S. G., East London Soap Works, Bow E., Soap Maker.
1898. Hall, Wm. F., Red House, viâ Zwartkops, Cape Colony, South Africa, Cyanide Manager.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1886. Haller, Geo., Sussex House, 52, Leadenhall Street, London, E.C., Chemical Merchant.
1893. Haller, H. Loft, 26, Scale Lane, Hull, Analytical Chemist.
1895. Halliwell, Edw., West Riding of Yorkshire Rivers Board, Wakefield, Yorks, Analyst.
1901. Hallock, Dr. Albert P., 440, First Avenue, New York City, U.S.A., Chemist.
1898. Halstead, Jno. E., 7, Bath Street, Elland, Yorks, Colour Chemist.
1892. Hamaguchi, K., Hiro Mura, Arito Gori, Wakayama Ken, Japan, Soy Manufacturer.
1897. Hambly, Fred. J., Buckingham, Quebec, Canada, Chemist.
1895. Hamburger, Aron, 18 and 19, Great Windmill Street, London, W., Technical Chemist.
1887. Hamilton, Jas. C., Arncliffe, Arnside, via Carnforth, Chemical Works Manager.
1885. Hamilton, Oswald, Lancaster Cottage, Old Stratford, near Stony Stratford, Chemical Engineer.
1884. Hamilton, Robert, Glengarnock Chemical Co., Ltd., Glengarnock, N.B., Works Manager.
1892. Hamilton, Robt., Leeds Steelworks, Ld., Leeds, Analytical Chemist.
O.M. Hammill, M. J., The Gables, St. Helens, Alkali Manufacturer.
1898. Hammersley, W. Stanley, Longjumeau, S. et O., France, Tanner.
1892. Hammond, Geo. W., Yarmouthville, Maine, U.S.A., Paper Co.'s Agent.
O.M. Hammond, J., Gas Works, Eastbourne, Sussex, Gas Manager.
1900. Hampton, F. T., Hill City, Tenn., U.S.A., Civil Engineer.
1900. Hancock, Walter C., 10, Upper Chadwell Street, Myddelton Square, E.C., Analytical Chemist.
1896. Hand, Daniel, 30, Mount Pleasant Avenue, Newark, N.J., U.S.A., Chemist.
1889. Handy, Jas. O., 325, Water Street, Pittsburg, Pa., U.S.A., Chemist.
1888. Hanks, Abbot A., 531, California Street, San Francisco, Cal., U.S.A., Assayer.
1901. Hanna, Charles E., 316, St. James' Street, Montreal, Canada, Secretary.
1899. Hanna, Dillinger C., 4262, Parkside Avenue, Philadelphia, Pa., U.S.A., Chemist and Superintendent.
O.M. Hanson, A. M., Abbey Printworks, Whalley, Blackburn, Print Works Chemist.
1891. Hanson, John, Highfield Villa, Belle Vue, Wakefield, Manufacturing Chemist.
1899. Hantke, Ernst, 646, Broadway, Milwaukee, Wis., U.S.A., Director of Brewers' School.
1894. Harden, Arthur, c/o British Institute of Preventive Medicine, Grosvenor Road, London, S.W., Lecturer in Chemistry.
1896. Hardman, Richard B., Fernhill Mills, Bury, Lancashire, Woollen Manufacturer.
1900. Hardwick, W. Roscoe, 13, Batavia Buildings, Hackins Hey, Liverpool, Chemist.
1897. Harger, Dr. Jno., 30, Jalland Street, Hull, Chemist.
1896. Hargreaves, Jas., May Villa, Peelhouse Lane, Widnes, Lancashire, Chemical Engineer.
O.M. Hargreaves, Jno., Widnes, Alkali Manufacturer.
1898. Hargreaves, Luke, c/o Electrolytic Alkali Co., Ltd., Middlewich, Cheshire, Chemical Engineer.
O.M. Harland, R. H., Plough Court, 37, Lombard Street, London, E.C., Consulting Chemist.
1893. Harlock, E. B., Newton Farm, Middlewich, Chemical Manufacturer.
1898. Harman, Edw. A., Elsinore, Gledholt, Huddersfield, Gas Engineer.
1890. Harmon, L. E., 46–54, Fulton Street (Drawer 255), Buffalo, N.Y., U.S.A., Analytical Chemist.
O.M. Harrington, W. B., Leeview, Montenotte, Cork, Chemical Manufacturer.
1893. Harris, Arthur, Marsh Gate Works, Stratford, E., Soap Maker.
1885. Harris, Booth, jun., Hillside, Loughton, Essex, Soap Maker.
O.M. Harris, D., Caroline Park, Edinburgh, Chemical Manufacturer.
1897. Harris, Fred. W., Sanitary Chambers, Chemical Department, Glasgow, Public Analyst.
1900. Harris, Dr. Harry B., 212, Jones Street W., Savannah, Ga., U.S.A., Chemist.
1896. Harris, H., Hall Mines Smelter, Nelson, British Columbia, Metallurgical Chemist.
1900. Harris, L. A., 28, Glengall Road, London, S.E., Chemist.
1896. Harris, Wm. T. A., Ideal Soapery, East Street, Brompton, Adelaide, South Australia, Soap Maker.
O.M. Harrison, A., Thames Sugar Refinery, Silvertown, London, E., Sugar Works Chemist.
O.M. Harrison, C., Hayle, Cornwall, Technical Chemist.
O.M. Harrison, G. D., Netham Chemical Works, Bristol, Chemical Manufacturer.
1883. Harrison, G. H., Hagley, near Stourbridge, Firebrick Maker.
1884. Harrison, G. King, Hagley, near Stourbridge, Fireclay Mine Owner.
O.M. Harrison, J., Madore, Ballintemple, Cork, Chemical Engineer.
1887. Harrison, Jno., 35th and Gray's Ferry Road, Philadelphia, Pa., U.S.A., Chemical Manufacturer.
1892. Harrison, Prof. John B., c/o Harrison, Griffin, and Co., Bridgewater Place, Manchester, Government Analyst.
1898. Harrison, Wm. H., 13, Brunswick Street, Leeds, Analytical Chemist.
1896. Hart, Bertram, c/o Tennants and Co., Clayton, Manchester, Analyst.
1886. Hart, Bertram H., The Elms, Old Charlton, S.E., Analytical Chemist.
O.M. Hart, Dr. E., Lafayette College, Easton, Pa., U.S.A., Professor of Chemistry.
1890. Hart, H. W., 13, Lynwood Villas, Darwen, Lancashire, Analytical Chemist.
1897. Hart, Wm. Beamont, Poste Restante, British Post Office, Constantinople, Consulting Chemist.
1888. Hartford, Jas., 3, Cedar Street, New York, U.S.A., Aniline Merchant.
1886. Hartley, Arthur, The Brewery, Emsworth, Hants, Brewer.
1883. Hartley, Joseph, 159, Hamilton Road, Longsight, Manchester, Technical Chemist.
1889. Hartley, R. Kent, Springwood House, Middleton Junction, near Manchester, Chemical Works Manager.
O.M. Hartley, Prof. W. N., F.R.S., Royal College of Science, Dublin, Professor of Chemistry.
1897. Hartmann, Ernest E., c/o Onomea Sugar Co., Papaikou, Hawaii, Chemist.
1891. Hartog, Philip J., 6, Mauldeth Road West, Withington, Manchester, Analytical Chemist.
1892. Hartridge, Jas. Hills, Holmwood, Hendon, Manufacturing Chemist.
1899. Harvey, Chas., c/o J. Thompson and Co., 10, Goree Piazzas, Liverpool, Manufacturing Chemist.
1892. Harvey, E. Feild, Omrac, St. John's, Newfoundland, Chemist.
1885. Harvey, Ernest W., 20, Malwood Road, Balham, S.W., A.R.S.M. Engineer.
1888. Harvey, H. C., Raglan House, Brooklands, near Manchester, Chemist.
1891. Harvey, Sidney, South-Eastern Laboratory, Canterbury, Analytical Chemist.
1899. Harvey, Thos. F., 84, Henry Road, West Bridgford, Nottingham, Analyst (Drug Co.).
1883. Harvey, T. H., Cattedown, Plymouth, Chemical Manufacturer.
1893. Harzer, C. A., 79½, Gracechurch Street, London, E.C., Merchant.
O.M. Hasenclever, R., Chemische Fabrik - Rhenania, Aachen, Prussia, Chemical Manufacturer.
1900. Haskell, J. Amory, Laflin and Rand Powder Co., 99, Cedar Street, New York City, U.S.A., President.
1900. Haslwanter, Chas., 904, Flushing Avenue, Brooklyn, N.Y., U.S.A., Analytical Chemist.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1897. Hasslacher, Jacob, P. O. Box 1999, New York, U.S.A., President of Roessler-Hasslacher Chemical Co.
1894. Hatfield, Jno. A., 89, Bridge Street, Wednesbury, Staffordshire, Analytical Chemist.
1891. Hatschek, M., 41, Montserrat Road, Putney, S.W., Chemical Engineer.
1887. Hatton, Wm. P., c/o W. R. Hatton & Sons, Wormwood Scrubs, W., Starch Works Manager.
1899. Haus, Simon V., c/o Nepera Chemical Company, Nepera Park, N.Y., U.S.A., Photographic Chemist.
1900. Havens, Dr. Franke S., 30–32, Varick Street, New York City, U.S.A., Silk Conditioner.
1899. Hawdon, H. S., Hedworth Barium Works, East Jarrow-on-Tyne, Manager.
1895. Hawker, E. W., Adelaide Club, Adelaide, South Australia, Metallurgist.
1897. Hawkins, Ernest M., South Eastern Laboratory, Canterbury, Chemist.
O.M. Hawkins, H., c/o American E.C. and Schultze Gunpowder Co., Ltd., Oakland, Bergen Co., N.J., U.S.A., Explosive Works Manager.
1893. Hawkins, J. Dawson, c/o Colo. Phila. Reduction Co., Colorado City, Col., U.S.A., Smelting Works Manager.
1887. Hawliczek, Josef, Yoredale, Alexandra Road, Waterloo, Liverpool, Technical Chemist.
1899. Haworth, Dr. Edw., 6, Stanley Villas, Runcorn, Cheshire, Chemist.
1895. Hay, Alex. B., Kelvindock Chemical Works, Maryhill, Glasgow, Manufacturing Chemist.
1898. Haycraft, Jos. H., St. Peter's, Adelaide, South Australia, Metallurgical Chemist.
1894. Haynes, David O., 396, Broadway, New York City, U.S.A., Proprietor of "Pharmaceutical Era."
1894. Heal, Carlton, c/o Northampton Tanning Co., St. James' End, Northampton, Chemical Student.
1899. Healey, Alfred E., Willesden Paper and Canvas Works, Willesden Junction, N.W., Managing Director.
1894. Heap, Isaac H., Turnhurst Hall, Chell, near Stoke-on-Trent, Pharmaceutical Chemist.
1890. Heape, Chas., 19, George Street, Manchester, Calico Printer.
1898. Heasman, Walter, Castle Brewery, Bridgnorth, Salop, Brewer.
O.M. Heath, R. C., Myton Grange, near Warwick, Chemical Manufacturer.
1897. Heaton, John, 3, Belle Vue Park, Sunderland, Brewer and Chemist.
1895. Hebden, Jno. C., 64, Exchange Place, Providence, R.I., U.S.A., Works Manager and Chemist.
1889. Hecht, Jos., c/o McCormick Harvesting Machine Co., Chicago, Ills., U.S.A., Analytical Chemist.
1895. Hecker, Paul, 102, Fenchurch Street, London, E.C., Chemical Merchant.
1900. Heckman, J. Conrad, Seneca Street, Buffalo, N.Y., U.S.A., Chemist.
1889. Heckmann, C., 9, Görlitzerufer, Berlin, S.O., Germany, Chemical Apparatus Maker.
1885. Hedley, Armorer, Mayfield, Gosforth, Newcastle-on-Tyne, Soap Manufacturer.
1895. Hedley, Geo. H., Hedge Mill, Loudwater, Bucks, Chemical Manufacturer.
1883. Heerlein, Robert, Pennsylvania Salt Manufacturing Co., Natrona, Pa., U.S.A., Salt Works Chemist.
1893. Hefford, Geo., Technical Institute, Stafford, Chemical Instructor.
O.M. Hehner, O., 11, Billiter Square, London, E.C., Analytical and Consulting Chemist.
1898. Heileman, W. H., Washington Agricultural College, Pullman, Wash., U.S.A., Chemist.
1887. Hellier, E. A., 90, Marlborough Avenue, Hull, Varnish Manufacturer.
1895. Hellon, Dr. R., 40, New Lowther Street, Whitehaven, Analytical and Consulting Chemist.
O.M. Helm, H. J., Simonstone, Hammelton Road, Bromley, Kent, Government Analyst.
1898. Hemingway, Frank C. R., Albyns, Forest Road, Walthamstow, Essex.
1883. Hemingway, H., Marsh Gate Lane, Stratford, E., Chemical Manufacturer.
1884. Hempleman, F. S., Wennington House, Wennington, Romford, Essex, Manure Manufacturer.
1900. Henderson, J. Brownlie, Government Analyst's Office, Brisbane, Queensland, Government Analyst.
1894. Henderson, Jos., 3, Derwent Street, Norton Road, Stockton-on-Tees, Metallurgical Chemist.
1894. Henderson, Norman M., Broxburn Lodge, Broxburn, N.B., Oil Works Manager.
1883. Henderson, Prof. G. G., The Technical College, George Street, Glasgow, Professor of Chemistry.
O.M. Henderson, W. F., Moorfield, Claremont Gardens, Newcastle-on-Tyne.
1893. Hendrick, Jas., Marischal College, Aberdeen, Lecturer on Agricultural Chemistry.
1889. Hennin, Alphonse, National Tube Works, McKeesport, Pa., U.S.A., Metallurgical Chemist.
1885. Henshaw, Jno., Green Lane, Brook Street, Manchester, Soap Manufacturer.
1894. Henshaw, Sam., Staffordshire Chemical Company, Limited, Tunstall, Stoke-on-Trent, Chemical Works Manager.
1894. Hepburn, J. G., Priory Works, Dartford, Kent, Leather Manufacturer.
1887. Herf, O., Herf & Frerichs Chemical Co., St. Louis, Mo., U.S.A., Chemical Manufacturer.
1897. Heriot, James, 18, Dumbiedykes Road, Edinburgh, Mineral Water Manufacturer.
1894. Heriot, T. H. P., Usine Ste. Madeleine, San Fernando, Trinidad, B.W.I., Analytical Chemist.
O.M. Herman, W. D., Holm Lea, Rainhill, Lancashire, Glass Works Chemist.
O.M. Heron, J., 110, Fenchurch Street, London, E.C., Brewing Chemist.
1899. Herrick, Rufus F., 22, Herrick Street, Winchester, Mass., U.S.A., Chemist.
1887. Herriot, Wm. Scott, c/o Calico Printers' Association, 56, Mosley Street, Manchester, Chief Engineer.
O.M. Herrmann, R. W., 59, Mark Lane, London, E.C., Chemical Merchant.
1891. Hersam, Ernest A., University of California, Berkeley, Cal., U.S.A., Assistant Professor of Metallurgy.
O.M. Herschel, Prof. A. S., F.R.S., Observatory House, Slough, Bucks, Hon. Professor of Experimental Physics.
1898. Hersey, Milton L., 146, St. James' Street, Montreal, Canada, Consulting Chemist.
1895. Hesketh, Everard, Dartford Ironworks, Dartford, Kent, Civil Engineer.
1898. Heslop, Oliver, 55, Sandown Lane, Wavertree, Liverpool, Analytical Chemist.
1885. Hess, Dr. Adolph, Oil Works, Leeds, Chemical Manufacturer.
1891. Hetherington, Dr. Albert E., Ammonia Soda Works, Fleetwood, Lancashire, Analytical Chemist.
1894. Hewitt, A. H., The Green Island Cement Co., Lim., Hong Kong, China, Engineer.
O.M. Hewitt, Dr. D. B., Oakleigh, Northwich, Cheshire, Alkali Manufacturer.
1899. Hewitt, Edw. R., 13, Burling Slip, New York, U.S.A., Glue Manufacturer.
1896. Hewitt, Dr. J. Theo., 65, Silverdale, Sydenham, S.E., Lecturer.
1897. Hewitt, T. Lacey, Beechfield, St. John's, Higher Broughton, Manchester, Analytical Chemist.
1890. Hewlett, John C., 40—42, Charlotte Street, Great Eastern Street, London, E.C., Manufacturing Chemist.
1893. Hey, Harry, 2, Ash Terrace, Savile Town, Dewsbury, Dyer.
1884. Heyden, Dr. F. von, Chemische Fabrik, Radebeul, bei Dresden, Germany, Salicylic Acid Manufacturer.
1894. Heyl-Dia, G. Edw., 236, Great Clowes Street, Higher Broughton, Manchester, Chemical and Electrical Engineer.
1884. Heys, W. E., 70, Market Street, Manchester, Engineer and Patent Agent.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1884. Heys, Z. J., Stonehouse, Barrhead, N.B., Calico Printer.

1883. Heywood, J. H., 231, Drake Street, Rochdale, Technical Chemist.

O.M. Heywood, J. S., 7, Caledonian Road, King's Cross, London, N., Chemical Manufacturer.

1897. Hibbard, Paul L., Nebraska City, Neb., U.S.A., Starch Chemist.

O.M. Hibbert, W., 101, Goldhurst Terrace, South Hampstead, N.W., Analytical Chemist.

1897. Hicks, Edwin F., 203, West 81st Street, New York City, U.S.A., Analytical Chemist.

1893. Hicks, Jas. A., c/o B. Redwood, 4, Bishopsgate Street Within, London, E.C., Analytical Chemist.

O.M. Higgin, W. H., Hollywood, Lostock, near Bolton-le-Moors, Chemical Manufacturer.

1886. Higgins, C. L., Muspratt's Works, Widnes; and (Journals) 79, Bedford Street South, Liverpool, Manufacturing Chemist.

1897. Hill, George, Barton-on-Humber, Chemical Works Manager.

1897. Hill, Herbert M., University of Buffalo, N.Y., U.S.A., Professor of Chemistry and Toxicology.

O.M. Hill, J. K., 13, Osborne Place, Copland Road, Govan, near Glasgow, Manufacturing Chemist.

1892. Hill, Sydney, c/o Blundell, Spence, and Co., Ltd., Hull, Analytical Chemist.

1898. Hill-Jones, Thos., 30, Bisham Gardens, Highgate, N., Manufacturing Chemist.

O.M. Hills, C. H., Anglesea Copper Works, Low Walker. Newcastle-on-Tyne, Copper Smelter.

1894. Hills, Harold F., 147, Bow Road, London, E., Analytical Chemist.

1898. Hills, Thos. Herbert, Chemical Works, Deptford, S.E., Chemical Manufacturer.

O.M. Hills, W., 225, Oxford Street, London, W., Pharmaceutical Chemist.

1893. Hilton, Edgar G., 37, Kourlandsky Street, St. Petersburg, Russia, Varnish and Paint Manufacturer.

1899. Hinchley, J. W., 29, Furnival Street, Holborn, London, E.C., Chemical Engineer.

O.M. Hindle, J. H., 8, Cobham Street, Accrington, Dyeworks Manager.

1883. Hinds, James, 127, Gosford Street, Coventry, Pharmaceutical Chemist.

1899. Hinks, Percy J., Tavern Street, Stowmarket, Chemist.

1891. Hinman, Bertrand C., 9, Worship Street, London, E.C., Metallurgical Chemist.

1892. Hinshelwood, Thos., Glasgow Oil and Paint Works, Glenpark Street, Glasgow, Oil Refiner.

1900. Hirsh, Jos. E., 1245, 85th Street, Brooklyn, N.Y., U.S.A., Chemist.

1895. Hirst, H. Reginald, Croft House, Batley, Yorks, Works Chemist.

1896. Hislop, Geo. R., Gas Work House, Craigielea, Paisley, N.B., Gas Engineer and Manager.

1900. Hobbs, Alex. F., Merrimack Manufacturing Co., Lowell, Mass., U.S.A., Printworks Superintendent.

1900. Hobbs, Dr. Perry L., Western Reserve Medical College, Cleveland, Ohio, U.S.A., Professor of Chemistry.

1894. Hodge, Andrew, 20, Hawthorn Grove, Heaton Moor, near Stockport, Printworks Chemist.

1890. Hodges, Harry B., Long Island Railroad Co., Long Island City, N.Y., U.S.A., Chemical Engineer.

O.M. Hodgkin, J., 12, Dynevor Road, Richmond, Surrey, Chemical Manufacturer.

O.M. Hodgkinson, Dr. W. R., 18, Glenluce Road, Blackheath, S.E. (Journals); and Royal Artillery College. Woolwich, S.E., Prof. of Chemistry.

O.M. Hodgson, C., High House, Eppleby, Darlington, Metallurgical Chemist.

1897. Hodgson, Matthew, Leitrim Cottage, Wicklow, Ireland, Technical Chemist.

1890. Hodgson, Wm., 66, Deansgate, Manchester, Oil and Colour Broker.

1886. Hogben, W., c/o Fiberloid Co., Newburyport, Mass., U.S.A., Analytical Chemist.

1888. Hogg, Quintin, 61, Threadneedle Street, London, E.C.; and (Journals) Polytechnic, 309, Regent Street, W., Merchant.

O.M. Hogg, T. W., c/o John Spencer & Sons, Newburn Steelworks, Newcastle-on-Tyne, Metallurgical Chemist.

1899. Holden, Archie Neill, 73, Albert Road, Southport, Manufacturing Chemist.

1887. Holden, G. H., Gildabrook, Edge Lane, Chorlton-cum-Hardy, Manchester, Manufacturing Chemist.

1885. Holgate, S. V., 29, Long Row, Nottingham, Pharmaceutical Chemist.

1885. Holgate, T. E., 173, Hollins Grove, Darwen, Lancashire, Metallurgist.

1884. Holgate, T., Rawson Avenue, Greenroyd, Halifax, Gas Engineer.

O.M. Holland, Philip, 22, Taviton Street, Gordon Square, London, W.C., Analytical Chemist.

1892. Holland, Philip H., 958, Sherbrooke Street, Montreal, Canada, Merchant.

O.M. Holliday, R. (Read Holliday & Sons), Huddersfield, Dye Manufacturer.

1898. Hollinger, M. J., Alma Portland Cement Co., Wellston, Ohio, U.S.A., Chemist.

1896. Hollings, J. Spencer, Brymbo, North Wales, Works Manager.

1900. Hollinshead, W. H., Vanderbilt University, Nashville, Tenn., U.S.A., Teacher of Chemistry.

1890. Holloman, Fred R., 43, Southern Road, Plaistow, E., Sugar Works Chemist.

1890. Holloway, G. T., 57 and 58, Chancery Lane, W.C., Analytical and Consulting Chemist.

1884. Holloway, Wm., Newlands, Middlesbro', Manufacturing Chemist.

1900. Hollway, Jno., 6, Highbury Grange, London, N., Mine Owner.

1883. Holmes, Ellwood, Wyncote, Jesmond Park East, Newcastle-on-Tyne, Colour Manufacturer.

O.M. Holmes, F. G., Haydn Villa, St. George's Road, Waterloo, Liverpool, Technical Chemist.

1900. Holthouse, Harold B., 12, Melton Grove, West Bridgford, Nottingham, Chemist.

1892. Holton, E. C., Sherwin-Williams Co., 100, Canal Street, Cleveland, Ohio, U.S.A., Chemist.

1893. Holzapfel, Max., Quayside, Newcastle-on-Tyne, Manufacturer.

1893. Homfray, D., 6, Dartmouth Row, Greenwich, S.E., Analytical Chemist.

1890. Hooker, Benj., Pear Tree Court, Farringdon Road, London, E.C., Mechanical Engineer.

1899. Hooker, H. D., 341, Adelphi Street, Brooklyn, N.Y., U.S.A., Sanitary Engineer.

O.M. Hooper, E. Grant, Government Laboratory, Clement's Inn Passage, Strand, W.C.; and (Journals) 16, Royal Avenue, Sloane Square, S.W., Analytical Chemist.

1889. Hooper, Ernest F., Wear Fuel Works, Hendon Dock, Sunderland, Technical Chemist.

1888. Hope, Jas., The Nickel Co., Kirkintilloch, N.B., Nickel Works Manager.

1892. Hopkins, Erastus, Lake Mary, Florida, U.S.A., Consulting Chemist.

1893. Hopkins, Gerald V., Nicholaston House, Penmaen, near Swansea; and (Journals) Silico, Rossland, Canada, Metallurgist.

1894. Hopkins, Herbert W., 13, Harrington Gardens, South Kensington, S.W., Metallurgist.

1891. Hopkinson, John, Marion Street, Lister Hills, Bradford, Yorks, Lubricant Manufacturer.

1898. Hopwood, Wm. H., Strines, near Stockport, Printworks Chemist.

1889. Horn, Wm., Lautaro Nitrate Co., Taltal, Chili, Technical Chemist.

1895. Horne, W. D., Yonkers, N.Y., U.S.A., Consulting Chemist.

1900. Horsfall, Jno., 4, Grange Avenue, Rawtenstall, Manchester, Analytical and Consulting Chemist.

1901. Horton, Edw., jun., 8, Orford Street, Chelsea, S.W., Student.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1889. Horton, William, 44, Cable Road, Hoylake, Cheshire, Analytical Chemist.
1892. Hosie, G. H., 136, Cambridge Drive, Kelvinside, N., Glasgow, Technical Chemist.
1890. Hoskins, A. Percy, 25, Cromwell Road, Belfast, Analytical Chemist.
1899. Hoskins, Wm., Room 55, 81, South Clark Street, Chicago, Ills., U.S.A., Chemist.
1897. Hotson, Arthur E., 147, East 125th Street, New York City, U.S.A., Chemist.
1899. Houlder, Bertram E., 10, Ossulton Villas, Southall, Middlesex, Chemist.
1892. Houston, John, 26, Princess Street, Manchester, Drysalter.
1888. Houston, Robt. S., Hawkhead Road, Paisley, N.B., Analytical Chemist.
1891. Hovenden, Fred., Glenlea, Thurlow Park Road, West Dulwich, S.E.
O.M. Howard, A. G., Burnt House, Chigwell, Essex, Chemical Manufacturer.
1900. Howard, Chas. D., Agricultural Experiment Station, Morgantown, W. Va., U.S.A., Chemist.
O.M. Howard, D., Devon House, Buckhurst Hill, Essex, Chemical Manufacturer.
1887. Howard, D. L., City Mills, Stratford, London, E., Chemical Manufacturer.
1898. Howard, Henry, 175, Mountfort Street, Brookline, Mass., U.S.A., Chemical Engineer.
O.M. Howard, W. D., City Mills, Stratford, London, E., Chemical Manufacturer.
1899. Howles, Fred., c/o McDougall Bros., Millwall Docks, London, E., Chemist.
1889. Howorth, F. Wise, c/o Lloyd Wise, 46, Lincoln's Inn Fields, W.C., Manufacturing Chemist.
1896. Hoyte, Percy S., Gas Works, Coxside, Plymouth, Gas Engineer.
1900. Hübner, Julius, 24, Delaunay's Road, Crumpsall, Manchester, Chemist and Colourist.
1898. Hudson, Albert, Northport Mining and Smelting Co., Northport, Wash., U.S.A., Assayer.
1899. Hudson, Dr. Edw. J., Cleveland Cliffs Iron Co., Gladstone, Mich., U.S.A., Chemist.
1896. Hudson, Jos., Rawden Lodge, Headingley, Leeds, Drysalter.
1897 Hudson, Thos., Isle of Cinder Oil and Grease Works, Leeds, Oil Manufacturer.
O.M. Hughes, J., 79, Mark Lane, London, E.C., Agricultural Chemist.
1898. Hughes, Raymond M., Oxford, Butler Co., Ohio, U.S.A., Professor of Chemistry and Physics.
O.M. Hughes, T., 31, Loudon Square, Cardiff, Analytical Chemist.
1900. Hulley, Geo. D., c/o J. Eavenson and Sons, 20th and Wood Streets, Philadelphia, Pa., U.S.A., Soapworks Chemist.
1893. Humfrey, Chas., Hilderstone, Hartford, Cheshire, Alkali Works Manager.
O.M. Hummel, Prof. J. J., 152, Woodsley Road, Leeds, Prof. of Dyeing.
1896. Humphrey, H. A., West View, Winnington, Northwich, Chemical Manager.
O.M. Humphrys, N. H., Gasworks, Salisbury, Wilts, Gas Engineer.
1895. Hunicke, Dr. H. Aug., 3532, Victor Street, St. Louis, Mo., U.S.A., Prof. of Applied Chemistry.
1900. Hunt, Arthur V., 76, Cromwell Street, Stretford, Lancashire, Analytical Chemist.
O.M. Hunt, Bertram, c/o C. D. Laing, 717, Taylor Street, San Francisco, Cal., U.S.A., Technical Chemist.
O.M. Hunt, C., Gasworks, Windsor Street, Birmingham, Gas Engineer.
O.M. Hunt, E., Wood Green, Wednesbury, Staffordshire, Chemical Manufacturer.
1897. Hunt, Edmund, 121, West George Street, Glasgow, Patent Agent.
1883. Hunt, J. S., Appleton, Widnes.
1895. Hunt, L. W., 29, Albert Road, Withington, Manchester, Paint and Colour Manufacturer.
O.M. Hunt, W., Hampton House, Wednesbury, Staffordshire, Chemical Manufacturer.
1897. Hunter, Prof. A. G. Kidston, (subs.) c/o John Hunter, 18, Great Clyde Street, Glasgow; and (Journals) P.O. Box 164, Dunedin, N.Z., Prof. of Chemistry.
1893. Hunter, Prof. Matthew, Rangoon College, Rangoon, Burmah, Prof. of Chemistry.
1892. Hunter, Sidney H., 202, Bow Road, E., Mechanical Engineer.
O.M. Huntington, Prof. A. K., King's College, Strand, London, W.C., Prof. of Metallurgy.
1897. Huntington, Dr. Harwood, The Buckingham, 2, East 50th Street, New York, U.S.A., Consulting Chemist.
1884. Hunzinger, A., Dinting Vale Printworks, Dinting, Derbyshire, Calico Printer.
1900. Hurd, Geo. E., 72, Michigan Avenue, Chicago, Ills., U.S.A., Food Products Manufacturer.
1894. Hurry, E. H., Bethlehem, Pa., U.S.A., Mechanical Engineer.
1884. Hurst, G. H., 22, Blackfriars Street, Salford, Manchester, Analytical Chemist.
O.M. Huskisson, P. L., 77, Swinton Street, London, W.C., Chemical Manufacturer.
O.M. Huson, C. W., 18, Batavia Buildings, Hackins Hey, Liverpool, Analytical Chemist.
1894. Hutcheson, Jno. F., 22, St. Enoch Square, Glasgow, Chemical Manufacturer.
O.M. Hutchinson, C. C., 3, Harcourt Buildings, Temple, E.C., Barrister-at-Law and Chemical Engineer.
1900. Hutchinson, Edw. G., Gasworks, Pontefract Road, Barnsley, Yorks, Assistant at Gasworks.
O.M. Hutchinson, T. J., Aden House, Manchester Road, Bury, Analytical and Consulting Chemist.
O.M. Huxley, J. H., 15, Kenwood Park Road, Sharrow, Sheffield, Metallurgical Chemist.
1897. Hyams, Geoffrey M., P.O. Box 5104, and 312, Sears Building, Boston, Mass., U.S.A., Mines Manager.
1897. Hyde, B. T. Babbitt, c/o B. T. Babbitt, 82, Washington Street, New York, U.S.A., Soap Manufacturer.
1899. Hyde, Fred. S., 215, Schermerhorn Street, Brooklyn, N.Y., U.S.A., Research Chemist.
1897. Hyde, Henry St. John, 210, East 18th Street, New York City, U.S.A.
1899. Hyde, Wm. Grantley, 20, Wincham Street, Clapham Common, S.W., Assayer.
1896. Hyndman, H. H. Francis, Physical Laboratory, Leyden, Holland, Analytical and Consulting Chemist.

I

1898. Ibbotson, E. C., jun., c/o Dearne and Dove Steelworks, Worsbrough Dale, Barnsley, Metallurgist.
1900. Ichioka, Tajiro, Stevenston, Ayrshire, Doctor of Chemistry, Chemist (Imperial Japanese Navy).
1885. Idris, T. H. W., Pratt Street, Camden Town, N.W., Mineral Water Manufacturer.
1899. Imhoff, Dr. Paul, 18, Greenbank Road, Liverpool, Chemist.
1900. Imrie, John, 415, Shields Road, Pollokshields, Glasgow, Analytical Chemist.
1900. Ingalls, Walter R., 153, Milk Street, Boston, Mass., U.S.A., Mining Engineer and Metallurgist.
1889. Ingle, Dr. Harry, 15, John Street, Kirkcaldy, Fifeshire, Organic Chemist.
1891. Ingle, Herbert, Yorkshire College, Leeds, Assistant Lecturer on Chemistry.
1884. Inglis, R. A., Culrain, Bothwell, N.B., Analytical Chemist.
1891. Innes, Murray, P.O. Box 156, Clifton, Arizona, U.S.A., Technical Chemist.
1888. Iriyè, Koremasa, China and Japan Trading Co., Kobé, Japan, Analytical Chemist.
O.M. Irvine, R., Royston, Granton, Edinburgh, Chemical Manufacturer.

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1884. Irving, J. M., 17A, Dickinson Street, Cooper Street, Manchester, Chemical Merchant.
O.M. Irwin, W., 3, Wilton Polygon, Cheetham Hill, Manchester, Analytical Chemist.
1893. Isaac, J. F. V., , Research Chemist.
1888. Isaac, T. W. Player, Barton Court, Abingdon, Chairman of Waterworks Co.
1896. Isaacs, Louis A., 110, Greencroft Gardens, West Hampstead, N.W., Manufacturer.
O.M. Isler, Otto, 35–37, Dickinson Street, Manchester, Chemical Merchant.
1900. Ittner, Dr. Martin H., c/o Colgate and Co., Jersey City, N.J., U.S.A., Soap and Essential Oil Chemist.

J

1890. Jackman, E. J., 60, Belgrave Road, Ilford, Essex, Technical Chemist.
1898. Jackson, Alf. Greville, 208, George Street, Brisbane, Queensland, Electrical Engineer.
1900. Jackson, Dr. W. Hatchett, Radcliffe Library, University Museum, Oxford, Librarian and Science Tutor (Keble College).
O.M. Jackson, Edward, Clovelly, Grove Avenue, Moseley, Birmingham, Alkali Works Inspector.
1891. Jackson, F., Smedley Bridge Works, Cheetham, near Manchester, Chemical Apparatus Maker.
1883. Jackson, Frederick, 14, Cross Street, Manchester, Laboratory Furnisher.
1884. Jackson, G. B., 7, Brazenose Street, Albert Square, Manchester, Chemical Manufacturer.
1886. Jackson, John, 98, Dobbie's Loan, Glasgow, Lubricant Manufacturer.
O.M. Jackson, R. V., c/o Scotch and Irish Oxygen Co., Polmadie, Glasgow, Technical Chemist.
1891. Jackson, Robt., 18, Harrington Street, Dublin, Analytical Chemist.
1890. Jackson, Saml., c/o Messrs. Binny & Co., Madras, India, Analytical Chemist.
1898. Jackson, Thos., Clayton Chemical Works, Clayton Manchester, Chemical Manufacturer.
1886. Jackson, Walter, 24, Sydenham Avenue, Sefton Park, Liverpool, Metallurgical Chemist.
1899. Jackson, W. E. Russell, Sunderland Brewery, Sunderland, Brewer.
1893. Jackson, Rt. Hon. W. L., M.P., F.R.S., 27, Cadogan Square, S.W.; and (Journals) Allerton Hall, Chapel Allerton, near Leeds, Leather Manufacturer.
1900. Jackson, Victor G., 167, Grove Lane, Denmark Hill, S.E., Chemist.
1899. Jackson, W. Morton, c/o Manchester Oxygen Co., Ltd., Great Marlborough Street, Manchester, Manager.
O.M. Jackson, W. P., Saxilby, near Lincoln, Chemical Works, Manager.
1900. Jacoby, Areli H., c/o F. E. Atteaux and Co., 176, Purchase Street, Boston, Mass., U.S.A., Chemist.
1897. Jacqué, Maurice, Fabrica de Dinamita, Galdacano, cerca Bilbao, Spain, Chemical Engineer.
1900. Jäger, B. M., c/o Geo. Jäger and Sons, 77, Burlington Street, Liverpool, Chemist, Sugar Refinery.
1886. Jago, Wm., Godrevy House, Wilbury Avenue, Hove, Sussex, Chemical Engineer.
1889. James, Alf., 56, New Broad Street, London, E.C., Mining Engineer.
1900. James, Edgar C., 202, Portway, West Ham, E., Chemist.
1883. James, E. T., British Alizarin Co., Ltd., Silvertown, Victoria Docks, E., Secretary.
1885. James, Dr. J. Wm., Aylmer House, Weston-super-Mare; and (Journals) 29, Redcliff Street, Bristol, Chemical Lecturer.
1893. James, Lawrence S., 32, Hawley Street, Boston, Mass., U.S.A., Gas Inspector.
1894. Jameson, A. H., Logan Manufacturing Co., Phœnixville, Pa., U.S.A., Chemist.
1897. Jansen, Dr. Robt., 43, Plymouth Avenue, Longsight, Manchester, Technical Chemist.
1890. Jantzen, Paul, 132, Fenchurch Street, London, E.C., Chemical Merchant.
O.M. Japp, Dr. F. R., F.R.S., The University, Aberdeen, Professor of Chemistry.
1890. Jarmain, Geo. S., Kirkheaton, near Huddersfield, Wool Extractor.
O.M. Jarmay, G., Hartford Lodge, Hartford, Cheshire, Alkali Manufacturer.
1894. Jarrett, H. T., 90, William Street, New York, U.S.A., Chemist.
1884. Jarves, Deming, Michigan Carbon Works, Detroit, Mich., U.S.A., Manufacturing Chemist.
1900. Jarvie, Hugh, Earnest Soap and Glycerin Works, Coatbridge, N.B., Chemist.
1900. Jarvie, Jas., Monkland House, Kirkintilloch, N.B., Chemist.
1894. Jarvis, Talbot McL., Castle Lodge, Bedford, Brewer.
O.M. Jayne, Dr. H. W., 931, North Broad Street, Philadelphia, U.S.A., Manufacturing Chemist.
1900. Jefferson, Jos., Empreza Industrial Portugueza, Sto. Amaro, Lisbon, Metallurgist.
O.M. Jekyll, J., Castle Moat House, Lincoln, Chemical Manufacturer.
1892. Jenkin, W. A., 5, Bella Vista, Minas de Rio Tinto, Provincia de Huelva, Spain, Metallurgical Chemist.
1894. Jenkins, John H. B., Laboratory, G.E.R. Works, Stratford, E., Analytical Chemist.
1894. Jenks, Robt. L., Research Department, Imperial Institute, London, S.W., Chemist.
O.M. Jenner, E., 209, Markhouse Road, Walthamstow, Essex, Chemical Manufacturer.
1898. Jennings, Arthur S., 62, Barry Road, East Dulwich, S.E., Editor of "Oils, Colours, and Drysalteries."
1899. Jennings, Thos., Brookfield, Cork, Ireland, Chemical Manufacturer.
1899. Jerdan, Dr. David S., c/o J. and G. Cox, Ltd., Gorgie Mills, Edinburgh, Chemist (Gelatin Works).
1899. Jessop, Louis V., 8, Rockmead Road, Victoria Park, N.E., Chemist.
1896. Job, Robt., 638, North 6th Street, Reading, Pa., U.S.A., Analytical Chemist.
1886. Johnson, A. E., 155, Lea Road, Wolverhampton, Analytical Chemist.
1900. Johnson, Albert C., 320, East 25th Street, Baltimore, Md., U.S.A., Chemical Engineer.
1893. Johnson, Chas. H., jr., Laboratory, Rubberine Works, Oatlands Mill, Leeds, Works Manager.
1891. Johnson, Edmond E., Engineering Works, Carpenter's Road, Stratford, E., Chemical Engineer.
1897. Johnson, Edward H., Cyanide Works Manager.
1900. Johnson, F. Carter, National Acid Co., 714, Union Street, New Orleans, La., U.S.A., Chemical Engineer.
O.M. Johnson, J. E., 40, Idmiston Road, Stratford, London, E., Manufacturing Chemist.
1884. Johnson, J. Grove, 23, Cross Street, Finsbury, London, E.C., Assayer.
1895. Johnson, Jesse F., c/o Hamilton Powder Co., Montreal, Canada, Chemical Engineer.
1900. Johnson, Jno. E., 95, Liberty Street, New York City, U.S.A., Chemical Engineer.
1900. Johnson, Jno. W. H., York House, Thornhill, Dewsbury, Yorks, Analytical Chemist.
O.M. Johnson, S. H., Warren Hill House, Loughton, Essex, Chemical Engineer.
1899. Johnson, S. H., jun., Engineering Works, Stratford, E., Chemical Engineer.
O.M. Johnson, T. A., Field House, Winnington Park, Northwich, Cheshire.
1900. Johnson, Thos. H., American Forcite Powder Manufacturing Co., Landing, N.J., U.S.A., Superintendent.
1895. Johnston, Alex. R., 18, Percy Street, Ibrox, Glasgow, Analytical Chemist.

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1894. Johnston, G. L., Kingswood Road, Sydenham Hill, S.E., Director (Bovril, Ltd.).
1889. Johnston, Thos., Nobel's Explosives Co., Ltd., 149, West George Street, Glasgow, Explosives Co.'s Manager.
1890. Johnston, Wm. A., The S. S. White Dental Manufacturing Co., Princess Bay, New York, U.S.A., Dental Enamel Manufacturer.
1894. Johnston, Wm. E. Lawson, 8, Park Crescent, London, W., Assistant Chemist (Bovril, Limited).
O.M. Johnston, Wm. G., Chemical Works, Coatbridge Street, Port Dundas, Glasgow, Technical Chemist.
O.M. Johnstone, Jas., Shawfield Works, Rutherglen, Glasgow, Technical Chemist.
O.M. Johnstone, W. G., The Brewery, Newark-on-Trent, Chemist.
O.M. Johnstoun - Coombes, Dr. W., Pilmuir, Falmouth, Analytical Chemist.
O.M. Jones, Chapman, Royal College of Science, South Kensington, S.W., Senior Demonstrator in Chemistry.
1897. Jones, Chas. H., Minas de Rio Tinto, South Spain, Technical Chemist.
1899. Jones, Ernest W., 18, Upper Tooting Road, S.W., Chemist.
O.M. Jones, E. W. T., 10, Victoria Street, Wolverhampton, Analytical Chemist.
1897. Jones, Fred. W., Barwick, near Ware, Herts, Explosives Works Manager and Chemist.
1896. Jones, G. Cecil, Basingstoke Ironworks, Basingstoke, Works, Chemist.
1900. Jones, Gordon, Pystill, Holywell, Flints., North Wales, Paper Manufacturer.
1898. Jones, Henry, Broughton Bridge Mills, Salford, Dyer and Finisher.
1893. Jones, Herbert. *See* Sefton-Jones, H.
1899. Jones, Llewellyn J. W., Omaha Smelting Works, Omaha, Neb., U.S.A., Metallurgist.
1898. Jones, Martin L., c/o Ooregum G. M. Co., Oorgaum, Mysore Prov., India, Metallurgical Chemist.
1894. Jones, M. W., 8, Cavendish Place, Jesmond, Newcastle-upon-Tyne, Analytical Chemist.
1899. Jones, Thos. J., Anglo-Continental Guano Works, North Woolwich Road, E., Foreman.
1887. Jones, T. Tolley, 356, Little Collins Street, Melbourne, Victoria, Explosives Manufacturer.
O.M. Jones, W. Norris, Lancashire Metal Works, Widnes, Technical Chemist.
1899. Joplin, Geo. C., 8, O'Connell Street, Sydney, N.S.W., Australia, Analyst.
1897. Jorissen, Dr. Wm. P., Koninklijk Inst. v. d. Marine, Willemsoord, Holland, Editor.
1892. Joseland, Walter H., Laboratory, Newport Lane, Burslem, Staffordshire, Analytical Chemist.
1900. Josephson, Edgar, 131, Amity Street, Brooklyn, N.Y., U.S.A.
1891. Joslin, Omar T., 215, East Fourth Street, Cincinnati, Ohio, U.S.A., Chemical Engineer.
1887. Joüet, Dr. C. H., Roselle, Union Co., N.J., U.S.A., Technical Chemist.
1889. Journand, Louis, 21, Grand Rue, Bourg-de-Péage, Drôme, France, Technical Chemist.
1888. Joy, Douglas G., Pine Wood, Beverley, Yorks, Oil Refiner.
1887. Jürgensen, Dr. Rolof, Karlsgasse 5, Prag-Zizkov, Austria, Chemist.
1900. Just, Jno. A., 109, West Kennedy Street, Syracuse, N.Y., U.S.A., Chemist.
O.M. Justice, P. M., 55–56, Chancery Lane, London, W.C., Patent Agent.

K

1898. Kahn, Julius, Hotel Majestic, 4, West 72nd Street, New York, U.S.A., Manufacturer of Rubber Goods.
1896. Kalbfleisch, Franklin H., 33–35, Burling Slip, New York, U.S.A., Chemical Manufacturer.
1884. Kalle, Dr. Wm., Biebrich-am-Rhein, Germany, Colour Manufacturer.
1899. Karas, J., c/o Tim and Co., Troy, N.Y., U.S.A., Laundryman.
1892. Kaufmann, Dr. Herbert M., c/o Mutual Chemical Co., Jersey City, N.J., U.S.A., Chemist.
1885. Kawakita, Michitada, Imperial Engineering College, Tokio, Japan, Analytical Chemist.
O.M. Kay, H. A., 71, Maida Vale, London, W.
1891. Kay, Dr. Percy, South-Western Polytechnic, Manresa Road, Chelsea, S.W., Analytical Chemist.
O.M. Kay, W. E., Ashlands, Sale, Cheshire, Printworks Chemist.
O.M. Kearns, H. W., Baxenden, near Accrington, Dyer.
1897. Kearns, Jno. S., Baxenden House, near Accrington, Chemist and Dyer.
1894. Kebler, Lyman F., 35, Poplar Street, Philadelphia, Pa., U.S.A., Analytical and Manufacturing Chemist.
1900. Keeble, Arthur J., Peterborough, Cement Manufacturer.
1886. Keiser, Prof. E. H., Washington University, St. Louis, Mo., U.S.A., Professor of Chemistry.
1900. Kelf, Henry C., c/o East India Distilleries, Nellikuppam, S. Arcot, Madras, India, Sugar Chemist.
1900. Kellner, Dr. Carl, Kellner Partington Paper Pulp Co., Hallein bei Salzburg, Austria, Paper Chemist.
1885. Kellner, Dr. Wm., 13, Victoria Road, Old Charlton, S.E., Chemist to War Department.
1901. Kelsey, D. McC. Stone, 192, Woodlawn Avenue, Saratoga Springs, N.Y., U.S.A., Manufacturing Chemist.
1898. Kemball, Chas. F., Ogdensburg, N.Y., U.S.A., Chemical Manufacturer.
1889. Kempson, John F., Pye Bridge Chemical Works, near Alfreton, Derbyshire, Chemical Manufacturer.
1891. Kenrick, Prof. Edgar B., St. John's College, Winnipeg, Manitoba, Canada, Professor of Chemistry.
1888. Kent, Wm. J., Holly Lodge, Hornsea, Yorks, Assayer and Chemical Engineer.
1889. Kenyon, Thos., The Shrubbery, Hilton Park, Prestwich, near Manchester, Manufacturing Chemist.
1900. Keppelmann, Alf. J., 308, Carpenter Street, Germantown, Pa., U.S.A., Chemical Merchant.
1888. Ker, Alan D., Millburn Chemical Works, Garngad Hill, Glasgow, Chemical Manufacturer.
1899. Kern, Walter P., 141, Milton Street, Brooklyn, N.Y., U.S.A., Chemist.
1894. Kerr, Jas., 42, Craiglea Drive, Morningside, Edinburgh, Works Chemist.
1890. Kerr, Saml. T., c/o Alex. Kerr Bros. & Co., Philadelphia, Pa., U.S.A., Salt Manufacturer.
1897. Kerr, Wm. M., c/o General Chemical Co., 608, Philadelphia Bourse, Philadelphia, Pa., U.S.A., Manufacturing Chemist.
1896. Kershaw, J. B. C., Faraday House, Charing Cross Road, W.C., Analytical Chemist.
1893. Kestner, Paul, 22, Boulevard Vauban, Lille, France, Chemist.
1898. Keswick, Wm., M.P., 3, Lombard Street, London, E.C., Merchant.
1900. Kewley, Jas., Arbory Road, Castletown, Isle of Man, Technical Chemist.
1890. Keys, W. H., Hall End Chemical Works, West Bromwich, Oil and Chemical Manufacturer.
1892. Kibble, W. Oakes, Sonora, Tuolumne Co., Cal., U.S.A., Chemical Engineer.
1896. Kier, Thos., Thornliebank, Glasgow, Chemist.
1900. Kilgore, Benj. W., Raleigh, N. Carolina, U.S.A., Chemist.
O.M. Kinch, E., Royal Agricultural College, Cirencester, Professor of Chemistry.
O.M. King, A. J., Ingersley Vale, Bollington, near Macclesfield, Bleacher and Finisher.
1883. King, C. M., Chemical Engineer.
1884. King, C. M., Campsie Alum Works, Lennoxtown, N.B., Alum Manufacturer.
1887. King, Sir James, Bart., 115, Wellington Street, Glasgow, Chemical Manufacturer.
O.M. King, J. Falconer, 20, Chambers Street, Edinburgh, Consulting Chemist.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1897. King, Joshua, Clarewood, Camberley, Surrey, Indian Civil Service (retired).
1887. King, Robt., 115, Wellington Street, Glasgow, Chemical Manufacturer.
1895. King, Sidney J., 49, Arundel Square, Barnsbury, N., Colour and Dyestuff Traveller.
O.M. King, Walter R., (Journals) Avalon, Trinity Avenue, Southend-on-Sea; and (Subscriptions) 47, Wilson Street, Finsbury, E.C., Chemical Manufacturer.
1839. King, Wm. R., Box 695, Summit, N.J., U.S.A., Mechanical Engineer.
1896. Kingdon, G. Holman, Ivy Lodge, Froghall, Warrington, Technical Chemist, M.A., Oxon.
1899. Kingsford, Edw. A., 91, Petherton Road, Highbury, N., Manufacturing Chemist.
1883. Kingsford, T. P., Oswego, New York, U.S.A., Starch Manufacturer.
O.M. Kingzett, C. T., Elmstead Knoll, Chislehurst, Kent, Technical Chemist.
1892. Kinnicutt, Professor L. P., 77, Elm Street, Worcester, Mass., U.S A., Professor of Chemistry (Worcester Polytechnic Institute).
1897. Kipping, Dr. F. Stanley, F.R.S., University College, Nottingham, Prof. of Chemistry.
1897. Kirkby, Wm., 14, Ducie Avenue, Oxford Road, Manchester. Chemist.
1898. Kirkland, Archd., High Street, Irvine, N.B., Baker.
1897. Kirkland, Robt., Viewfield, Newmains, N.B., Chemist.
1900. Kirkpatrick, Stafford F., c/o Mountain Copper Co., Keswick, Shasta Co., Cal., U.S.A., Assayer.
1887. Kitamura, Y. (Journals), c/o R. Fujihanaya, Yokoyamacho Sanchome, Tokyo, Japan, Agricultural Chemist.
1883. Kitchen, Theo., (Journals) 28, Flinders Lane North, Melbourne, Australia; and (subs.) 35, Queen Victoria Street, E.C., Soap and Candle Manufacturer.
1891. Kitson, Sir James, Bart., M.P., Gledhow Hall; and (Journals) Monkbridge Iron and Steel Co., Ltd., Leeds, Iron and Steel Manufacturer.
1883. Kitto, B., 26, Lancaster Road, Finsbury Park, London, N., Analytical Chemist.
1900. Kittredge, H. G., 42, Linden Avenue, Dayton, Ohio, U.S.A., Chemist.
1900. Kleber, Dr. Clemens, Union Avenue, Clifton, N.J., U.S.A., Director (Fritzche Bros.' Laboratory).
1888. Kleemann, Dr. S., Farben Fabrik, Forcheim, Bavaria, Analytical Chemist.
1898. Klein, Otto H., Room 110, Stewart Building, 280, Broadway, New York, U.S.A., Consulting Engineer.
1889. Klipstein, A., 122, Pearl Street, New York, U.S.A. Chemical Manufacturer.
1891. Knaggs, Alfred B., Bradley Lane, Huddersfield, Techuical Chemist in Dyeworks.
1900. Knapp, Rudolf E., 487, East Congress Street, Detroit, Mich., U.S.A., Chemist.
1901. Knecht, Carl E., 1615, Figueroa Street, Los Angeles, Cal., U.S.A., Chemist.
1892. Knecht, Dr. E., Station Road, Crumpsall, Manchester, Analytical Chemist.
1900. Kniffen, Fred., U.S. Naval Smokeless Powder Factory, Indian Head, Md., U.S.A., Chemist.
1887. Knight, A. H., 2, Gerald Road, Oxton, Cheshire, Assayer.
1884. Knight, Henry, 33, Faraday Street, Breck Road, Liverpool, Colour and Varnish Manufacturer.
O.M. Knight, J. B., Silvertown Soapworks, Silvertown, London, E., Soap Manufacturer.
1894. Knight, Wm. A., Sexey's Trade School, Bruton, Somerset, Head Master.
1887. Knights, J. West, Public Laboratory, Tenison Road, Cambridge, Analytical Chemist.
1885. Knipler, F., c/o R. Harper and Co., 352, Flinders Lane, Melbourne, Victoria, Starch Manufacturer.
1883. Knowles, Joshua, Stormer Hill, Tottington, near Bury, Calico Printer.
1886. Knox, E. W., Colonial Sugar Refining Co., Sydney, N.S.W.; and c/o Parbury Henty & Co., 20, Eastcheap, London, E.C., Sugar Manufacturer and Refiner.
1895. Koechl, Victor, 122, Hudson Street New York; (Journals) 47, Montgomery Place, Brooklyn, N.Y., U.S.A.; Dye Merchant.
1884. Kohn, Dr. Chas. A., University College, Liverpool, Chemical Demonstrator.
1896. Kohnstamm, E. H., 44, West Broadway, New York, U.S.A., Colour Maker and Importer.
1884. Kolb, J., Soc. Anon. des Manuf. de Produits Chimiques, Lille, France, Chemical Manufacturer.
1898. Koop, Eugene, 1, Leadenhall Street, London, E.C., Chemical Merchant.
O.M. Kraftmeier, E., 54, Parliament Street, Westminster, S.W., Explosives Manufacturer.
1894. Krause, Dr. Albert H., 32, Wellington Avenue, Cleveland, Ohio, U.S.A., Chemist (Grasselli Chemical Co.).
O.M. Krause, Dr. G., "Chemiker-Zeitung," Cöthen, Germany, Editor.
O.M. Krause, O. H., c/o American Sugar Refining Co., Jersey City, N.J., U.S.A., Chemical Engineer.
1898. Krebs, H. J., Wilmington, Del., U.S.A., Manufacturing Chemist.
1900. Kremers, Dr. Edw., Madison, Wis., U.S.A., Professor (University of Wisconsin).
1899. Krick, Howard L., Sheridan Furnaces, Sheridan, Leb. Co., Pa., U.S.A., Analytical Chemist.
O.M. Kühl, W. H., 73, Jägerstrasse, Berlin, Germany, Bookseller.
1900. Kunheim, Erich, 32, Doratheenstrasse, Berlin, N.W., Germany, Chemist.
1885. Kupferberg, Dr. H., 303, Collyhurst Road, Manchester, Technical Chemist.
1896. Kuttroff, Adolf, 128, Duane Street, New York, U.S.A., Chemical Merchant.
1900. Kuttroff, Fred., 128, Duane Street, New York City, U.S.A., Merchant.
O.M. Kynaston, J. W., 3, Oak Terrace, Beech Street, Liverpool, Chemical Engineer.
1898. Kynaston, Wm. C. R., 9, Harland Road, Higher Tranmere, Cheshire, Analyst.

L

1897. Labonde, Dr. Leon, Los Angeles, Cal., U.S.A., Consulting Chemical Engineer.
1890. Lacey, E. C., 10, Clarence Road, Croydon, Manufacturing Chemist.
O.M. Lacey, T. S., Gas Light and Coke Company, Lupus Street, Pimlico, S.W., Gas Engineer.
1899. Lachman, Albert, California Wine Association, San Francisco, Cal., U.S.A., Wine Merchant.
1897. Ladd, Edwin F., Agricultural College, Fargo, North Dakota, U.S.A., Prof. of Chemistry.
1888. Lagerwall, Dr. Ivar, 3, Prince's Street, London, E.C.; and (Journals) Sunthorpe, Wallington, Surrey, Petroleum Manufacturer.
O.M. Laidler, C. P., 20, Noble Terrace, Gateshead-on-Tyne, Analytical Chemist.
1894. Laing, Wm., 10-11, The Exchange, Bradford, Yorks, Oil Merchant.
O.M. Lake, G., jun., 83, Primrose Lane, Glossop, Derbyshire, Analytical Chemist.
1900. Lamar, Wm. R., 840, Southern Boulevard, New York City, U.S.A., Chemist.
1898. Lamb, Morris C., Herold's Institute, Drummond Road, Bermondsey, S.E., Chemist.
1898. Lamb, Osborn R., 59, Carmine Street, New York, U.S.A.
1892. Lambert, Alan, Union Oil Mills, Ld., 18, Bishopsgate Street Within, E.C., Oil Mills Director.
1900. Lambert, Walter S., 56, Leytonstone Road, Stratford, E., Analyst.
1899. Lamborn, Leebert Ll., 108, Fulton Street, New York City, U.S.A., Technical Chemist.
1895. Lancaster, Jno. C., 260, Alfreton Road, Nottingham, Engineering Works Manager.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1900. Lander, Geo. D., 1, Balmoral Road, Nottingham, Lecturer.
1895. Landin, John, 40, Drottninggatan, Stockholm, Sweden, Public Analyst.
1890. Lang, Jas. G., Balmoral Hotel, Victoria, British Columbia, Analytical Chemist.
1899. Lang, Dr. Wm. R., University of Toronto, Canada, Professor of Chemistry.
O.M. Langdon, Dr. M. J., 16, Harriet Street, Stretford, Manchester, Analytical Chemist.
1890. Lange, Dr. Martin, Nieuwe Witsenkade 35, Amsterdam, Holland, Analytical Chemist.
1892. Langer, Dr. Carl, Ynyspenllwch, Clydach, R.S.O., Glamorganshire, Analytical Chemist.
1897. Langmuir, Arthur C, c/o Marx and Rawolle, 9, Van Brunt Street, Brooklyn, N.Y., U.S A., Analytical Chemist.
1898. Langstaff, Wm., 34, Fowler Street, Cleveland, Ohio, U.S.A., Chemist.
1900. Lant, Herbert, c/o Chas. Stanley & Son, Ltd., Wath-on-Dearne, near Rotherham, Yorks, Chemist and Manager.
1884. Latham, Baldwin, 13, Victoria Street, Westminster, S.W., Civil Engineer.
1889. Latham, J. J., Mill House, Bold, Widnes, Chemical Works Manager.
O.M. Lawrence, Jas., Repauno Chemical Works, Paulsboro', N.J., U.S.A., Assistant Manager.
O.M. Laws J. P., 2, Aigburth Vale, Liverpool, S., Analytical Chemist.
1885. Lawson, Arthur J., Marsh Soapworks, Bristol, Soap Manufacturer.
1888. Lawson, Dr. T. A., 90, Boundary Road, London, N.W., Colour Chemist.
1900. Lawson, Wm., Alameda Sugar Co., Alvarado, Cal., U.S.A., Chemist.
1893. Lawton, Thos., Calthorpe House, Aldridge Road, Perry Bar, Birmingham, Chemical Works Manager.
1890. Laycock, Dr. W. F., 2, Park Street, Dewsbury, Analytical Chemist.
1898. Lean, Geo., 15, Park Terrace, Glasgow, Chemist.
1897. Leathart, Thos. H., Bracken Dene, Gateshead-on-Tyne, Lead Manufacturer.
O.M. Leather, Dr. J. W., Dehra Dun, N.W.P., India, Agricultural Chemist, Government of India.
1897. Le Bosquet, Maurice, 328, East Eagle Street, East Boston, Mass., U.S.A., Technical Chemist.
1893. Le Boutillier, Clement, c/o Taylor Iron and Steel Co., High Bridge, N.J., U.S.A., Chemist.
1896. Lecomber, W. G., Moorland Villa, Brooklands, near Manchester, Engineer.
1896. Lederle, Dr. E. J., Health Department, New York City, U.S.A., Chief Chemist.
1892. Ledoff, Prof. A., Technological Institute, Kharkoff, Russia, Professor of Chemistry.
1895. Ledoux, Dr. Albert R., 99, John Street, New York City, U.S.A., Chemist.
1898. Lee, Jno. L., 44, Westby Street, Lytham, Lancashire, Dyer and Bleacher.
1889. Lee, J. W. Richmond, 70, St. Heleus Gardens, North Kensington, W.; and (Journals) Villar, Onis, Prov. de Oviedo, Spain, Mining Engineer.
1885. Lee, S. Wright, 6–10, Whitechapel, Liverpool, Wholesale Druggist.
1891. Lee, Theo. H., (subsn.) Edgcumbe Villa, Clevedon, Somerset; and (Journals) St. John Del Rey Mine, Morro Velho, Villa Nova de Lima, Minas Geraes, Brazil; Analytical Chemist.
1899. Lee, Waldemar, Passaic, N.J., U.S.A., Chemist.
1886. Leeds, F. H., 26, East Bank, Stamford Hill, N., Analytical Chemist.
1889. Leese, Joseph, 3, Lord Street West, Southport.
1884. Leete, Jos., 19—25, Bermondsey Street, S.E., Lithographic Printer.
1901. Leibfried, Jno. E., Bethlehem, Pa., U.S.A., Analytical Chemist.
1888. Leigh, Cecil, Adderley Park Rolling Mills, Birmingham, Technical Chemist.
1894. Leitch, Jno. W., Milnsbridge Chemical Works, near Huddersfield, Aniline Dye Manufacturer.
1898. Leman, Wm. T., c/o Paragon Refinery Co., Toledo, Ohio, U.S.A., Oilworks Manager.
1894. Lenders, A. W. H., c/o Glucose Sugar Refining Co., Davenport, Iowa, U.S.A., Technical Chemist.
1883. Lennard, F., 70, Gracechurch Street, E.C.; and (Journals) Merrow Croft, Merrow, Guildford, Chemical Manufacturer.
1884. Leonard, Wm. J., Hope Chemical Works, Hackney Wick, E., Naphtha Distiller.
1888. Lequin, E., 9, Rue Ste. Cécile, Paris, General Manager of Chemical Works (St. Gobain Co.).
1895. Lesinsky, Dr. Jos., 36, East 61st Street, New York, U.S.A., Manufacturing Chemist.
1894. Leslie, Hugh M., Marikuppam, Mysore State, South India, Chemical Engineer.
1899. Lesser, Wm., P.O. Box 162, Albany, N.Y., U.S.A., Manufacturing Chemist.
1900. Lessner, Chas. B., 331, Ivydale Road, London, S.E., Metallurgical Chemist.
1896. Lester, Isaac E., Lyndhurst, Coundon Road, Coventry, Steelworks Manager.
1892. Lester, J. H., Royal Exchange, Manchester, Analytical Chemist.
1899. Le Sueur, Henry R., Chemical Laboratory, St. Thomas' Hospital, London, S.E., Demonstrator.
1894. Lett, Stephen J., 25, Percy Street, Liverpool, and Journals) Fort Young, N.E Rhodesia, *viâ* Chinde and Kota Kota, Analytical Chemist.
1891. Lever, Jas. D., Thornton Hough, Cheshire, Soap Manufacturer.
1891. Lever, Wm. H., Thornton House, Thornton Hough, Cheshire, Soap Manufacturer.
1900. Levine, Edmund J., c/o The Fiberloid Co., 638, Broadway, New York City, U.S.A., Chemist.
1901. Levinstein, Dr. Herbert, Crumpsall Vale Chemical Works, Crumpsall, Manchester, Chemist.
O.M. Levinstein, Ivan, 21, Minshull Street, Manchester, Colour Manufacturer.
1887. Lewes, Prof. Vivian B., Royal Naval College, Greenwich, S.E. Professor of Chemistry.
1898. Lewin, H. James, Royal Victoria Yard, Deptford, S.E., Assistant Inspector of Stores.
O.M. Lewinton, B.,
1889. Lewis, A. E., 2, Mulgrave Street, Liverpool, Analytical Chemist.
1896. Lewis, Daniel C., c/o Millville Manufacturing Co., Millville, N.J., U.S.A., Dye and Bleach Works Chemist.
1900. Lewis, Ernest A., 310, Dudley Road, Birmingham, Chemist and Metallurgist (Muntz Metal Co.).
1900. Lewis, John, 57, East Dulwich Road, East Dulwich, S.E., Cashier (Paint Works).
1900. Lewis, Saml. J., 122, Newington Causeway, London, S.E., Pharmaceutical Chemist.
1889. Lewkowitsch, Dr. Julius, 71, Priory Road, West Hampstead, N.W., Consulting Chemist.
1901. Lichtenstein, Alf. S., Arnold Printworks, North Adams, Mass., U.S.A., Chemist.
O.M. Lichtenstein, Theodore, Chemical Works, Silvertown, London, E., Manufacturing Chemist.
1892. Liddle, G. A., 313, Walmersley Road, Bury, Lancashire, Chemist, Dyewood Extract Works.
1885. Liddle, W. T., Woodville, Walmersley Road, Bury, Lancashire, Manager, Dyewood Extract Works.
O.M. Liebmann, Dr. A., 61, Marsden Street, Manchester, Analytical Chemist.
1899. Liedbeck, P. F. Alarik, Stockholm, Sweden, Chemical Engineer.
O.M. Lightfoot, T. E., 88, Arden Terrace, Accrington, Calico Printer's Chemist.
1898. Lilly, Josiah K., c/o Eli Lilly and Co., Indianapolis, Ind., U.S.A., Manufacturing Pharmacist.
1885. Lilly, Oliver M., The Croft, Spondon, Derby, Colour Manufacturer.
1897. Lindsay, Robt., Rosshead, Alexandria, N.B., Chemist.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1890. Ling, Arthur R., Laboratory, 2, St. Dunstan's Hill, E.C., and (Journals) 45, Lambton Road, Cottenham Park, Wimbledon, Analytical and Consulting Chemist.

1900. Linton, Jas. H., c/o Tenn. Coal, Iron, and R. R. Co., Ensley, Ala., U.S.A., Chemist.

1896. Lishman, Geo. P., Bunker Hill, Fence Houses, Co. Durham, Colliery Chemist.

1896. Littell, R. Ballantine, 50, South Walnut Street, E. Orange, N.J., U.S.A., Chemist.

1900. Little, Jno. G., 66, Albany Street, London, N.W., Assayer.

1889. Little, Wm. G., Blendon Grove, Bexley, Kent, Chemical Manufacturer.

O.M. Littlejohn, J., Analytical Chemist.

1886. Liversedge, A. J., 41, Elms Road, Clapham Common, S.W., Mechanical Engineer.

O.M. Liversidge, Prof. A., F.R.S., The University, Sydney, New South Wales, Professor of Chemistry.

1883. Livingston, W. J., London County Council, Spring Gardens, London, S.W., Analytical Chemist.

1899. Lloyd, Charles, 77, Bishopsgate Street Within, E.C., and (Journals) c/o Manager, Lake View Consols, Ltd., Boulder, Western Australia, Secretary.

1900. Lloyd, Fred. J., Muscovy House, Trinity Square, London, E.C., Analyst.

1900. Lloyd, Thos. H., 121, Kingsley Road, Prince's Park, Liverpool, Analyst.

1899. Lockwood, Alfred A., 48, East Street, Faversham, Kent, Metallurgist.

1899. Loder, Francis H., 9, St. John's Park, Blackheath, S.E., Director.

1884. Lodge, A. S., Newchurch, near Manchester, Technical Chemist.

1888. Lodge, Edw., 25, Cowcliffe Hill, Huddersfield, Teacher of Wool Dyeing.

1900. Loeb, Dr. Morris, New York University, University Heights, New York City, U.S.A., Professor of Chemistry.

1901. Loebell, Eugene, jun., 130, Dickenson Road, Rusholme, Manchester, Brewers' Chemist.

1891. Loewenthal, Dr. R., Sandweg 22, Frankfurt a/M., Germany, Textile Chemist and Lecturer on Dyeing.

1899. Logan, John, Moatfield House, Timperley, Cheshire, Indigo-Blue Dyer.

O.M. Lomas, T., 10, Selborne Place, Minehead, Taunton, R.S.O., Chemical Manufacturer.

1888. Lombard, Emile, 12, Rue Breteuil, Marseilles, France, Director of Pyrites Co.

1898. Longstaff, Jas. P., Chemical Department, University New Buildings, Edinburgh, Assistant.

1899. Loos, Hermann A., c/o Copper Corporation of Chile, Chañaral, Chile, Chemist.

1890. Lord, F. J., 4, Winmarleigh Street, Warrington Analytical Chemist.

1896. Lord, Jno. Lloyd, 5, Commercial Buildings, Love Clough, near Rawtenstall, Chemist and Manager.

1897. Lord, N. W., 338, West 8th Avenue, Columbus, Ohio, U.S.A., Professor of Metallurgy.

O.M. Lorenz, H., 7 and 8, Idol Lane, London, E.C., Chemical Merchant.

O.M. Lorimer, J., Britannia Row, Islington, N., Manufacturing Chemist.

O.M. Lorrain, J. G., Norfolk House, Norfolk Street, Strand, London, W.C., Civil Engineer.

O.M. Lott, F. E., The Laboratory, Bridge Chambers, Burton-on-Trent, Consulting Brewing Chemist.

1893. Loughton, J. P., Washington Chemical Works, co. Durham, Technical Chemist.

O.M. Louis, D. A., 77, Shirland Gardens, London, W., Metallurgist and Mining Engineer.

1894. Louis, Prof. Henry, Durham College of Science, Newcastle-on-Tyne, Professor of Mining.

O.M. Love, Dr. E. G., 80, East 55th Street, New York, U.S.A., Analytical Chemist.

1899. Love, Wm., 28, Royal Exchange Square, Glasgow, Managing Director (Broxburn Oil Co., Ltd.).

1895. Lovejoy, Frank W., Kodak Park, Rochester, N.Y., U.S.A., Chemical Engineer.

O.M. Lovibond, J. W., Lake House, Salisbury, Tintometer Manufacturer.

O.M. Lovibond, T. W., West Jesmond House, Newcastle-on-Tyne, Brewer.

1897. Low, Albert H., P.O. Drawer 1537, Denver, Colo., U.S.A., Metallurgical Chemist.

1900. Low, Prof. Wilson H., Cudahy Packing Co., South Omaha, Neb., U.S.A., Chemist.

1887. Lowe, C. W., Summerfield House, Reddish, near Stockport, Manufacturing Chemist.

1900. Lowe, Herbert G., c/o Falulah Paper Co., Fitchburg, Mass., U.S.A., Paper Manufacturer.

1892. Lowe, Jas. S., c/o T. & W. A. McLaren, 29, Queen Street, Edinburgh, Sugar Planter.

O.M. Lowe, W. F., 9, Hough Green, Chester, Analytical Chemst.

1885. Lowson, J. G. F., Hollycot, Lasswade, N.B., Paper Maker.

1895. Lucas, Alf., Survey Department, Public Works Ministry, Cairo, Egypt, Analyst.

1892 Lucas, Bernard R., 3, Dyar Terrace, Winnington, Northwich, Alkali Works Manager.

O.M. Lucas, R., Alwinenstrasse 11, Wiesbaden, Germany, Technical Chemist.

O.M. Luck, A., Home Farm, Rusthall, Tunbridge Wells, Explosives Chemist.

O.M. Luck, E., 68, Sumner Street, Southwark, S.E., Manufacturing Chemist.

1900. Lummus, Walter E., 62, Newhall Street, Lynn, Mass., U.S.A., Manager (Commonwealth Manufacturing Co.).

1888. Lund, Jas., 142, Hawthorne Street, Malden, Mass., U.S.A., Ammonia Works Manager.

1888. Lundholm, Carl O., Ardeer Factory, Stevenston, Ayrshire, Explosives Works Manager.

1898. Lundteigen, Andreas, Union City, Mich., U.S.A., Chemist.

O.M. Lunge, Dr. G., Englisches Viertel, Hottingen, Zürich, Switzerland, Professor of Chemistry.

1894. Lungwitz, Dr. Emil E., 14, Belvedere Street, Brooklyn, N.Y., U.S.A., Chemist.

1894. Lungwitz, Theo., c/o Chas. Pfizer and Co., 81, Maiden Lane, New York, U.S.A., Superintending Chemist.

1885. Lupton, Sydney A., 102, Park Street, Grosvenor Square, London, W.

1899. Lustig, Alf. L., Lexington Printworks, Canton, Mass., U.S.A., Printworks Superintendent.

1890. Luthy, Edmund O., P.O. Box 232, Cincinnati, Ohio, U.S.A., Distiller.

1884. Lüthy, Otto, 2336, Fairmount Avenue, Philadelphia, Pa., U.S.A., Analytical Chemist.

1895. Luxmoore, Dr. Chas. M., University Extension College, Reading, Lecturer on Chemistry.

1899. Luxton, Thos., 4, Cavendish Square, Margaret Street, Hull, Teacher of Chemistry.

1885. Lye, W. T., Leagrave Hall, near Luton, Beds, Straw Dyer.

1884. Lyle, James, Plaistow Wharf, North Woolwich Road, London, E., Sugar Refiner.

1885. Lyle, Jno., 21, Mincing Lane, London, E.C., Sugar Refiner.

1889. Lymn, Arthur H., 1, Manor Crescent, East Molesey, Chemical Works Manager.

1899. Lynn, R. Rankine, 7, Highburgh Terrace, Dowanhill, Glasgow, and (Journals) Plattenstrasse 19, Zurich, Switzerland, Chemical Engineer.

1899. Lynn, Vaughan G., c/o Messrs. Best and Co., Madras, India, Merchant.

1898. Lynne, Miss Daisie, c/o American Reduction Co., 1514, Second Avenue, Pittsburg, Pa., U.S.A., Chemist.

1898. Lyon, C. W., 244, West Somerset Street, Philadelphia, Pa., U.S.A., Oil Chemist and Manufacturer.

O.M. Lyon, J. G., The Aire Tar Works, Knottingley, Yorks, Tar Distiller.

O.M. Lyte, F. Maxwell, 60, Finborough Road, Redcliffe Square, London, S.W., Chemical Manufacturer.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

O.M. Lytle, A. M., 34, Victoria Street, Belfast, Ireland, Chemical Manufacturer.

M

1898. Maass, Frank, P.O. Box 507, Paterson, N.J., U.S.A., Silk Dyer.
1887. Mabery, Prof. Chas. F., Case School of Applied Science, Cleveland, Ohio, U.S.A., Professor of Chemistry.
1894. Mabey, Fred O., 196, Amhurst Road, Hackney, N.E., Wine Merchant.
1891. Macadam, Herbert E., Milton House, Selsdon Road, Wanstead, E., Manure Works Manager.
O.M. Macadam, Prof. W. Ivison, Surgeons' Hall, Edinburgh, Professor of Chemistry and Consulting Chemist.
1894. Macadam, Stevenson, jun., Surgeons' Hall, Edinburgh, Analytical Chemist.
O.M. McAlister, R., Lawes' Chemical Manure Co., Limited, Barking Creek, Essex, Manure Works Manager.
1894. McAlley, Robt., Bankside, Falkirk, N.B., Paint Works Manager.
1891. Macallan, J., 3, Charlemont Terrace, Clontarf, Dublin, Analytical Chemist.
1892. Macara, Thos., jun., 6, West Bank Terrace, Hillhead, Glasgow, Chemical Student.
1889. McArthur, Jno., 196, Trinity Road, Wandsworth Common, S.W., Chemist.
1887. McArthur, J. B., Price's Patent Candle Co., Limited, Bromborough Pool, near Birkenhead, Oil Works Chemist.
1886. Macarthur, J. G., 98, Dobbie's Loan, Glasgow, Lubricant Manufacturer.
O.M. McArthur, J. S., 45, Renfield Street, Glasgow, Consulting Chemist and Metallurgist.
1892. McArthur, Thos., 7, Temple, Dale Street, Liverpool, Drysalter and Dyewood Extractor.
1892. McBretney, E. G., Pontefract Road, Castleford, Yorks, Glass Works Chemist.
1898. MacCallum, D. A., 10, Midlothian Drive, Shawland, Glasgow, Chemist.
O.M. McCallum, J. M., South Park, Paisley, N.B., Soap Manufacturer.
O.M. McCalman, D., 18, Harbour Street, Irvine, N.B., Technical Chemist.
1894. McCann, Owen, 80, Studley Road, Forest Gate, Essex, Printing Ink Manufacturer.
1893. McCombie, C., 19, St. Dunstan's Hill, London, E.C., Drug and Chemical Merchant.
O.M. McCowan, W., 6, Marlborough Mansions, West Hampstead, N.W., Brewer.
1897. McCrae, Dr. John, jun., Yorkshire College, Leeds, Chemical Demonstrator.
1898. McCreath, W. D., West Cornwall Creamery, Lelant, R.S.O., Cornwall, Analytical Chemist.
1884. McCulloch, J., Oakleigh, Rose Street, Garnet Hill, Glasgow, Chemical Works Manager.
1900. McCulloch, John, Glencoe, Lostock Gralam, Cheshire, Chemical Engineer.
O.M. McDaniel, J. J., Bandon, Ireland, Distiller.
O.M. Macdonald, A., 72, Great Clyde Street, Glasgow.
1897. MacDonald, G. W., c/o Curtis and Harvey, Ltd., Dartford, Kent, Explosives Chemist.
1894. McDonald, John, Distillery Offices, Fort William, N.B., Distiller.
O.M. Macdonald, J. W., c/o Messrs. H. Tate & Sons, Love Lane, Liverpool, Analytical Chemist.
1899. MacDonald, S. Fremont, c/o Ashtabula Hide and Leather Co., Ashtabula, Ohio, U.S.A., Tanner.
O.M. McDonald, T. M., Walilabo Estate, St. Vincent, West Indies, Sugar Chemist.
1888. McDougall, Arthur, Fallowfield House, Fallowfield, Manchester, Chemical Manufacturer.
1899. McDougall, Hugh, Mount Pleasant, Uddingston, N.B., Chemical Engineer.
1895. McDougall, Isaac, jun., High Bank, Didsbury, Manchester, Student.
1895. McDougall, Isaac S., High Bank, Didsbury, Manchester, Manufacturing Chemist.
1890. McDougall, J. T., Dunolly, Morden Road, Blackheath, S.E., Manufacturing Chemist.
1889. MacEwan, Peter, 37, Hornsey Lane Gardens, Highgate, N., Editor of "Chemist and Druggist."
1891. McEwen, Atholl F., 43, Gilmore Road, Lewisham, S.E., Analytical Chemist and Assayer.
O.M. Macfarlane, J. A., Metallurgical Chemist.
O.M. Macfarlane, R. F., Tharsis Copper Works, East Moors, Cardiff, Technical Chemist.
1884. Macfarlane, Thos., Inland Revenue Dept., Ottawa, Canada, Analyst to Dominion of Canada.
1803. Macfarlane, Walter, Kelvin, Hollies Drive, Wednesbury, Chemist and Metallurgist.
1894. McFarlane, Dr. Walter D., c/o Canada Paper Co., Windsor Mill, P.Q., Canada, Paper Manufacturer.
1890. McFarlane, W. W., 522, West 9th Street, Chester, Pa., U.S.A., Dyeworks Manager.
1900. McFie, Robt. A., The Nickel Co., Kirkintilloch, N.B., Chemist.
1893. McGhie, T. Burns, c/o Quirk, Barton, and Co., Normandy Wharf, Rotherhithe, S.E., Analytical Chemist and Assayer.
1891. McGill, Dr. J. T., Vanderbilt University, Nashville, Tenn., U.S.A., Adjunct Professor of Chemistry.
1899. MacGillivray, Wm. A., c/o Swansea Safety Fuse Co., Pipe House Wharf, Swansea, Analytical Chemist.
1887. McGlashan, John, Cawnpore Sugar Works, Cawnpore, India, Technical Chemist.
1884. McGowan, John, Ash House, Talke, near Stoke-upon-Trent, Colliery Manager.
1896. McIlhiney, Dr. Parker C., 145, East 23rd Street, New York City, U.S.A., Chemist.
1894. McIlwaine, Alf. W., Stoneferry, Hull, Oil Manufacturer.
O.M. MacIndoe, G. D., Belfast, Christchurch, New Zealand, Chemical Works Manager.
1900. Mackay, Philip A., Mineral Point Zinc Co., Mineral Point, Wis., U.S.A., Superintendent of Acid Department.
1888. MacKean, Wm., Incandescent Gas Light Co., Ltd., 14, Palmer Street, Westminster, S.W., Technical Chemist.
O.M. McKechnie, D., Eccleston Grange, Prescot, Lancashire, Copper Extractor.
O.M. McKechnie, D. M., 196, Lodge Lane, Liverpool, Copper Extractor.
1898. McKechnie, Robt., 56, Mosley Street, Manchester, Calico Printer.
1887. McKellar, W. G., c/o United Alkali Co., Ld., Eglinton Works, Irvine, N.B., Technical Chemist.
1895. McKenna, Dr. Chas. F., 221, Pearl Street, New York City, U.S.A., Chemist.
1899. Mackensie, Alex. H., 12, Hale Street, North Adams, Mass., U.S.A., Colour Mixer.
1891. Mackenzie, Dr. G. S., Sydney Smelting Works, Woolwich, N.S.W., Metallurgical Chemist.
1900. Mackenzie, John K., 1104, Rookery Building, Chicago, Ills., U.S.A., Mining Engineer.
1885. Mackenzie, T. E., 6, Cardonald Park Terrace, Cardonald, Renfrewshire, N.B., Technical Chemist.
1898. McKenzie, Thos., Dailuaine House, Carron, Morayshire, Distiller.
1884. Mackenzie, Dr. W. Cossar, Tewfikieh College of Agriculture, Ghizeh, Egypt, Analytical Chemist.
1893. McKerrow, C. A., 8, Exchange Street, Manchester, Analytical and Consulting Chemist.
1893. McKesson, John, 91, Fulton Street, New York City, U.S.A., Manufacturing Chemist.
1891. Mackey, W. McD., Victoria Chambers, Leeds, Analytical Chemist.
1898. McKillop, Fred. W., c/o Jos. Townsend, Ltd., Port Dundas, Glasgow, Chemical Works Manager.
1900. McKillop, George F., Broxburn Oilworks, Broxburn, N.B., Works Chemist.
1890. McKillop, Jno., 10, Adelphi Terrace, London, W.C., Metallurgist.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1884. McKinlay, R. W., Ameliaville, Aytoun Road, Pollokshields, N.B., Metal Merchant.
1898. McLaurin, Robt., Cassel Gold Extracting Co., Ruchill Road, Maryhill, Glasgow, Chemist.
1888. MacLean, Alex. S., 31, Bank Street, Greenock, N.B., Soap Refiner.
O.M. McLellan, J. Y., 21, Onslow Square, Dennistoun, Glasgow, Chemical Manufacturer.
1892. McLeod, Jas., Westhill, Cardross Road, Dumbarton, N.B., Analytical Chemist and Gas Examiner.
1896. McMaster, Daniel, McMurray's Royal Paper Works, Wandsworth, S.W., Paper Mill Manager.
1894. Macmillan, Arch., 12, Hastings Street, Sunderland.
O.M. McMillan, W. G., 8, Leigham Court Road, Streatham, S.W., Metallurgical Chemist.
1889 McMurtrie, J. M., 21, Princes Street, Pollokshields, Glasgow, Brass Founder.
1900. McMurtrie, Wm. T., 101, West 81st Street, New York, U.S.A., President of American Chemical Society.
1895. McMurtry, G. C., Copper Smelting Works, Lithgow, N.S.W., Australia, Metallurgist.
1884. Macnab, C., Lillyburn, Milton of Campsie, N.B., Calico Printer.
O.M. Macnab, W., Edinburgh Lodge, Howick Place, Victoria Street, S.W., Analytical Chemist.
O.M. Mactear, J., 28, Victoria Street, Westminster, S.W., Chemical Engineer.
1892. McVie, Jas. P., *Ravenscraig, Canning Street*, Hebburn-on-Tyne, Analytical Chemist.
1894. McVitie, Robt., 12, Greenhill Gardens, Edinburgh, Biscuit Manufacturer.
1901. Maertens, Emile, P.O. Box 1002, Providence, R.I., U.S.A., Engineer.
1895. Magnus, Isidor, 52, Leadenhall Street, London, E.C., Chemical Merchant.
1885. Mahon, R. W., 1778, Second Avenue, Pittsburg, Pa., U.S.A., Analytical Chemist.
1898. Main, Wm., 299, Jefferson Avenue, Brooklyn, N.Y., U.S.A., Chemical Expert.
O.M. Major, J. Lewis, Sculcoates, Hull, Tar Distiller and Chemical Manufacturer.
1886. Mallinckrodt, Edw., Mallinckrodt Chemical Works, St. Louis, Missouri, U.S.A., Manufacturing Chemist.
1897. Mallory, J. Halsey, 409, Fitten Building, Atlanta, Ga., U.S.A., Assistant Chemist (The American Cotton Oil Co.).
1896. Mann, E. A., Government Chemical Laboratory, Fremantle, Western Australia, Government Inspector of Explosives.
1893. Mann, Harold H., Indian Tea Association, Royal Exchange Buildings, Calcutta, India. Research Chemist.
1899. Mann, Jas. S., 521, Barking Road, Plaistow, Essex, Analyst.
1891. Mann, John C., c/o Major and Co., Ltd., Sculcoates, Hull, Chemist.
1900. Manna, Haridas, 4, Gulu Ostagur's Lane, Calcutta, India, Chemist and Doctor.
O.M. Mannington, H. T., Marshlea, Beaconsfield Road, Farnworth, Widnes.
1896. Manoukian, Wahan, Königsplatz 3A I, Breslau, Germany, Analytical Chemist.
1892. Mansbridge, Wm., Colgate, near Horsham, Sussex, Chemist.
1893. Marchlewski, Dr. L., Strzelecka, 9, Krakau, Austria.
1899. Margetson, J. Charles, Struan, Wexford Road, Wandsworth, S.W., India-Rubber Manufacturer.
1883. Markel, Dr. K., Lodge Lane, Bewsey, Warrington, Technical Chemist.
1886. Markham, A. D., 71, Queen Street, Hull, Pharmaceutical Chemist.
1901. Marsden, Dr. Fred, 4, Swinton Grove, Manchester, S.E., Chemist.
O.M. Marsh, J. T., Ammonia Soda Works, Fleetwood, Lancashire, Chemist.
1883. Marsh, W., Union Alkali Co., Soho Works, Manchester, Chemical Manufacturer.
1895. Marshall, Arthur, c/o Mrs. Griffiths, Farm Hill, Waltham Abbey, Essex, Chemist.
1891. Marshall, Dr. Hugh, Chemistry Department, The University, Edinburgh, Professor of Chemistry.
1895. Marshall, Frank G., 4, Woodhouse Terrace, Bewick Road, Gateshead, Technical Chemist.
1894. Marshall, Jas., St. Blane's, Paisley, N.B., Chemical Student.
1896. Marshall, Percy S., Union Laboratory, Half Moon Street, Huddersfield, Assistant Chemist.
1887. Marshall, Dr. T. Rymer, c/o Stockham and Dawley, Clayoquot, Vancouver Island, Chemist.
1883. Marshall, Wm., 149, Drake Street, Rochdale, Dyer.
1884. Marshall, Wm., 35, Streathbourne Road, Balham, S.W., Analytical Chemist.
1894. Martin, Alex. M., Douglas Villa, Coatbridge, N.B., and (Journals), Twechar Office, Kilsyth, N.B., Analytical Chemist.
1895. Martin, Chas. H., 14, Aldred Street, Crescent, Salford, Oil and Soap Works Assistant Manager.
1885. Martin, H., 67, High Street, Wellington, Somerset, Manure Works Manager.
O.M. Martin, N. H., Ravenswood, Low Fell, Gateshead-on-Tyne, Manufacturing Chemist.
1894. Martin, T. Tremills, 45, Stapleton Hall Road, Stroud Green, N., Analytical Chemist.
1899. Martin, Wm. E., c/o Kynoch Ltd., Arklow, Co. Wicklow, Ireland, Chemist.
O.M. Martin, W. H., 183B, King's Road, Chelsea, London, S.W., Analytical Chemist.
1892. Martindale, Wm., 19, Devonshire Street, Portland Place, W., Pharmaceutical Chemist.
1887. Martineau, Sydney, Northwood, Rydal Road, Streatham, S.W., Sugar Chemist.
1894. Martyn, T. Graham, 11, Stratton Terrace, Truro, Cornwall, Metallurgist.
O.M. Mason, J., Eynsham Hall, Witney, Oxon, Director of Pyrites Co.
1887. Mason, J. Francis, Eynsham Hall, Witney, Oxon.
1892. Mason, Thos., Hyson Green Works, Nottingham, Manufacturing Chemist.
1884. Mason, W. B., 117, Derby Street, Bolton-le-Moors, Pharmaceutical Chemist.
O.M. Masson, Prof. D. Orme, University of Melbourne, Victoria, Australia, Professor of Chemistry.
1889. Master, Ardesheer B., 679, Tardeo, Bombay, India, Chemical Manufacturer.
1893. Mather, Colin, Salford Iron Works, Manchester, Engineer.
O.M. Mather, J., Blaydon Chemical Works, Blaydon-on-Tyne, Manager.
1900. Mather, Wm., c/o British Aluminium Co., Ltd., Larne Harbour, co. Antrim, Ireland, Chemist.
1896. Mather, Wm., M.P., Salford Ironworks, Salford, Manchester, Chemical and Mechanical Engineer.
1890. Matheson, W. J., 182–184, Front Street, New York, U.S.A., Chemical Merchant.
1900. Mathews, Dr. J. A., 4, First Place, Brooklyn, N.Y., U.S.A., Chemist.
1898. Mathewson, E. P., c/o Guggenheim's Sons, Antofagasta, Chile, U.S.A., Metallurgist.
1888. Mátos, Louis J., 99, North 19th Street, East Orange, N.J., U.S.A., Chemist.
1896. Matsui, G., c/o Japan Sugar Refinery Co., Onagigawa, Tokio, Japan, Chemical Engineer.
O.M. Matthews, C. G., 31, Stapenhill Road, Burton-on-Trent, Brewing Chemist.
1896. Matthews, Donald J., 165, Ebury Street, London, S.W., Chemist.
1899. Matthews, Dr. J. Merritt, 634, Spruce Street, Philadelphia, Pa., U.S.A., Professor of Chemistry and Dyeing (Philadelphia Textile School).
1889. Mawdsley, W. H., c/o Gold Mining Co., Ltd., Mount Morgan, Queensland, Chemist.
1894. Maxwell, Jno., Solway Chemical Works, Silloth, Cumberland, Chemical Manure Manufacturer.
1897. May, George H., Hohokus P.O., Bergen Co., N.J., U.S.A., Assistant Chemist (American Pegamoid Co.).

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1884. Mayenfeld, Dr. E. von Salis. See under "Salis."
1896. Mayfield, A. S., Avenue House, Beverley Road, Hull, Analyst.
1892. Mayfield, H. B., Normanhurst, Mundy Street, Heanor, near Nottingham, Dyer.
1885. Mayhew, E. W. A., High Street, Freemantle, Western Australia, Manufacturing Chemist.
1900. Maywald, F. J., 1028, 72nd Street, Brooklyn, N.Y., U.S.A., Technical Chemist.
1892. Meacham, Chas. S., c/o Ohlsson's Cape Breweries, Ltd., Cape Town, South Africa, Brewer.
1898. Meeds, Alonzo D., 103, Boston Block, Minneapolis, Minn., U.S.A., City Gas Inspector and Chemist.
1896. Meggitt, Loxley, Laboratory, Sutton-in-Ashfield, Notts, Analytical Chemist.
1888. Meikle, Jno., 8, Melrose Street, Great Western Road, Glasgow, Journalist.
O.M. Meldola, Prof. R., F.R.S., 6, Brunswick Square, London, W.C., Professor of Chemistry.
1891. Meldrum, Jas. Jones, Atlantic Works, City Road, Manchester, Manufacturing Engineer.
1891. Mellen, E. D., 1590, Massachusetts Avenue, Cambridge, Mass., U.S.A., Treasurer (Curtis, Davis, and Co.)
O.M. Mellon, W. W., 16, Sandymount Road, Dublin, Ireland, Manufacturing Chemist.
O.M. Mellor, S., Magnesium Metal Co., Patricroft, Manchester, Metal Refiner.
1899. Mellors, Paul, Locksley House, Sherwood Rise, Nottingham, Mine Manager.
1884. Melville, D., P.O. Box No. 1, Woodmere, Wayne Co., Mich., U.S.A., Chemical Works Manager.
1900. Mende, Alex. P., 536, West 14th Street, New York City, U.S.A., Manufacturing Chemist.
1893. Mensching, Dr. C., Crumpsall Vale Works, Blackley, near Manchester, Chemist.
O.M. Menzies, R. C., Inveresk Mills, Musselburgh, N.B., Paper Maker.
1892. Mercer, C. A., 22, Streathbourne Road, Upper Tooting, S.W., Chemical Apparatus Maker.
1886. Mercer, J. B., 330, Lower Broughton Road, Manchester.
O.M. Mercer, F. M., 34, Camomile Street, London, E.C., Manufacturing Chemist.
1890. Merck, E., Darmstadt, Germany, Manufacturing Chemist.
1896. Merck, Geo., cor. of University and Clinton Places, New York City, U.S.A., Chemical Manufacturer.
1887. Merrell, Geo., Lock Box 786, Cincinnati, Ohio, U.S.A., Manufacturing Chemist.
1899. Merrill, Frank H., Los Angeles Soap Co., Los Angeles, Cal., U.S.A., Factory Superintendent.
1897. Meslans, Prof. M., 59, Quai de la Baronnie, Ablon (Seine et Oise) France, Professor of Chemistry.
O.M. Messel, Dr. R., 30, Ebury Street, S.W., Chemical Manufacturer.
1899. Metcalf, Howard F., Farr Alpaca Co., Holyoke, Mass., U.S.A.
1886. Metcalf, Jno., Moorfield, Altham, near Accrington, Tar Distiller.
1885. Metcalf, Wm., Aspin House, Oswaldtwistle, near Accrington, Tar Distiller.
1898. Metz, Herman A., P.O. Box 2178, New York, U.S.A. (Victor Koechl and Co., Dyestuffs and Chemicals).
1900. Mewborne, Robt. G., c/o Kentucky Tobacco Product Co., Louisville, Ky., U.S.A., Chemist.
1883. Mewburn, J. C., 55 and 56, Chancery Lane, London, W.C., Patent Agent.
1898. Meyer, Dr. Franz, c/o Actien Gesellschaft für Zinkindustrie vorm. W. Grills, Hamborn a/Rhein, Germany, Chemist and Manager.
1900. Meyer, Karl, 15, Fredericiagade, Kopenhagen K., Denmark, Chemist.
1896. Miles, G. Wellington, 29, Central Street, Boston, Mass., U.S.A., Analytical Chemist.
1889. Milestone, W. C., Garratt Lane, Wandsworth, S.W., Chemical Works Manager.
1900. Miller, Hampton K., Lake City, Fla., U.S.A., Chemist (Florida A. & M. College).
1899. Millar, Jas. H., c/o P. J. Petersen and Co., P.O. Box 38, Cape Town, South Africa, Laboratory Manager.
1897. Millard, Edgar J., 40–42, Charlotte Street, London, E.C., Chemist and Manager.
1883. Miller, Dr. A. K., Kilvert's Buildings, Withy Grove, Manchester, Analytical Chemist.
1884. Miller, A. Russell, Cambuslang, near Glasgow, Printworks, Chemist.
1899. Miller, Chas. E., 6, Gibson Street, Hillhead, Glasgow, Chemist.
O.M. Miller, E. V., c/o New Zealand Sugar Co., Auckland, New Zealand, Sugar Works Chemist.
1889. Miller, Geo., Wood Lane, Halewood, near Liverpool, Technical Chemist.
1897. Miller, Dr. Edmund H., School of Mines, Columbia University, New York, U.S.A., Chemist.
1893. Miller, Dr. Harry E., 1015, Chestnut Street, Oakland, Cal., U.S.A., Analytical Chemist.
1883. Miller, Dr. H. von, Beatrixgasse 32, Wien III., Austria, Chemical Manufacturer.
1894. Miller, Dr. John A., 40–45, Lewis Block, Buffalo, N.Y., U.S.A., Consulting Chemist, State Analyst.
1897. Miller, Jas., Minas de Sao Bento, Santa Barbara de Matto Dentro, Minas Geraes, Brazil, Metallurgical Chemist.
1894. Miller, J. Carlile, 89, Rumford Street, Bridgeton, Glasgow, Manufacturing Chemist.
1888. Miller, J. Hopkins, 5, Catherine Street, Parliamentary Road, Glasgow, Dyeworks Chemist.
1889. Miller, Jno. Poynter, Sandilands Chemical Works, Aberdeen, Technical Chemist.
1884. Miller, Dr. N. H. J., Harpenden, near St. Albans, Agricultural Chemist.
1899. Miller, P. Schuyler, Mount Prospect Laboratory, Flatbush Avenue, Brooklyn, N.Y., U.S.A., Chemist.
1884. Miller, T. Paterson, The Cairns, Cambuslang, near Glasgow, Dyer and Printer.
1884. Miller, W. M., Caledonia Estate, Prov. Wellesley, Penang, S.S., Sugar Chemist.
1894. Mills, Chas., 188, Bedford Hill Road, Tooting Common, S.W., Chemist to Colour Works.
O.M. Mills, Prof. E. J., F.R.S., 60, John Street, Glasgow, Professor of Chemistry.
O.M. Mi"ner, E., Hartford Manor, Northwich, Alkali Manufacturer.
1887. Milnes, Edmund, Seedfield, Bury, Lancashire, Dyeing Extract Maker.
1895. Miner, Harlan S., c/o Welsbach Light Co., Gloucester City, N.J., U.S.A., Technical Chemist.
1889. Miniati, T., Penketh, near Warrington, Chemist.
1896. Misell, D., 65, 66, Basinghall Street, E.C., Commercial Traveller.
1895. Mitchell, Chas. A., c/o Beaufoy and Co., South Lambeth Road, S.W., Analyst.
1898. Mitchell, G. D. H., c/o S. S., White Dental Manufacturing Co., Prince's Bay, Staten Island, N.Y., U.S.A., Chemist.
1883. Mitchell, J. W., Wood Leigh, Clough Fold, near Manchester, Waste Bleacher.
O.M. Mitting, E. K., 43, Highfield South, Rock Ferry, Cheshire, Technical Chemist.
1900. Mixner, Albert F., c/o Homeward Bound G. M. Co., Yalwal, viâ Nowra, N.S.W., Australia, Metallurgist.
1895. Moale, Dr. Philip R., 100, Merrimon Avenue, Asheville, N.C., U.S.A., Analytical Chemist.
O.M. Mohr, Dr. B., 69A, Parliament Hill, Hampstead, N.W., Consulting Chemist and Metallurgist.
1894. Mole, Herbert B., Ivy Cottage, Shepton Mallet, Somerset, Brewer.
1891. Molineux, Roland, 6–8, Jersey Street, Newark, N.J., U.S.A., Colour Work Chemist and Manager.
1899. Mommers, Rich., Glucose Sugar Refining Co., Marshalltown, Pa., U.S.A., Chemist.
O.M. Mond, Dr., L., F.R.S., 20, Avenue Road, Regent's Park, N.W.; and 64, Via Sistina, Rome, Alkali Manufacturer.
1891. Mond, Robt. L., Winnington Hall, Northwich, Chemist.

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1890. Moodie, W. E., Croftingea Works, Alexandria, N.B., Analytical Chemist.
1898. Moody, Herbert R., 159, West 105th Street, New York City, U.S.A., Science Instructor.
1884. Mook, Chas., 2, Kapellenstrasse, Eisenach, Germany, Alkali Works Director.
1883. Mooney, M., 118, Pembroke Road, Dublin, Chemical Manufacturer.
1898. Moore, Byron L., c/o N. W. Fertilising Co., 45th and Center Avenue, Chicago, Ill., U.S.A., Chemist.
1887. Moore, Chas. C., 11, Old Hall Street, Liverpool, Chemist.
1892. Moore, Dr. Geo. D., 201, Salisbury Street, Worcester, Mass., U.S.A., Professor of Chemistry.
1899. Moore, Landon C., 85, Perkins Hall, Harvard University, Cambridge, Mass., U.S.A., Secretary.
1899. Moore, Quintin, jun., Dalmarnock Chemical Works, 89, Rumford Street, Glasgow, Works Manager.
1899. Moore, Russell, W., 47, Linden Place, Orange, N.J., U.S.A., Chemist (U.S. Appraiser's Office).
1885. Moore, R. T., 156, St. Vincent Street, Glasgow, Mining Engineer.
1890. Moore, Thos., Laboratoire du Service Local, Noumea, New Caledonia, Analytical Chemist.
1891. Moore, Wm. F., Lonsdale, Temple Road, Upper Rathmines, Dublin, Wholesale Druggist.
1890. Mordle, F. Dare, 38, The Ropewalk, Nottingham, Starch Manufacturer.
1892. Morgan, Albert J., 439, West Street, New York City, U.S.A., Soap Manufacturer.
1890. Morgan, J. Jas., Rooth Street, Wood Green, Wednesbury, Assayer.
1898. Morgan, Thos. M., Longue Pointe, Hochelaga Co., Canada, Manufacturer.
1885. Morgans, Thos., 60, Queen Square, Bristol, Civil Engineer.
1897. Morison, Samuel L., 26, Cortlandt Street, New York, U.S.A., Water Engineer.
O.M. Moritz, Dr. E. R., 45, Great Tower Street, London, E.C., Brewing Chemist.
1885. Morley, Dr. H. Forster, 5, Lyndhurst Road, Hampstead, N.W., Professor of Chemistry.
1884. Morrice, Jas. A., 1, Prince's Terrace, Dowanhill, Glasgow, Starch and Gum Manufacturer.
1898. Morris, Edgar F., Grey House, Barrington Road, Altrincham, Cheshire, Research Chemist.
O.M. Morris, Dr. G. Harris, 45, Great Tower Street, London, E.C. (Journals), 18, Gwendyr Road, West Kensington, W., Brewing Chemist.
1897. Morris, Harry, Avenue House, Doncaster, Chemical Merchant.
1890. Morris, Herbert N., Gorton Brook Chemical Works, Manchester, Technical Chemist.
O.M. Morris, J. Haydn, 9, Rathbone Road, Wavertree, Liverpool, Technical Chemist.
1890. Morrison, Geo. R., c/o E. Ryan & Co., Ltd., Pope's Quay, Cork, Analytical Chemist.
O.M. Morton, T., 124, Southampton Row, Russell Square, London, W.C., Manufacturing Chemist.
1899. Morton, Dr. Hy., Stevens Institute of Technology, Hoboken, N.J., U.S.A., President.
1889. Morton, Jas., Dalquhurn Works, Renton, N.B., Dyeworks Manager.
1897. Morton, Jno., 50, North Road, St. Helens, Lancashire, Analytical Chemist.
1899. Morton, Thos. W., Kew College, Kew, Surrey, Headmaster.
1888. Mosenthal, Henry de, 220, Winchester House, Old Broad Street, E.C., Explosives Company Manager.
O.M. Moss, J., Wilson Street, New Cross Road, London, S.E., Manufacturing Chemist.
1894. Moszczenski, J. von, Tartar Chemical Co., Ninth Street and Gowanus Avenue, Brooklyn, N.Y., U.S.A., Consulting Chemist.
1897. Motion, Jno., c/o Jno. Ellis & Co., Edgewater, N.J., U.S.A., Oil Refinery Chemist.
1887. Moul, Frank, Aldersgate Chemical Works, Southall, Technical Chemist.
1884. Moult, J., Underhill, Low Fell, Gateshead-on-Tyne, Secretary.
1890. Moulton, G. J., Rulow, Macclesfield, Chemical Manufacturer.
1898. Moulton, Prof. Chas. W., Vassar College, Poughkeepsie, N.Y., U.S.A., Professor of Chemistry.
1892. Mount, Edw., Oaklands, Aughton, near Ormskirk, Assistant Secretary (United Alkali Company).
O.M. Muir, J. P., 233, Camden Road, London, N., Chemist.
1890. Muir, Jas. Stanley, Rota Anna Mines, Ltd., Kapnikbanya, Hungary, Chemist.
1896. Muir, Wm., 97, Church Street, Edmonton, Middlesex, Merchant.
1894. Muir-Smith, W., c/o A. B. Fleming & Co., Ltd., Caroline Park, Edinburgh, Oil Works Manager.
O.M. Müller, Dr. H., F.R.S., 13, Park Square East, Regent's Park, London, N.W., Research Chemist.
1896. Mundy, Lionel, 27, Merton Road, Kensington, W., Importer of Unfermented Wines.
1887. Munroe, Prof. Chas. E., Columbian University, Washington, D.C., U.S.A., Professor of Chemistry and Dean.
1900. Munsell, Dr. Chas. E., c/o Devor and Raynolds Co., 110, Horatio Street, New York City, U.S.A., Colour Chemist.
1900. Munton, Fred. T., The Oak House, Winsford, Cheshire, A.R.S.M., Analytical Chemist.
1897. Murch, D. Wilshin, Church Road, Lostock Gralam, Cheshire, Chemist.
1886. Murdoch, H. R. M., 4, Nobel's Villas, Stevenston, Ayrshire, Explosives Chemist.
1899. Murphy, Albert J., The Laboratory, 11, Lyddon Terrace, Leeds, Brewer's Chemist.
1899. Murray, Jas. J., c/o Mountain Copper Co., Ltd., Iron Mountain, Shasta Co., Cal., U.S.A., Mining Engineer.
1896. Murray, Dr. Thos. S., 1, Nelson Street, Dundee, Professor of Chemistry.
1898. Murray, Rd., Laurel Bank, Potternewton Lane, Chapel Allerton, Leeds, Analyst.
O.M. Muspratt, E. K., Seaforth Hall, near Liverpool, Alkali Manufacturer.
1894. Muspratt, Max, 2, Mannering Road, Sefton Park, Liverpool, Technical Chemist.
O.M. Muspratt, S. K., 24, Grove Park, Liverpool, Alkali Manufacturer.
O.M. Muter, Dr. J., Winchester House, Kennington Road, London, S.E., Chemical Lecturer.
1895. Muurling, T. J. R., P.O. Box 2660, New York City, U.S.A., Dyestuff Importer.
1897. Myers, Dr. Henry C., University of California, Berkeley, Cal., U.S.A., Professor of Chemistry.
1893. Myers, Dr. Jno. A., Room 125, Anderson Building, John Street, New York City, U.S.A., Chemist.
1891. Myers, Wm. S., Rutger's College, 15, Union Street, New Brunswick, N.J., U.S.A., Associate Professor of Chemistry.

N

1884. Naef, Dr. P., 132, Woody Crest Avenue, and 165th Street, New York, U.S.A., Technical Chemist.
1897. Nairn, Michael, Kirkcaldy, N.B., Linoleum Manufacturer.
1901. Nanabhai, Krishnalal, 8–10, Nepean Sea Road, Malabar Hill, Bombay, India, Technological Chemist.
1893. Napier, Jno. W., Gas Works, Carnoustie, N.B., Manager and Chemist.
1897. Nash, Leonard M., 281, Seven Sisters Road, Finsbury Park, N., Student of Chemistry.
1900. Nathan, Major Fred. L., R.A., Royal Gunpowder Factory, Waltham Abbey, Essex, Superintendent.
1898. Nation, Edmund C., 237, Smith Street, Peekskill, N.Y., U.S.A., Manager (Highlands Chemical Co.).
1892. Naylor, Wm., 16, Walton's Parade, Preston, Lancashire, Chief Inspector (Ribble Joint Committee).

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

O.M. Naylor, W. A. H., 38, Southwark Street, London, S.E., Manufacturing Chemist.
1899. Neale, Harry A., Brentwood, Clothorn Road, Didsbury, Manchester, Chemist.
1899. Neate, Percy J., 268, High Street, Rochester, Kent, Director of Cement Co.
1898. Neil, Jas. Millar, 129, Beverley Street, Toronto, Ont., Canada, Technical Chemist.
1890. Neill, Geo. D., Drumslea, Greenock, N.B., Sugar Refiner.
1898. Neilson, Alex. M., c/o T. Stanes and Co., Coimbatore, Madras, India, Analytical Chemist.
1889. Neilson, Thos., Silver Bell, Redrock, Arizona, U.S.A., Metallurgical Chemist.
1893. Nelson, Arthur J., c/o Clayton Aniline Co., Ld., Clayton, Manchester, Chemist.
1898. Nelson, Elnathan K., 4220, Grand Boulevard, Chicago, Ill., U.S.A., Chemist.
1897. Nelson, H. W., 15, Hamilton Chambers, 17, St. John Street, Montreal, Canada, Manufacturer of Electrical Insulators.
1897. Nelson, Walter, Messrs. Geo. Nelson, Dale, & Co., Ltd., Emscote Mills, Warwick, Gelatin Manufacturer.
O.M. Ness, T., Black Banks Chemical Works, Darlington, Tar Distiller.
1899. Neurath, Dr. F., 37, George Street, Cheetham Hill, near Manchester, Chemist.
O.M. Newall, F. S., Washington, co. Durham, Chemical Manufacturer.
1889. Newberry, Spencer B., Sandusky Portland Cement Co., Sandusky, Ohio, U.S.A., Cement Works Manager.
1896. Newcomen, Thos., Chemical Works, Lydbrook, near Ross; Wood Distiller.
O.M. Newlands, B. E. R., 2, St. Dunstan's Hill, London, E.C., Analytical and Consulting Chemist.
O.M. Newlands, W. P. R., 232, Amesbury Avenue, Streatham Hill, S.W., Sugar Chemist.
1885. Newton, A. H., Pury Park, Stony Stratford, Artists' Colour Manufacturer.
O.M. Newton, H. C., 4, Ornan Mansions, Haverstock Hill, N.W., Artists' Colour Manufacturer.
1884. Newton, Jno., Park Green, Macclesfield, Silk Dyer.
O.M. Newton, Jno., Manor Works, Rotherhithe New Road, London, S.E., Manure Manufacturer.
1900. Newton, Dr. Wm., 39, Mincing Lane, London, E.C., Chemist.
1884. Nichols, J. A., Stanley Mount, New Mills, near Stockport, Teacher of Science.
1888. Nichols, W. H., 45—47, Cedar Street, New York, U.S.A., Manufacturing Chemist.
1897. Nicholson, Harry, Smethurst Furnace, Penmaenpool, near Dolgelly, North Wales, Assayer.
O.M. Nicholson, J. C., Hunslet Chemical Works, Leeds, Chemical Manufacturer.
1897. Nicholson, Wm. J., 27, Dundonald Road, Kelvinside, Glasgow, Chemist.
1897. Nickel, Herman, c/o The N. K. Fairbank Co., 3rd and Convent Streets, St. Louis, Mo., U.S.A., Chemist.
1888. Nickolls, John B., The Laboratory, Grange, Guernsey, Analytical Chemist.
O.M. Nicol, Dr. W. W. J., 15, Blacket Place, Edinburgh, Chemical Lecturer.
1900. Nield, J. H., c/o General Chemical Co., Bayonne Works, Bayonne, N.J., U.S.A., Superintendent.
1898. Nightscales, Geo., 9, Tynemouth Street, Hull, Oil Merchant.
1899. Nihoul, Dr. Edw., Waremme, Belgium, Professor of Leather Industries.
O.M. Nimmo, J., Penshurst, Stanger Road, South Norwood, S.E., Analytical Chemist.
1885. Nishigawa, T., Ryuso Kaisha, Osaka, Japan, Director of Sulphuric Acid and Soda Works.
1898. Nishikawa, T., c/o Nippon, Seimikaisha, Onoda, Nagato, Japan, Chemist.
O.M. Nolting, Dr. E., Ecole de Chimie, Mulhouse, Alsace, Germany, Professor of Chemistry.
O.M. Norman, F. J., Lyndhurst, Higher Runcorn, Cheshire, Chemical Manufacturer.
1900. Norman, Geo. M., 249, Center Street, Bloomsburg, Pa., U.S.A., Chemist.
1892. Norman, J. T., Avalon, Putney Common, S.W., Consulting Chemist.
1898. Norris, Albert P., 760, Massachusetts Avenue, Cambridgeport, Mass., U.S.A., Assistant Chemist.
1899. Norris, Geo. L., Standard Steel Works, Burnham, Mifflin Co., Pa., U.S.A., Chemist.
1893. Norris, Wm. M., Princeton, N.J., U.S.A., Leather Chemist.
1890. North, E. Gordon N., Bella Vista 14, Minas de Rio Tinto, Huelva, Spain, Technical Chemist.
O.M. Northing, J., The Murrough, Wicklow, Ireland, Technical Chemist.
O.M. Norton, Dr. S. A., 363, East Town Street, Columbus, Ohio, U.S.A., Professor of Chemistry (Ohio State University).
1887. Norton, Dr. T. H., Kharput, Turkey in Asia, *viâ* Constantinople, Ph.D., Sc.D., U.S. Consul.
1899. Noyes, Henry, 17, Queen Street, Melbourne, Vic., Australia, Engineer.
1900. Nuttall, Thos. R., 175, Fernsholme, Walmersley Road, Bury, Lancashire, Technical Chemist.

O

1894. Oakes, Geo. A., Bloomfield, N.J., U.S.A., Woollen Mill Owner.
1884. O'Beirne, W. G., British Chemical Works, Clydebank, Glasgow, Manufacturing Chemist.
1900. O'Brien, Frederick, 104, Hartington Road, Liverpool, Analytical Chemist.
1900. O'Byrne, Leo C., 996, Washington Boulevard, Chicago, Ills., U.S.A., Chemist.
1887. Oddie, Jas., School of Mines, Ballaarat, Australia, Chemical Lecturer.
1888. Oddy, Robert W., 60, Waterhouse, Toad Lane, Rochdale, Chemist.
O.M. Odling, Dr. Wm., F.R.S., 15, Norham Gardens, Oxford, Professor of Chemistry.
1884. Oehler, K., Offenbach-am-Main, Germany, Colour Manufacturer.
1888. Ogata, Saburo, Zohei Shikyoku, Okurasho, Tokyo, Japan, Assayer.
1896. Ogilvy, D. J., Gest Street; and C. H. and O. R. R., Cincinnati, Ohio, U.S.A., Manufacturing Chemist.
1898. Ogle, F. B., Royston Park, Pinner, Middlesex, Cyanide Manager.
1898. Olden, Chas., The Oaklands, Warley, Langley, Birmingham, Metallurgical Engineer.
1884. Oliver, F., 31, Horsley Hill Road, Westoe, South Shields, Analytical Chemist.
1888. Oliver, Wm. Letts, 1066, 12th Street, Oakland, Cal., U.S.A., Mining Engineer.
O.M. Ollerenshaw, S., 96, Davyhulme Lane, Urmston, Manchester, Technical Chemist.
1899. Olsson, Gustav, c/o Hecla Compressed Gas Co., West 3rd Street, Chelsea, Mass., U.S.A., Manufacturing Chemist.
O.M. O'Neill, E. H., Johnson's Saccharum Co., Limited, Stratford, London, E., Managing Director.
1893. Ormerod, Ernest, The Oaklands, Rochdale, Lancashire, Chemical Student.
1894. Ormerod, John, Globe Leather Works, Castleton, Manchester, Tanner and Currier.
O.M. Orr, A. (subs.), 10, Caird Drive, Glasgow; and (Journals), 35A, Bligh Street, Sydney, New South Wales, Analytical Chemist.
O.M. Orr, J. B., Chestnut Lodge, Widnes, Lancashire, Chemical Manufacturer.
1884. Orr, Robert, 8, Great Western Terrace, Glasgow, Manufacturing Chemist.
1899. Orr, Thos. W., Umtali, Rhodesia, and (Journals), Moss Cottage, Dumbreck Road, Glasgow, Chemist.
1890. Orsman, W. J., Roburite Explosives Co., Gathurst, near Wigan, Explosives Chemist.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1897. Osborne, Thos. B., P.O. Box 485, New Haven, Conn., U.S.A., Chemist.
1900. Osbourne, Jno. P., 572, Alexandra Parade, Dennistoun, Glasgow, Analytical Chemist.
1896. Osmond, Jno. H., c/o Smith, Bell, & Co., Manila, Sugar Works and Technical Chemist.
1889. Ostlere, Edward, Messrs. Barry, Ostlere, & Co., Kirkcaldy, N.B., Linoleum Manufacturer.
1900. O'Shaughnessy, Francis R., Home Farm, Tyburn, Birmingham, Chemist.
1885. O'Shea, L. T., Firth College, Sheffield, Chemical Lecturer.
O.M. O'Sullivan, C., F.R.S., 140, High Street, Burton-on-Trent, Brewer and Chemist.
1883. O'Sullivan, J., High Bank, Burton-on-Trent, Brewing Chemist.
1893. Oswell, Benj. L., 5, Balmoral Road, Burton-on-Trent, Brewer's Chemist.
1898. Oushkoff, John P., c/o P. K. Oushkoff & Co., Moscow, Russia, Chemical Manufacturer.
1887. Overtoun, Lord, 7, West George Street, Glasgow, Chemical Manufacturer.
1891. Owens, Caradoc, 88, Great Clowes Street, Lower Broughton, Manchester, Dyer's Manager.

P

O.M. Packard, E., jun., Bramford, near Ipswich, Manure Manufacturer.
1899. Paessler, Dr. Joh., Vorstand der Deutschen Versuchsanstalt für Lederindustrie, Freiberg in Sachsen, Germany, Chemist.
O.M. Page, F. J. M., 54, Sutherland Street, Pimlico, S.W., Chemical Lecturer.
1886. Pagés, Albert, 34, Boulevard Henri IV., Paris, Technical Chemist.
1892. Paine, Augustus G., 60, Times Building, New York, U.S.A., President of Paper Making Co.
O.M. Paine, S., Devisdale, Bowdon; and (Journals), Otter Works, Manchester Pharmaceutical Chemist.
1887. Palmer, T. Chalkley, Box 19, Chester, Pa., U.S.A., Manufacturing Chemist.
1887. Palmer, Thos. C., 98, Commercial Road East, London, E., Engineer.
O.M. Park, J., Millburn Chemical Works, Garngad Hill, Glasgow, Chemical Manager.
1888. Parker, Chas. E., Vine House, Penketh, Warrington, Tanner.
1894. Parker, Chas. E., 150, Alden Street, Orange, N.J., U.S.A., Chemist.
1898. Parker, Charles H., Manor House, Tettenhall, Wolverhampton, Chemist.
1894. Parker, Dr. J. Gordon, Herold's Institute, Drummond Road, Bermondsey, S.E., Head of Tanning School.
1891. Parker, Edw., Laburnum House, Rushford Park, Levenshulme, Manchester, Analytical Chemist.
1897. Parker, Matthew A., 13, Hamilton Crescent, Partick, Glasgow, Assistant to Professor of Chemistry.
O.M. Parker, Thos., Manor House, Tettenhall, Wolverhampton, Electrical Engineer.
1894. Parker, Thos. J., Bayonne, N.J., U.S.A., Chemical Works Manager.
1898. Parker, W. W., Whitehouse Street Tannery, Bristol, Tanner.
1900. Parkes, Geo. A., Hayfield, Antrim, Ireland, Chemist.
1898. Parmelee, C. W., New York and Boston Dyewood Co., Green and West Streets, Brooklyn, N.Y., U.S.A., Chemist.
1898. Parrish, Saml., 10, Sholebroke Mount, Leeds, Teacher of Chemistry.
1896. Parry, John, E. V. Wharf, Newport, Mon., Analytical Chemist.
1899. Parsons, C. Chauncy, 43, Sedgwick Street, Brooklyn, N.Y., U.S.A., Manufacturing Chemist.
O.M. Pass, A. C., Hawthornden, Clifton Down, Bristol, Lead Smelter.
1901. Pass, James, Syracuse, N.Y., U.S.A., Pottery Manufacturer.
1897. Patchett, Jas., Oakworth, Hadley, Wellington, Salop, Ironmaster.
1888. Paterson, Dr. Jas. H. R., 10, Millerfield Place, Edinburgh.
1884. Paterson, John, Belle Isle Place, Workington, Cumberland, Mechanical Engineer.
1887. Paton, J. M. C., Messrs. Manlove, Alliott & Co., Ltd., Nottingham, Mechanical Engineer.
1886. Paton, W. Grant, Greenbank Alkali Works, St. Helens, Lancashire, Alkali Works Manager.
O.M. Patterson, G., c/o The Manbré Saccharine Co., Ld., Hammersmith, W., Technical Chemist.
1893. Patterson, Harry J., College Park, Prince George's Co., Md., U.S.A., Agricultural Chemist.
O.M. Patterson, T. L., Maybank, Finnart Street, Greenock, N.B., Sugar Works Manager.
1884. Pattinson, Dr. H. Salvin, 75 Side, Newcastle-on-Tyne, Analytical Chemist.
O.M. Pattinson, J., 75, The Side, Newcastle-on-Tyne, Consulting Chemist.
O.M. Pattison, J., 83, North Oswald Street, Glasgow, N.B., Chemical Merchant.
1889. Pattison, Percy J., 5, Kingsley Road, Forest Gate, E., Technical Chemist.
1894. Paul, Dr. Benjamin H., 13, Fenchurch Avenue, E.C.; and (Journals) Parkside, Kingston Vale, Putney, S.W., Consulting and Analytical Chemist.
1900. Paul, Dr. L. Gordon, 3, Market Street, Huddersfield, Consulting Chemist.
1891. Paul, Jas. H., Albion Chemical Co., Riverside, Charlton, S.E., Analytical Chemist.
O.M. Pauli, Dr., Höchst a/Main, Germany, Chemical Manufacturer.
1900. Payas, Fred. Alexis, Calpe Pharmacy, 129, Waterport Street, Gibraltar, Pharmaceutical Chemist.
O.M. Payne, J. B., 15, Mosley Street, Newcastle-on-Tyne, Manufacturing Chemist.
1888. Peak, C. P., Bridgewater Chemical Works, Wigan, Manufacturing Chemist.
1898. Pearce, Edw. D., Messrs. T. P. Shepard and Co., P.O. Box 1336, Providence, R.I., U.S.A., Manufacturing Chemist.
1894. Pearce, Jas. Stanley, Clements, Snaresbrook, Essex, Chemical Manufacturer.
1897. Pearce, Richard, Argo, Colorado, U.S.A., Smelting Works Manager.
1883. Pearce, W., Bow Common, London, E.; and (Journals) The Elms, Salway Hill, Woodford, Essex, Chemical Manufacturer.
1892. Pears, Andrew, jun., Spring Grove, Isleworth, Analytical Chemist.
1893. Pearson, Frank P., Arnold Printworks, North Adams, Mass., U.S.A., Printworks Manager.
1894. Pearson, Wm. H., 6, Fenchurch Buildings, London, E.C., Analytical Chemist.
O.M. Pechiney, A. R., Salindres, Gard, France, Chemical Engineer.
1898. Peck, Dr. Ernest L., Claremont, Merrilocks Road, Blundellsands, near Liverpool, Analytical Chemist.
1898. Peckham, Stephen F., 1489, Pacific Street, Brooklyn, N.Y., U.S.A., Chemist.
1894. Peden, Jno., 30, Ardgowan Street West, Greenock, N.B., Analytical Chemist.
O.M. Pedler, Prof. A., F.R.S., 31—32, Judges' Court Road, Alipore, Calcutta, India, Professor of Chemistry.
1886 Pedler, J. R., 47, Tregunter Road, South Kensington, S.W., Clerk.
1899. Pell, A., 7, Elphinstone Circle, Bombay, India, Chemist.
1897. Pellew, Chas. E., Columbia University, New York City, U.S.A., Adjunct Professor of Chemistry.
1888. Pemberton, Henry, jun., 1008, Clinton Street, Philadelphia, Pa., U.S., Manufacturing Chemist.
1896. Péniakoff, D. A., Selzaete, Belgium, Chemist and Physicist.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1896. Penney, Mulgrave D., 11, High Street, Hull, Analytical Chemist.
1890. Pennock, J. D., c/o Solvay Process Co., Syracuse, N.Y., U.S.A., Technical Chemist.
1885. Pentecost, S. J., Nottingham Road, New Basford, Nottingham, Lace Dresser.
1887. Pentermann, H. T., 37, Clifton Crescent, Peckham, S.E., Brewing Chemist.
1892. Peploe, D. H. T., Seale Lodge, Farnham, Surrey.
1899. Peppel, S. Vernon, 169, King Avenue, Columbus, Ohio, U.S.A., Chemist.
1885. Perkin, A. G., 8, Montpelier Terrace, Hyde Park, Leeds, Technical Chemist.
1898. Perkin, Dr. F. Mollwo, Borough Polytechnic, Borough Road, S.E., Head of Chemical Department.
O.M. Perkin, Dr. W. H., F.R.S., The Chestnuts, Sudbury, Harrow, Research Chemist.
1887. Perkin, Dr. W. H., jun., F.R.S., Fairview, Wilbraham Road, Fallowfield, Manchester, Professor of Chemistry.
1896. Perkins, Chas. W., P.O. Box 573, Waterbury, Conn., U.S.A., Chemist and Druggist.
1899. Perkins, Prof. Maurice, Union College, Schenectady, N.Y., U.S.A., Professor of Chemistry.
1893. Perkins, T. S., c/o Californian Tartar Co., 318, Front Street, San Francisco, Cal., U.S.A., Chemist.
1899. Perks, Walter G., Glanafon, Hayle, Cornwall, Manufacturer.
1887. Perry, D., Forth and Clyde Chemical Works, Kirkintilloch, N.B., Manufacturing Chemist.
1895. Perry, Jos. H., 176, Highland Street, Worcester, Mass., U.S.A., Teacher of Chemistry.
1897. Peter, Dr. A. H., 205, Third Avenue, New York, U.S.A., Chemist.
1893. Pethybridge, Walter, 3, Rhodesia Road, Clapham Rise, S.W., Chemist and Assayer.
1883. Pettigrew, J., 6, St. Helen's Place, Bishopsgate, London, E.C., Technical Chemist.
1892. Pettigrew, Robt., c/o Mersey and Irwell Joint Committee, 44, Mosley Street, Manchester, Electrochemist.
O.M. Peyton, E. P., Chemical Works, Lister Street, Birmingham, Chemical Manufacturer.
1900. Peyton, Wm. C., Mutual Life Building, San Francisco, Cal., U.S.A., Chemist.
1888. Philip, Arnold, 67, Waverley Road, Redland, Bristol, Electro-Metallurgist and Electrical Engineer.
1886. Phillips, A. G., 11, Essex Villas, Phillimore Gardens, Kensington, W., Barrister-at-Law.
1891. Phillips, George Brinton, 622, Race Street, Philadelphia, Pa., U.S.A., Manufacturing Chemist.
O.M. Phillips, Harcourt, 9, Crawford Avenue, Bolton, Analytical Chemist.
1895. Phillips, S. Chas., 47, Cannon Street, London, E.C., Chemical Engineer.
1898. Phillips, Wm. H., 100, Milton Avenue, East Ham, E., Soapmakers' Assistant.
1883. Phipson, Dr. T. L., 83, Erpingham Road, Putney Common, S.W., Analytical and Consulting Chemist.
1894. Picard, Hugh F. K., c/o H. L. Sulman, 60, Gracechurch Street, London, E.C., Metallurgist.
O.M. Pick, Dr. S., Direction der Soda Fabrik, Szczakowa, Galizien, Austria, Chemical Engineer and Manager.
1897. Pickert, Leo. W., American Sugar Refining Co., Granite Street, South Boston, Mass., U.S.A., Chemist.
1884. Pickles, H., Prussiate Works, Droylsden, Manchester, Technical Chemist.
1899. Pidduck, E. W., 28, Portland Street, Aberystwith, Wales, Assistant Chemist.
1901. Pierce, Ira L., Gibbstown, Gloucester Co., N.J., U.S.A., Chemist (Repauno Chemical Co.).
1899. Pilgrim, Julius A., 67, Poulton Road, Seacombe, Cheshire, Dyer's Chemist.
1897. Pilhashy, B. M., c/o Rheinstrom, Bettman, Johnson, and Co., 906–910, Sycamore Street, Cincinnati, Ohio, U.S.A., Distiller's Chemist.
1888. Pilkington, G., Laboratory, Victoria Buildings, Silver Street, Bury, Lancashire, Analytical Chemist.
1893. Pilley, Thos. W., 33, Grove Hill Road, Denmark Hill, S.E., Analytical Chemist.
1894. Pilling, John E., 28, Agnew Villas, Whitegate Lane, Blackpool, Chemist.
1900. Pinto-Leite, A., Manufacturing Chemist.
1883. Pipe, Jas., Messrs. Wm. Henderson & Co., Irvine, N.B., Chemical Manufacturer.
1896. Piper, Walter E., Boston Rubber Shoe Co., Malden, Mass., U.S.A., Chemist.
1899. Pirie, Alex. G., Messrs. Alex. Pirie and Sons, Ltd., Stoneywood Works, Bucksburn, Aberdeenshire, Paper Manufacturer.
1900. Pitman, Jno. R., c/o Lafflin and Rand Powder Co., Pompton Lakes, N.J., U.S.A., Chemist.
O.M. Pitt, T., 16, Coleman Street, London, E.C., Manufacturing Chemist.
1884. Pittuck, F. W., 19, Stratford Grove, Newcastle-on-Tyne, Technical Chemist.
1899. Pizey, Jas. H., 11, St. Albans Villas, Highgate Road, London, N., Chemist.
1894. Platten, Frank, c/o Elliot's Metal Co., Limited, Selly Oak, near Birmingham, Metallurgical Chemist.
1890. Platts, Jno. C., Heaton Moor Lodge, Heaton Chapel, Stockport, Metallurgical Chemist.
1896. Plaut, Albert, 128, William Street, New York, U.S.A., Wholesale Druggist.
1888. Playfair, David J., 7, Victoria Crescent, Dowanhill, Glasgow, Manufacturing Chemist.
1891. Pocklington, Hy., 41, Virginia Road, Leeds, Assurance Co.'s Local Manager.
1893. Pollitt, R. B., De Beers Explosives Works, Cape Town, South Africa, Civil Engineer.
1883. Pollock, A., Dillichip Turkey-red Dyeworks, Bonhill, Dumbartonshire, Dyeworks Manager.
1890. Pomeroy, Dr. Chas. T., 55, Broad Street, Newark, N.J., U.S.A., Ink Manufacturer.
1896. Pond, Prof. G. G., State College, Centre Co., Pa., U.S.A., Professor of Chemistry.
O.M. Pond, J. A., 99, Queen Street, Auckland, New Zealand, Analytical Chemist.
1900. Pont, Francis G. du, Wilmington, Del., U.S.A., Manufacturer.
1895. Pont, Pierre S. du, Lorain, Ohio, U.S.A., Explosives Manufacturer.
1896. Poole, Herman, 357, Canal Street, New York, U.S.A., Manufacturing Chemist.
O.M. Pooley, T. A., 76, Grove Lane, Denmark Hill, S.E., Analytical Chemist.
1892. Pope, Frank, c/o, Jobbins, W. F., P.O. Box 422, Aurora, Kane Co., Ill., U.S.A., Chemist.
O.M. Pope, S., 35, Victoria Road, Runcorn, Chemical Works Manager.
1899. Pope, Thos. H., South Street, Ponders End, Middlesex, Chemist.
1900. Pope, W. J., Goldsmiths' Institute, New Cross, London, S.E. Chemist.
1900. Popplewell, Jos. M., c/o Brotherton and Co., Holmes Street, Dewsbury Road, Leeds, Chemist.
1899. Porter, A. Felix, Pompton Lakes, N.J., U.S.A., Explosives Chemist.
1896. Porter, Herbert, Ivy House, Polygon Road, Crumpsall, Manchester, Alkali Inspector.
O.M. Pott, W. Hamilton, 68, Sumner Street, Southwark, S.E., Vinegar Brewer.
1899. Potter, Chas. A., 198, Waterman Street, Providence, R.I., U.S.A., Chemist.
1884. Potter, Chas. E., Love Lane Sugar Refinery, Liverpool, Sugar Works Chemist.
1888. Potter, Chas. J., Heaton Hall, Newcastle-on-Tyne, Cement Manufacturer.
O.M. Potter, E. P., Fernclough, Bolton-le-Moors, Alkali Manufacturer.
1899. Potter, Rowland S., 44, Margaret Street, Beverley Road, Hull, Chemist.
1900. Potts, Geo., E., Dover, N.J., U.S.A., Explosives Manufacturer.

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1892. Potts, Joseph T., Price's Patent Candle Co., Bromboro' Pool, near Birkenhead, Chemist.
1900. Pough, Frank H., 146, Hicks Street, Brooklyn, N.Y., U.S.A., Manager (Bergen Point Sulphur Works).
1889. Powell, A. Ernest, Craigowan, Clarendon Road, Whalley Range, Manchester, Oil Merchant.
1900. Powell, Harry J., Whitefriars Glass Works, London, E.C., Glass Manufacturer.
1884. Powell, L. S., 5, Campden Hill Square, London, W., Electrician.
1897. Power, Dr. Fred. B., Wellcome Research Laboratories, 6, King Street, Snow Hill, London, E.C., Director.
1900. Pratt, N. P., Laboratory, Atlanta, Ga., U.S.A., Manufacturing Chemist.
1889. Pratt, Walter E., 35, Regent Street, Lancaster, Analytical Chemist.
1897. Prentice, Dr. Bertram, Royal Technical Institute, Salford, Lecturer on Chemistry.
1897. Prentiss, Geo. N., North-western Iron Co., Mayville, Wis., U.S.A., Analyst and Assayer.
1888. Prescott, Dr. Albert B., Ann Arbor, Mich., U.S.A.
1900. Prescott, Saml. C., Mass. Inst. of Technology, Boston, Mass., U.S.A., Instructor in Bacteriology.
1891. Preston, Alf., Park Hill View, Bury, Lancashire, Chemist.
1883. Preston, R., Ryecroft, Manchester Road, Bury, Lancashire, Manufacturing Chemist.
O.M. Price, A. F., 524, Sacramento Street, San Francisco, Cal., U.S.A., Analytical Chemist.
1899. Prinsen-Geerligs, H. C., Fegal, Java, Netherlands Indes, Director of Sugar Cane Experimental Station.
1893. Pritchard, Edgar J., Burrows, Swansea, Works Manager.
1896. Prochazka, Dr. Geo. A., 138, West 13th Street, New York, U.S.A., Colour Manufacturer.
1897. Prochazka, John, 15, East 12th Street, New York, U.S.A., Coal-Tar Colour Chemist.
O.M. Procter, H. R., Yorkshire College, Leeds; and (Journals) Thornleigh, Wheatley Road, Ilkley, Yorks, Lecturer on Tanning.
1884. Procter, J. W., Skeldergate Bridge, York, Manure Manufacturer.
1890. Proctor, Miss Anne J., Free Library, Widnes, Librarian.
O.M. Proctor, C., 99, Underhill Road, East Dulwich, S.E., Analytical Chemist.
O.M. Proctor, W. W., 33, The Side, Newcastle-on-Tyne, Assayer and Analytical Chemist.
1901. Propach, C., 189, Kinzir Street, Chicago, Ill., U.S.A., Colour Merchant.
1894. Proude, Jas., 30, Cromwell Terrace, Halifax, Yorks, Soap Works Chemist and Manager.
1899. Pullar, Edmund, Keirfield, Bridge of Allan, N.B., Manufacturer.
1894. Pullar, Herbert S., Rosebank, Perth, N.B., Dyer.
O.M. Pullar, Sir Robert; Journals to J. Minto, Sandeman Public Library, Perth, N.B., Dyer.
O.M. Pullar, R. D., Pullar's Dyeworks, Perth, N.B., Dyer.
1899. Pullman, Edw. E., 13, Claremont Gardens, Surbiton, Leather Manufacturer.
1894. Purdie, Dr. Thos., F.R.S., 14, South Street, St. Andrews, N.B., Professor of Chemistry.

Q

1887. Quibell, Oliver, Manure Manufacturer.
1897. Quinan, Wm. R., De Beers Explosives Works, Cape Town, South Africa, Superintendent (Powder Works).
1891. Quincke, Dr. F., Farbenfabriken Leverkusen, Mulheim (Rhein), Germany, Chemical Works Director.
1891. Quinn, J. Cardwell, Hillesdon, Barnstaple, N. Devon, Consultant on India Rubber.
1897. Quirk, Jno. S., Lead Smelting Works, St. Helens, Lancashire, Manager.

R

1898. Radcliffe, Lionel G., 6, Alma Terrace, Old Trafford, Manchester, Chemist.
1884. Rademacher, H. A., P.O. Box 243, Lawrence, Mass., U.S.A., Consulting Technical Chemist.
1900. Radley, Ernest, 49, Ernest Street, West Norwood, S.E.
O.M. Rae, G., 41, Garthland Drive, Dennistoun, Glasgow, Assayer.
1897. Rae, Roderic H., 103, Sotheby Road, Highbury Park, N., Engineer (Edison-Swan Electric Works).
1895. Raegener, Louis C., 280, Broadway, New York, U.S.A., Lawyer.
O.M. Ramsay, Dr. W., F.R.S., University College, Gower Street, London, W.C.; Journals to 12, Arundel Gardens, W., Professor of Chemistry.
1888. Ramsay, W., c/o Laird Bros., Ironworks, Birkenhead, Chemist and Assayer.
1898. Ramsden, Andrew, Deccan Sugar Co., Ltd., Samalkot, Godaveri District, India, Manager.
1887. Ramsden, Edw., 11, Cecil Avenue, Horton Park, Bradford, Spinner.
1883. Ramsden, J., Lion Brewery, Belvedere Road, Lambeth, London, S.E., Brewer.
1895. Raper, Arthur E., Alston House, Thornton Road, Bradford, Yorks, Works Chemist.
1897. Raper, Thos. H., 18, Victoria Embankment, Darlington, Analytical Chemist.
1898. Raschen, Dr. Julius, The Highlands, Runcorn, Cheshire, Consulting Chemist (United Alkali Co.).
1893. Ratcliff, F. D., 108, Varna Road, Birmingham, Vinegar Brewer.
1898. Ratcliffe, Walter, 21, Mawdsley Street, Bolton, Analytical Chemist.
1895. Rau, Dr. H. M., 130–132, Pearl Street, New York, U.S.A., Chemist.
1901. Rauter, Dr. G., Sofienstrasse 8–17, Charlottenburg 2, bei Berlin, Germany, Engineering Chemist.
1901. Rawlins, Herbert J. L., Hope Cottage, Rainhill Lancashire, Managing Director.
O.M. Rawson, C., 2, Melbourne Place, Bradford; and (Journals) Planter's Club, Mozufferpore, Tirhoot, India, Analytical and Consulting Chemist.
1883. Rawson, Dr. S. G., Technical Schools, Huddersfield, Analytical Chemist.
O.M. Raymond, C. W., 32, Campbell Road, Bromley-by-Bow, E., Chemical Works Inspector.
1895. Read, E. J., 69, Sheen Lane, Mortlake, Surrey, Analyst.
1890. Reade, Thos., Chemical Works, Cleveland Road, Wolverhampton, Manufacturing Chemist.
O.M. Readman, Dr. J. B., Chemical Laboratory, 4, Lindsay Place, George IV. Bridge, Edinburgh, Analytical and Consulting Chemist.
O.M. Reddrop, J., Sound Cottage, Sound, near Nantwich, Analytical Chemist.
1890. Redgate, J. G., Traffic Street, Nottingham, Aërated Water Manufacturer.
O.M. Redwood, Dr. Boverton, 4, Bishopsgate Street Within, London, E.C., Petroleum Expert.
1884. Redwood, I. I., Bantry House, Picardy Hill, Belvedere, Kent, Technical Chemist.
1887. Redwood, Robt., 4, Bishopsgate Street Within, London, E.C., Secretary.
1891. Redwood, T. Horne, Olveston, Sedlescombe Road, St. Leonard's-on-Sea, Analytical Chemist.
1886. Rée, Dr. A., 15, Mauldeth Road, Withington, Manchester, Aniline Dye Manufacturer.
1884. Reed, Albert E., The Grange, Leigham Court Road, Streatham, S.W., Paper Works Chemist.
1895. Reed, Dr. J. Hastings, Hambledon, Cairns, North Queensland, Sugar Manufacturer.
1893. Reekie, J. A., Shaw Lane, Dinting, near Manchester, Calico Printer's Colour Mixer.

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1883. Reeks, T. H., 106, Queen Victoria Street, London, E.C., Analytical and Consulting Chemist.
1897. Rees, W. H., Big Pine, Inyo Co., Cal., U.S.A., Chemist.
1900. Reese, Dr. Chas. L., c/o New Jersey Zinc Co., Passaic Avenue, Newark, N.J., U.S.A., Chemist.
1897. Reid, Andrew, 133, Minard Road, Crossmyloof, Glasgow, Chemist.
1896. Reid, Robt., Oil Mills, Horbury Bridge, near Wakefield, Chemical Student.
1895. Reid, T. Anderson, 8, Ashton Drive, Hunt's Cross, Liverpool, Works Manager.
1894. Reid, Walter C., Broomlee, Haydon Bridge-on-Tyne, Manufacturer.
O.M. Reid, Walter F., Fieldside, Addlestone, Surrey, Technical Chemist.
1893. Reid, Wm., jun., Bombay Dyeworks, Dadur, Bombay, India, Dyer.
1898. Reitmeyer, Robt. E. D., 1 & 2, Rangoon Street, London, E.C., Chemical Merchant.
1900. Remington, J. Stewart, Laboratory, Corporation Street, Lancaster, Consulting Chemist.
1884. Renaut, F. W., The Brambles, Elmbourne Road, Tooting Common, S.W., Secretary.
O.M. Rennie, Dr. E. H., University of Adelaide, South Australia, Professor of Chemistry.
O.M. Rennoldson, W. L., c/o United Alkali Co., Lim., Allhusen's Works, Gateshead, Manager.
1885. Reoch, R., River Point, Rhode Island, U.S.A., Print Works Manager.
1894. Rettie, Theodore, 16, Great King Street, Edinburgh, Metallurgical Chemist.
1895. Reubens, Chas. M., 108, West 113th Street, New York, U.S.A., Chemist.
1896. Reuter, Dr. L., 17, Rue de Mérode, Bruxelles-Midi, Belgium, Chemist.
1899. Reynolds, F. Emory, Columbian G.M. and Milling Co., York, Montana, U.S.A., Chemist.
O.M. Reynolds, Dr. J. Emerson, F.R.S., Trinity College, Dublin, Professor of Chemistry.
O.M. Rhodes, E., c/o Thos. Vickers & Sons, Widnes, Technical Chemist.
1892. Rhodes, Jos., Fairview, New Mills, Derbyshire, Print Works Chemist.
1900. Rhodin, Jno. G. A., 47, Victoria Buildings, Manchester, Analytical Chemist.
1895. Ricarde-Seaver, Major F. J., 16, Grafton Street, Bond Street, W., Metallurgist.
1889. Richards, Edgar, 341, West 88th Street, New York, U.S.A., Analytical Chemist.
1898. Richards, Harry E., 159, Franklin Street, Bloomfield, N.J., U.S.A., Lawyer.
O.M. Richards, W. A., Sandbach, Cheshire, Alkali Works Manager.
1888. Richardson, Clifford, New York Testing Laboratory, Long Island City, N.Y., U.S.A., Chemical Engineer.
1898. Richardson, C. Gordon, c/o N.Y. Chemical Refining Co., 38, Park Row, New York, U.S.A., Chemist.
1888. Richardson, D. B., Glen Aros, Isle of Mull, N.B., Chemical Merchant.
1884. Richardson, F. W., Broad Oak, Oak Avenue, Bradford, Yorkshire, Analytical Chemist.
1892. Richardson, G. E., Branch House, Batley, Yorks, Manufacturing Chemist.
1894. Richardson, Jas. C., 19, Claremont Square, London, N., Electro-chemical Engineer.
1900. Richardson, Jno. H., c/o H. D. Pochin and Co., Ltd., Salford, Manchester, Manager.
1889. Richardson, S. M., 415, Main Street, Bonhill, N.B., Analytical Chemist.
1891. Richardson, Walter W., 1, Montpellier Terrace, Cliff Road, Leeds, Manufacturing Chemist.
1894. Richardson, Wm. H., Newsky Thread Mills, Malaja Bolotnaja, St. Petersburg, Russia, Textile Chemist.
1899. Richmond, Edmund W. T., 132, Queen Victoria Street, London, E.C., Gas Engineer.
1886. Richmond, H. D., 24, Baronsfield Road, Twickenham, Chief Chemist (Aylesbury Dairy Co.).
1898. Richmond, Jno. R., Woodend Park, Grassendale, Liverpool, Alkali Works Manager.
1884. Richmond, W. H., Liver Alkali Co., Limited, Ditton Road, Widnes, Alkali Manufacturer.
1886. Riddell, R., 87, Horninglow Street, Burton-on-Trent, Brewer.
1894. Ridding, Howard C., A.R.S.M., 8, Grove Place, Shelton, Stoke-on-Trent, Analytical Chemist.
1884. Rideal, Dr. Samuel, Chemical Laboratory, 28, Victoria Street, Westminster, S.W., Analytical and Consulting Chemist.
O.M. Ridsdale, C. H., Milton Lodge, Southfield Road, Middlesbrough, Yorks, Analytical Chemist.
1899. Riederer, Emil J., Hercules Powder Works, Ashburn, Mo., U.S.A., Chemist.
1888. Rigby, John S., West Thurrock, Essex, Chemical Manufacturer.
1892. Riker, Jno. J., 45, Cedar Street, New York City, U.S.A., Merchant.
O.M. Riley, E., 2, City Road, Finsbury Square, London, E.C., Metallurgical Chemist.
O.M. Riley, J. E., Arden Hall, near Accrington, Chemical Manufacturer.
1884. Riley, Jno., Thornliebank, near Glasgow, Print Works Manager.
1899. Riley, Walter A., jun., Brunswick Lodge, Newmarket Road, Norwich, Brewer.
1893. Riley, Wm., Castleton, Manchester, Chemical Manufacturer.
1899. Rink, Arnold, 9, Butler Street, Milton Street, London, E.C., Tannin Extract Manufacturer.
1889. Rintoul, Wm., Royal Gunpowder Factory, Waltham Abbey, Essex, Explosives Chemist.
O.M. Ripley, H., Bowling Dyeworks, Bradford, Yorkshire, Dyer.
1901. Ripley, Philip F., Andover, Mass., U.S.A., Chemist.
1900. Rising, Willard B., Berkeley, Cal., U.S.A., Professor of Chemistry.
1888. Ritchie, Robt., Shawfield Works, Rutherglen, near Glasgow, Technical Chemist.
1885. Ritson, T. N., Gas Works, Kendal, Gas Engineer.
1899. Rivington, W. John, 24, Mark Lane, London, E.C., Newspaper Proprietor.
O.M. Rix, W. P., Ashfield Cottage, Liverpool Road, Newcastle, Staffordshire, Potter.
O.M. Robbins, J., 57, Warrington Crescent, Maida Vale, London, W., Pharmaceutical Chemist.
1898. Roberts, Caryl C., 14, Wesley Street, Waterloo, Liverpool, Teacher of Chemistry.
1890. Roberts, C. F., Linfitts, Delph, viâ Oldham, Chemical Merchant.
1887. Roberts, F. A., Cornbrook Chemical Works, Manchester, Chemical Manufacturer.
O.M. Roberts, F. G. Adair, Lion House, Amhurst Park, Stamford Hill, N., Chemical Manufacturer.
1885. Roberts, R. Wightwick, 22, Calle Arturo Prat, Valparaiso, Chili, Analytical and Consulting Chemist.
1900. Roberts, Wm. Brittain, Wilderspool House, Warrington, Brewer and Analyst.
1894. Robertson, Alex., Argyle Chemical Works, Oban, N.B., Manufacturing Chemist.
1891. Robertson, Alex. A., 12, Bennison Drive, Grassendale, Liverpool, Technical Chemist.
1897. Robertson, Andrew J., Williamsburg Avenue, Richmond, Va., U.S.A., Analytical Chemist.
1892. Robertson, Geo. H., 30, Hemstall Road, West Hampstead, N.W., Electro-Chemist.
1900. Robertson, Jas., 103, Whifflet Street, Coatbridge, N.B., Analytical Chemist.
1891. Robertson, Robt., Royal Gunpowder Factory, Waltham Abbey, E., Analytical Chemist.
1895. Robins, Walter, 9, Northbrook Road, Lee, S.E., Chemist.
1897. Robinson, Clarence J., Westerleigh, West New Brighton, N.Y., U.S.A., Chemist.
1900. Robinson, Edw. B., Wellington Works, South Wellington Street, Glasgow, Oil Distiller.

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O.M. Robinson, Prof. H. H., 9, The Barons, Twickenham, Professor of Chemistry.
O.M. Robinson, Jos., Farnworth, Widnes, Chemical Manufacturer.
O.M. Robinson, Jno., 8, May Bell Avenue, Blackpool, Chemical Engineer.
1887. Robinson, Thomas, 401, West Street, Glasgow, Chemical Works Manager.
1894. Robson, Jas., 204, George Street, Glasgow, Chemist.
1894. Rodda, Edw. D., 6, Gold Street, Roath, Cardiff, Engineer.
1884. Rodger, Edw., 1, Clairmont Gardens, Glasgow, W.
1900. Rogers, Geo. J., Wallaroo Smelting Works, South Australia, Chemist.
1890. Rogers, Harry, 5, Stoke Newington Common, London, N.
1899. Rogers, John, Nobel's Explosives Co., Ltd., Ardeer, Stevenston, Ayrshire, Chemist.
1890. Rogerson, W. J., 38, Southwark Street, London, S.E., Wholesale Druggist.
1898. Roller, H. C., Roselle, N.J., U.S.A., Chemist.
1899. Rollin, Chas., 1, St. Nicholas Buildings, Newcastle-on-Tyne, Chemical Manufacturer.
O.M. Rollin, J. C., 1, St. Nicholas Buildings, Newcastle-on-Tyne, Chemical Manufacturer.
1898. Roode, Rudolf de, International Paper Co., Glens Falls, N.Y., U.S.A., Chemist and Superintendent.
O.M. Roscoe, Sir Henry, F.R.S., 10, Bramham Gardens, South Kensington, S.W., Consulting Chemist.
1901. Roscow, Jas., 471, Park Avenue, Paterson, N.J., U.S.A., Colourist and Chemist.
1893. Roscow, Jno. F., c/o United States Finishing Co., Norwich, Conn., U.S.A., Print Works Chemist.
1899. Roscow, Wm., 102, Central Avenue, Pawtucket, R.I., U.S.A., Analytical Chemist.
1901. Rose, Jno. Leonard, 454, Cheetham Hill Road, Manchester, Chemist.
1890. Rosell, Dr. Claude A. O., "The Pierrepoint," 45, West 32nd Street, New York, U.S.A., Chemist.
1897. Rosengarten, Dr. Geo. D., 1700, Fitzwater Street, Station D, Philadelphia, Pa., U.S.A., Manufacturing Chemist.
1896. Rosenheim, Dr. Otto, 68, Belsize Park Gardens, Hampstead, N.W., Analytical and Research Chemist.
1887. Ross, Alex. J. J., Tayavalla, Falkirk, N.B., Chemical Manufacturer.
1893. Ross, Arthur, 1, Glengall Road, Old Kent Road, London, S.E., Analytical Chemist.
1901. Ross, Herbert W., 1070, 16th Street, Oakland, Cal., U.S.A., Chemist.
1887. Ross, J. G., Sunbury, Belford Road, Edinburgh, Analytical Chemist.
1900. Ross, Raymond, Public Analyst's Office, Burnley, Lancashire, Analytical Chemist.
1901. Rothberg, Dr. M. E., Johnstown, Pa., U.S.A., Chemist.
1888. Rothwell, C. F. Seymour, 15, Skerton Road, Old Trafford, Manchester, Print Works Chemist.
1896. Rothwell, Rich. P., Room 368, 20, Bucklersbury, E.C., Editor "Engineering and Mining Journal."
O.M. Rottenburg, Paul, Messrs. Leisler, Bock & Co., 105, West George Street, Glasgow, Chemical Merchant.
1896. Round, Wm., 100, Bagot Street, Birmingham, Analytical Chemist.
1900. Rountree, Walter B., c/o Mountain Copper Co., Keswick, Shasta Co., Cal., U.S.A., Chemist.
1899. Rouse, H. W., 62, Russell Road, Custom House, E., Foreman (Sulphuric Acid Works).
O.M. Rowland, W. L., 4800, Chester Avenue, Philadelphia, Pa., U.S.A., Chemist.
1884. Roxburgh, J. W., Levenbank Cottage, Jamestown, Dumbartonshire, N.B., Print Works Manager.
1899. Roy, Benjamin, Ailsa Lodge, Whitelow Road, Chorlton-cum-Hardy, Manchester, Chemist.
1896. Royal-Dawson, H., 3, Kenilworth Road, Ealing, W., Chemist.
1898. Royle, Chas. L., c/o East India Distilleries and Sugar Factories, Ltd., Nellikuppam, S. Arcot, Madras, India, Sugar Chemist.
1898. Royle, Thos. H., c/o Messrs. Carew and Co., Rosa, N.W.P., India, Chemist.
O.M. Royle, T., Dalton House, Upton Lane, E., and (Journals) 41, George Street, Cheetham Hill, Manchester, Chemical Engineer.
O.M. Royse, S. W., St. Andrew's Chambers, Albert Square, Manchester, Chemical Engineer.
1890. Royston, Ernest R., 15, Water Street, Liverpool, Patent Agent.
1896. Ruddock, Fred. G., 19, Stanley Street, Warrington, Analytical Chemist.
1895. Rudge, Alfred, Sutton Alkali Works, St. Helens, Analytical Chemist.
1884. Ruffle, Jno., Musley, Ware, Herts, Consulting Chemist and Electrician.
1898. Ruhl, Louis, c/o Roessler and Hasslacher Chemical Co., P.O. Box 1999, New York, U.S.A., Chemical Merchant.
O.M. Rumble, C., Belmont Works, Battersea, London, S.W., Candle Works Chemist.
1899. Rumbold, Wm. R., 569, Chester Road, Old Trafford, Manchester, Electro-Metallurgist.
1895. Rump, Ernst, The Leeds Phosphate Works, Hunslet, Leeds, Manager.
1899. Rushby, Wm., Cheapside, Batley, Yorks, Analyst.
1901. Rushton, Benjamin, Waterloo, Whalley Road, Accrington, Analytical Chemist.
1887. Russell, D., Cadham, Markinch, Fife, N.B., Paper Maker.
1896. Russell, G. H., c/o Thomson Bros., New Chester Road, Birkenhead, Chemist (Glue and Gelatin Works).
1884. Russell, Jno., Anchor Brewery, Britten Street, Chelsea, London, S.W., Brewer.
O.M. Russell, Dr. W. J., F.R.S., 34, Upper Hamilton Terrace, London, N.W., Professor of Chemistry.
1892. Russell, Wm., c/o Gold and Silver Extraction Co. of America, Box 1606, Denver, Col., U.S.A., Analytical Chemist.
1883. Ryder, C. E., Northfield, near Birmingham, Electro-Metallurgist.
1884. Ryland, Howard P., Moxhull Park, Erdington, Birmingham, Agricultural Chemist.

S

1895. Saalfeld, Adolphe, 38–40, Lancaster Avenue, Fennel Street, Manchester, Chemical Merchant.
1895. Saarbach, Dr. L., 114, Pearl Street, New York, U.S.A., Consulting Chemist.
1883. Sadler, A. E., Sand Hall, Ulverston, Lancashire, Manufacturing Chemist.
O.M. Sadler, Dr. S. A., M.P., Middlesbrough-on-Tees, Colour Manufacturer.
1884. Sadtler, Dr. S. P., 145, North 10th Street, Philadelphia, Pa., U.S.A., Consulting Chemist.
1896. Sadtler, Dr. S. S., 336, West Franklin Street, Germantown, Pa., U.S.A., Chemist (U.S. Customs).
1897. Sage, C. Edward, 2, Charterhouse Street, London, E.C., Consulting Chemist.
1897. St. John, Harry, Queen Street Brewery, Sunderland, Brewer and Analyst.
1884. Salamon, A. G., 1, Fenchurch Avenue, London, E.C., Consulting Chemist.
1885. Salamon, Jno., Rainham, S.O., Essex, Manufacturing Chemist.
1884. Salis-Mayenfeld, Dr. E. von., P.O. Box 165, Albany, N.Y., U.S.A., Technical Chemist.
1894. Salter, Chas. T. C., 33, Park Hall Road, East Finchley, N., Scientific Journalist.
O.M. Samuel, W. Cobden, 337, Norwood Road, West Norwood, S.E., Analytical Chemist.
O.M. Samuelson, Rt. Hon. Sir Bernhard, Bart., F.R.S., 56, Prince's Gate, London, S.W., Ironmaster.

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1896. Samuelson, Francis A. E., Sir B. Samuelson and Co., Ltd., Middlesbrough, Ironmaster.
1895. Samuelson, Godfrey B., c/o Messrs. W. T. Glover and Co., Salford, Electrical Manufacturer.
1901. Sanders, C. Newell, Roanoke, Va., U.S.A., Railway Chemist.
1895. Sanderson, John, Chemist.
1898. Sanderson, T. Crisp, c/o Matheson and Co., 25–27, Cedar Street, New York City, U.S.A., Chemical Engineer.
1899. Sandford, J. Wallace, c/o A. W. Sandford and Co., Grenfell Street, Adelaide, S. Australia, Analytical Chemist.
1884. Sandon, R., 42, Lewisham Road, Dartmouth Park, N.W., Examiner at Patent Office.
O.M. Sanford, P. Gerald, Analytical Laboratory, 20, Cullum Street, E.C., Analytical and Consulting Chemist.
1890. Saniter, E. H., 51, Grange Road West, Middlesbrough, Analytical Chemist.
1891. Sankey, Chas. H., Iron Bridge and Essex Wharves, Canning Town, E., Fire- and Acid-Proof Goods Maker.
1896. Saunders, Walter M., 20, Dewey Street, Olneyville, R.I., U.S.A., Analytical Chemist.
1895. Savage, Arthur E., Sulphide Corporation Works, Cockle Creek, Newcastle, N.S.W., Metallurgist.
1895. Sawers, Wm. D., 70, Barrington Drive, Glasgow, W., Chemist.
1901. Sawyer, Harris E., 172, Federal Street, Boston, Mass., U.S.A., Chemist and Bacteriologist.
1898. Saxe, Sigmond, 108, Fulton Street, New York City, U.S.A., Manufacturing Chemist.
1895. Sayer, Harry, 29, St. George's Square, London, S.W., Metallurgical Chemist.
1894. Sayers, Jos. J., Mayville, Stevenston, Ayrshire, Explosives Chemist.
1895. Scales, F. Shillington, Wearmouth Paper Mill, Sunderland, Paper Maker.
1899. Schaak, Dr. Milton F., 108, Penn Street, Brooklyn, N.Y., U.S.A., Chemist.
O.M. Schack-Sommer, Dr. G., 48, Marlborough Mansions, Victoria Street, S.W., Sugar Refiner.
1884. Schad, Julius, York Buildings, 33, Mosley Street, Manchester, Aniline Co.'s Agent.
1899. Schaefer, Dr. L., Maywood, N.J., U.S.A., Manufacturing Chemist.
1898. Schaffer, Herbert A., 347, Brodhead Street, Easton, Pa., U.S.A., Chemist (Vulcanite Portland Cement Co.).
O.M. Schäppi, Dr. H., Mitlödi, Canton Glarus, Switzerland, Analytical Chemist.
1886. Schellhaas, H., Thornhill, Beach Road, Hartford, Northwich, Mechanical Engineer.
1894. Schidrowitz, Dr. P., 57, Chancery Lane, W.C., Research Chemist.
1895. Schieffelin, Dr. W. Jay, 841, Southern Boulevard, New York, U.S.A., Manufacturing Chemist.
1893. Schleicher, Francis J., 38, West Tenth Street, Long Island City, N.Y., U.S.A., Technical Chemist.
1899. Schniewind, Dr. F., 277, Broadway, New York City, U.S.A., Chemist.
1897. Schoder, Dr. Robt., The Incandescent Gas Light Co., 14, Palmer Street, Westminster, S.W., Chemist.
O.M. Scholefield, H. E., Greenwood, Victoria Park, Wavertree, Liverpool, Chemical Manufacturer.
1898. Scholes, Geo. R., 27, Station Road, Urmston, Manchester, Analytical Chemist.
1895. Schroeder, E. August, c/o Church and Co., 36, Ash Street, Brooklyn, N.Y., U.S.A., Chemist.
1900. Schroller, Wm., 20, Mount Street, Manchester, Engineer.
1894. Schryver, Dr. S. B., Chemist.
1888. Schulze, Dr. Karl E., Winkel, Rheingau, Germany, Technical Chemist.
O.M. Schunck, Dr. E., F.R.S., Kersal, near Manchester, Colour Chemist.
1893. Schüpphaus, Dr. R. C., 174, Broadway, New York, U.S.A., Consulting Chemist.
1893. Schwab, Dr. L. C., Sedanstrasse 53, Bernburg, Anhalt, Technical Chemist.
1900. Schwarz, Dr. Henry P., c/o Haas Bros., 27, William Street, New York City, U.S.A., Chemist.
1889. Schweich, Emil, 85, Belgrave Road, London, S.W., Technical Chemist.
1894. Schweitzer, Dr. H., 40, Stone Street, New York City, U.S.A., Analytical Chemist.
1891. Scott, Andrew, Royal Gunpowder Factory, Waltham Abbey, Essex, Analytical Chemist.
1893. Scott, A. Ross, Verreville, Lenzie, N.B., Manufacturing Chemist.
1889. Scott, Ernest G., 2, Talbot Court, Gracechurch Street, London, E.C., Soap Works Chemist.
1898. Scott, Jas., Cawnpore Woollen Mills, Cawnpore, India, Chemist.
1894. Scott, Jno. Gillespie, Annislea, Northfield, Liberton, near Edinburgh, Analytical Chemist.
1894. Scott-Smith, G. E., 67, Surrey Street, Sheffield, Analytical Chemist.
1889. Scovell, M. A., Lexington, Kentucky, U.S.A., Agricultural Chemist.
1887. Scrutton, Willis, Analytical Chemist.
1896. Scrymgeour, Wm., Box 92, Kalgoorlie, West Australia, Chemist.
O.M. Scudder, F., Mersey and Irwell Joint Committee, 44, Mosley Street, Manchester, Analytical Chemist.
1895. Seabrooke, H. Cecil, Laboratory, The Brewery, Reading, Research Chemist.
1898. Seal, Alf. N., 504, 11th Street N.W., Washington, D.C., U.S.A., Chemist.
1900. Searby, Fred. W., West Berkeley, Cal., U.S.A., Oilworks Superintendent.
1889. Searl, Albert, Montreux, Victoria Road, Sidcup, Kent, Technical Chemist.
1898. Searle, Alf. B., 280, Western Bank, Sheffield, Analytical Chemist.
1896. Sedding, G. H. P., c/o Florida Syndicate, Jacksonville, Florida, U.S.A., Chemist.
1901. Sederholm, Erik, 28, Jakopsgatan, Stockholm, Sweden, Chemist (Royal Navy Board).
1901. Seeler, Dr. F., c/o Geo. Lueders and Co., Chemical Works, Elizabeth, N.J., U.S.A., Manufacturing Chemist.
1893. Sefton-Jones, Herbert, c/o W. P. Thompson and Co., 322, High Holborn, W.C., Analytical Chemist.
1899. Seher, A., c/o Maas and Waldstein, Riverside Avenue, Newark, N.J., U.S.A., Chemist.
1896. Seldner, Rudolph, 217, Jefferson Avenue, Brooklyn, New York, U.S.A., Instructor in Chemistry.
1884. Semet, Louis, 217, Chaussée de Vleurgat, Brussels, Alkali Manufacturer.
1900. Semonite, Radcliffe G. C., 910*a*, Greene Avenue, Brooklyn, N.Y., U.S.A., Chemist.
1898. Sen (Gupta), Nagendra Nath, 18, Lower Chitpur Road, Calcutta, India, Physician and Chemist.
1895. Senger, Robt., 37, Warren Street, New York City, U.S.A., Manufacturing Chemist.
1899. Senior, Francis L., Lock 28, Sanford, Maine, U.S.A., Mill Chemist.
O.M. Sevin, C., c/o Dollman & Pritchard, 9 and 10, King Street, Cheapside, E.C., Chemical Engineer and Oil Refiner.
1900. Seward, Geo. O., Holcomb Rock, Va., U.S.A., Chemist.
1896. Seyler, Clarence A., Technical Institute, Nelson Terrace, Swansea, Chemist and Assayer.
1889. Seymour-Jones, A., Cambrian Leather Works, Wrexham, Leather Manufacturer.
1894. Shallcross, Arthur, Excelsior Chemical Works, Corbett Street, Bradford, near Manchester, Chemical Manufacturer.
1892. Shanks, Arch., Bridgend Mills, Dalry, Ayrshire, N.B., Chemist.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

O.M. Shapleigh, W., Welsbach Incandescent Gas Light Co., Gloucester City, N.J., U.S.A., Technical Chemist.

1883. Sharp, James, Shirley Manor, Wyke, near Bradford, Yorks, Dyer.

1891. Sharpe, Granville H., 11 & 12, Great Tower Street, London E.C., Analytical Chemist.

1884. Sharples, Stephen P., 13, Broad Street, Boston, Mass., U.S.A., Analytical Chemist.

1896. Sharpley, Wm. P., Ditton Copper Works, Widnes, Lancashire, Analytical Chemist.

1900. Sharwood, Wm. J., c/o Montana Mining Co., Marysville, Lewis and Clarke Co., Mont., U.S.A., Metallurgical Chemist.

1900. Shattuck, A. F., The Solvay Process Co., Detroit, Mich., U.S.A., Chemist.

1885. Shaw, F. W., Temple House, Heapey, near Chorley, Lancashire, Analytical Chemist.

1883. Shaw, Geo., 35, Temple Row, Birmingham, Patent Agent.

1890. Shaw, H. Dixon, Bond Street, Dewsbury, Yorks, Analytical and Consulting Chemist.

O.M. Shearer, A., 36, Demesne Road, Alexandra Park, Manchester, Technical Chemist.

O.M. Shenstone, W. A., F.R.S., Clifton College, Bristol, Chemical Lecturer.

1892. Shenton, Jas. P., 34, Lansdowne Road, Albert Park, Didsbury, Manchester, Analytical Chemist.

1889. Shepard, Dr. Chas. U., 56–58, Broad Street, Charleston, S.C., U.S.A.

1900. Shepherd, E. Sanger, 5-7, Gray's Inn Passage, Holborn, W.C., Scientific Instrument Maker.

1893. Shepherd, H. H. B., Northcote, Mount Pleasant Lane, Upper Clapton, N.E., Chemist.

1898. Shepherd, Reginald des F., Handforth, Cheshire, Printworks Chemist.

1895. Sherman, G. W., Room 509, Exchange Building, 53, State Street, Boston, Mass., U.S.A., Chemical Engineer.

1899. Shero, John E., c/o Pittsburgh Reduction Co., Niagara Falls, N.Y., U.S.A., Chemist.

1893. Shields, Dr. J., Scottish Cyanide Co., Ld., Leven, Fife, N.B., Chemist.

1899. Shillitoe, Frank, Pontefract Road, Castleford, Yorks, Chemist.

1896. Shimomura, K., c/o Osaka Seimi Works Co., Kawagishicho, Nishiku, Osaka, Japan, Chemist.

1886. Shimosé, Masachika, Shimosé Powder Works, Takinogawa, near Oji, Tokyo, Japan, Chemical Engineer.

1888. Shishkoff, Sergius A., Elabouga, Govt. of Viatka, Russia, Manager (Glass Works).

1893. Shishkoff, Waldemar A., Russia, Chemical Engineer.

1899. Sholes, Chas. E., c/o General Chemical Co., Syracuse, N.Y., U.S.A., Chemical Salesman.

1900. Shonk, Albert, 168, Malmesbury Road, Canning Town, E., Analytical Chemist.

1899. Shores, Jeff H., Mill Brow, Widnes, Chemist..

1897. Shorey, Dr. Edmund C., Office of Board of Health, Honolulu, H.I., Chemist.

1901. Shukoff, Dr. Alexis A., c/o A. M. Shukoff, St. Petersburg, Russia, Technical Chemist.

1899. Shuler, Darius P., Sudbury, Ont., Canada, Chemist.

1890. Shutt, Frank T., Central Experimental Farm, Ottawa, Canada, Agricultural Chemist.

O.M. Siebold, L., Broomville Avenue, Sale, Manchester, Analytical Chemist.

O.M. Sill, T. T., c/o United Alkali Co., Ld., Flint, North Wales, Alkali Works Manager.

1884. Sillar, W. Cameron, The Native Guano Co., Limited, 29, New Bridge Street, Blackfriars, E.C., Director (Native Guano Co.).

1892. Silvester, Harry, Holyhead Road, Handsworth, Birmingham, Analytical and Consulting Chemist.

1899. Simeons, Carl, 70, Finsbury Pavement, London, E.C., Gelatine Manufacturer.

1898. Simon, Dr. A., 55–56, Bishopsgate Street, E.C., Chemical Engineer.

1890. Simonds, Dr. F. M., 159, Front Street, New York, U.S.A., Mining Engineer and Assayer.

1897. Simpson, Edw. S., Geological Survey Office, 395, St. George's Terrace, Perth, West Australia, Government Assayer.

O.M. Simpson, W. S., Halcyon House, Private Road, Enfield, N., Analytical Chemist.

1900. Sims, W. Edgar, 11, Brampton Grove, Cheetham, Manchester, Technical Chemist.

1894. Sinclair, Dr. W., 60, Stirling Road, Trinity, Edinburgh, Chemist.

1890. Sindall, R. W., c/o Lloyd, Ltd., Sturgeon Falls, Ont., Canada, Paper Mills Chemist.

1889. Singer, Ignatius, Petone, near Wellington, New Zealand, Manufacturing Chemist.

1899. Singmaster, Jas. A., Palmerston, Pa., U.S.A., Chemist (India Refining Co.)

O.M. Sisson, G., jun., c/o Washington Chemical Co., Lim., Washington Station, R.S.O., Co. Durham, Works Manager.

1885. Skaife, Wilfred T., 630, Sherbrooke Street, Montreal, Canada, Sugar Chemist.

1894. Skelton, John R., St. Augustine's Crape Factory, Norwich, Technical Chemist.

1897. Skertchley, W. P., Laboratory, 11, Billiter Square, E.C., Analytical Chemist.

1891. Skilton, C. F. E., Brewery House, Staines, Brewer.

1896. Skurray, Thos., United Breweries, Abingdon, Berks, Brewer.

1897. Skvortzoff, Basil N., Works of Oushkoff & Co., Kazan, Russia, Chemical Technologist.

O.M. Slade, H. E., Streatham Common, London, S.W., Rubber Works Manager.

1887. Slatter, Geo. W., Carlton Terrace, Nab Wood, Shipley, Yorkshire, Analytical Chemist.

1895. Slocum, Frank L., 401, South Linden Avenue, E.E., Pittsburgh, Pa., U.S.A., Chemist.

1899. Slosson, Edwin E., University of Wyoming, Laramie, Wyoming, U.S.A., Professor of Chemistry.

1883. Smail, J. I., Warren Wood, Hayes Common, Beckenham, Kent, Chemical Manufacturer.

1898. Small, Fritz H., c/o Graton and Knight Manufacturing Co., Worcester, Mass., U.S.A., Chemist.

O.M. Smetham, A., 16, Brunswick Street, Liverpool, Analytical Chemist.

1884. Smiles, Jas., Blandfield Chemical Works, Canonmills, Edinburgh, Manufacturing Chemist.

1900. Smith, A. George, 9, Forest Road, Aberdeen, Optician.

1898. Smith, Alf. B., Whiteley House, Glossop, Derbyshire, Bleacher and Dyer's Manager.

1886. Smith, Alfred, Excelsior Chemical Works, Clayton, Manchester, Manufacturing Chemist.

1897. Smith, Allan, c/o Kellner-Partington Paper Pulp Co., Hallein, bei Salzburg, Austria, Paper Mills Chemist.

1898. Smith, Andrew B., c/o Mr. Armstrong, Chemist, Queenstown, C.C., S. Africa.

1896. Smith, Andrew T., 43, Castle Street, Liverpool, Chemical Broker.

1895. Smith, E. Ellsworth, 36, East 29th Street, New York, U.S.A., Consulting Physiological Chemist.

1893. Smith, Edgar B., Prince Regent's Wharf, Silvertown, E., Chemist.

O.M. Smith, Edgar F., c/o E. M. Robson, Trelawny, Fairfax Road, Bedford Park, W., Analytical Chemist.

1892. Smith, Ernest A., The Assay Office, Leopold Street, Sheffield, Assayer.

1900. Smith, E. Sell, c/o Grasselli Chemical Co., East Chicago, Indiana, U.S.A., Manufacturing Chemist.

1898. Smith, E. Shrapnell, 35, Botanic Road, Wavertree, Liverpool, Chemical Engineer.

1891. Smith, Francis P., Room 2, Bryson Block, Los Angeles, Cal., U.S.A., Chemist.

1885. Smith, Fred., Analytical Chemist.

O.M. Smith, G., Polmont Station, Scotland, Explosives Works Manager.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1897. Smith, Sir Geo. J., Messrs. Bickford, Smith, & Co., Ltd., Tuckingmill, Cornwall, Fuse Manufacturer.
1890. Smith, Harry, 74, Fairfield Road, West Jesmond, Newcastle-on-Tyne, Technical Chemist.
1890. Smith, Harry E., 29, 31st Street, Milwaukee, Wis., U.S.A., Analytical Chemist.
1900. Smith, H. Ewing, 22, City Road, London, E.C., Manufacturing Chemist.
1898. Smith, H. Gilbertson, Hollies, Park Hill, Clapham, S.W.
O.M. Smith, H. R., 1, Aubert Park, Highbury, London, N., Analytical Chemist.
1890. Smith, H. Wood, c/o British Cyanides Co., Ltd., Oldbury, near Birmingham, Analytical Chemist.
1897. Smith, James, 14, Mersey Road, Aigburth, Liverpool, Analytical Chemist.
1893. Smith, Jas. F., 30, Chester Road, Akroydon, Halifax, Analytical Chemist.
O.M. Smith, J., Ash Grove House, Radcliffe, Manchester.
O.M. Smith, Dr. J. H., Wollishofen, Zurich, Switzerland, Chemical Manufacturer.
1884. Smith, J. Johnstone, Lockwood Brewery, Huddersfield, Brewing Chemist.
1898. Smith, John, Hartley Street Dyeworks, Dewsbury, Yorks, Dyer.
1896. Smith, Joseph Kent, Oakville, Alsager, Cheshire, Metallurgical Chemist.
1888. Smith, J. Tertius, c/o Jeyes' Sanitary Compound Co., Ltd., Plaistow, Essex, Technical Chemist.
O.M. Smith, Jno. W., Massachusetts Institute of Technology, Boston, Mass., U.S.A., Analytical Chemist.
1890. Smith, J. Wm., Solvay Process Co., Syracuse, N.Y., U.S.A., Alkali Works Manager.
1898. Smith, R. F. Wood, Laboratory, 89, Bartholomew Close, E.C., Consulting Chemist.
1890. Smith, R. Greig, Linnean Society's House, Elizabeth Bay, Sydney, N.S.W., Analytical Chemist.
1890. Smith, R. Watson, c/o J. and J. Cunningham, Ltd., Salamander Street, Leith, N.B., Chemical Works Manager.
O.M. Smith, S., Hacienda, Leicester Road, New Barnet, Analytical Chemist.
1900. Smith, T. Connell, Blandfield Chemical Works, Edinburgh, Manufacturing Chemist.
1896. Smith, T. Reader, Urban District Council, Kettering, Surveyor, Assoc. M. Inst. C.E.
1897. Smith, Theophilus R., c/o Brotherton & Co., Haigh Park Chemical Works, Stourton, near Leeds, Chemist.
1896. Smith, Walter E., 47, Jenkins Street, Providence, R.I., U.S.A., Instructor in Chemistry.
O.M. Smith, Watson, 34, Upper Park Road, Haverstock Hill, N.W., Editor of Society's Journal.
O.M. Smith, Wilfred, 182, West Street, Glasgow, Chemical Manufacturer.
1896. Smith, W. Stanley, Highfield, near Wrexham, North Wales, Brewer.
O.M. Smithells, Prof. A., Yorkshire College, Leeds, Professor of Chemistry.
O.M. Smithers, F. O., Dashwood House, 9, New Broad Street, London, E.C., Chemical Agent.
O.M. Smithson, J., Park Printworks, Halifax, Stuff Printer.
1892. Smithson, Saml., Ravensthorpe, near Dewsbury, Yorks, Dyer and Drysalter.
1888. Snape, Dr. H. Lloyd, University College, Aberystwith, Professor of Chemistry.
1896. Snowdon, Charlie, 269, West Ferry Road, Millwall, E., Chemical Works Manager.
1896. Snowdon, Jno., jun., Messrs. Snowdon, Sons, & Co., Millwall, E., Chemical and Oil Manufacturer.
1900. Snyder, Geo. D., 31, Bradford Street, Brooklyn, N.Y., U.S.A., Chemist.
1900. Sodeau, Wm. H., 25, Shore Road, London, N.E., Chemist to Explosives Committee.
1894. Sohn, Chas. E., 2, Harpur Street, Bedford Row, London, W.C., Analyst.
1895. Solvay, Armand, 25, Rue Prince Albert, Brussels, Gérant de la Société Solvay et Cie.
1884. Solvay, Ernest, 43, Rue des Champs Elysées, Brussels, Alkali Manufacturer.
1897. Somerset, H. St. John, jun., Mount Morgan Gold Mining Co., Mount Morgan, Queensland, Assayer.
1884. Sommer, Adolf, corner 1st and Binney Streets, East Cambridge, Boston, Mass., U.S.A., Pharmaceutical Chemist.
1898. Sommerville, Jno. D., 45, Montgomerie Street, Kelvinside, Glasgow, Analytical Chemist.
1894. Sonstadt, Edw., Church Fields, Cheshunt, Herts, Chemical Technologist.
1896. Sorel, Ernest, 93, Avenue d'Orleans, Paris, Engineer.
1896. Souther, H., 440, Capitol Avenue, Hartford, Conn., U.S.A., Chemical and Metallurgical Engineer.
1892. Southern, Thos., Jr., Wheathill Chemical Works, St. Simon Street, Salford, Manufacturing Chemist.
1883. Soward, A. W., 28, Therapia Road, Honor Oak, S.E., Principal Clerk (Legacy Duty Office).
1890. Sowerby, Thos. H., Canal Soap Works, Verney Road, Rotherhithe New Road, S.E., Soap Manufacturer.
O.M. Sowerby, W. M., 12, Upper Queen's Terrace, Fleetwood, Lancashire, Alkali Works Manager.
1887. Spackman, Chas., Rosehaugh, Clitheroe, Lancashire, Portland Cement Manufacturer.
1900. Sparks, John C., Bement Avenue, Livingston, S.I., N.Y., U.S.A., Chemist.
1883. Spence, D., Alum Works, Manchester, Alum Manufacturer.
O.M. Spence, F., Alum Works, Manchester, Alum Manufacturer.
1900. Spence, Howard, Audley, Broad Road, Sale, Cheshire, Chemical Manufacturer.
1894. Spence, J. Napier, Heathfield, Harrow-on-the-Hill, Teacher of Chemistry.
1883. Spence, J. W., 58, Dobbie's Loan, Glasgow, Drysalter.
1900. Spencer, Harold, Springside, Sharples, Bolton, Lancashire, Paper Maker.
1884. Spencer, Jno., Globe Tube Works, Wednesbury, Tube Manufacturer.
O.M. Spencer, J. W., Newbiggin House, Kenton, Newcastle-on-Tyne, Steel Manufacturer.
1897. Sperry, Erwin S., 208, Colorado Avenue, Bridgeport, Conn., U.S.A., Metallurgist.
1884. Spiegel, Dr. Adolf, Messel, bei Darmstadt, Germany, Analytical Chemist.
1899. Spieler, Aug. J., c/o The Will and Baumer Co., Syracuse, N.Y., U.S.A., Stearic Acid Works Superintendent.
1889. Spies, Adolph, 102, Fenchurch Street, London, E.C., Chemical Merchant.
1889. Spies, Hermann, 102, Fenchurch Street, London, E.C., Chemical Merchant.
1885. Spiller, A., Edison-Swan Electric Co., South Benwell Works, Newcastle-on-Tyne, Electrician.
O.M. Spiller, J., 2, St. Mary's Road, Canonbury, London, N., Consulting Chemist.
1896. Spoor, J. L., Madras Cement Works, Madras, India; and (Journals), Culver House, Gravesend, Kent, Portland Cement Manufacturer.
O.M. Sprengel, Hermann Johann Philipp, Ph.D. (Heidelb.), F.R.S., Royal Prussian Professor (titular); Journals to Prof. Sprengel, F.R.S., Savile Club, 107, Piccadilly, London, W., Chemist.
1900. Spurge, Edw. C., 11, Gotha Street, Victoria Park Road, London, N.E., Chemist.
O.M. Squire, P. W., 413, Oxford Street, London, W., Pharmaceutical Chemist.
O.M. Squire, Dr. W. S., Clarendon House, St. John's Wood Park, N.W., Chemical Engineer.
1896. Stafford, Chas. H., c/o The Birkacre Printing Co., Birkacre, Chorley, Colourist.
1898. Stainton, Wm. J., 378, Elmwood Avenue, Buffalo, N.Y., U.S.A., Analytical Chemist.
O.M. Stahl, Dr. K. F., 57th Street and A. V. Ry., Pittsburgh, Pa., U.S.A., Chemical Works Manager.
1891. Stanger, W. Harry, Broadway Testing Works, Westminster, S.W., Engineer.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1884. Stanning, John, Broadfield, Leyland, near Preston, Bleacher.
1888. Stantial, Frank G., c/o Cochrane Chemical Co., Everett, Mass., U.S.A., Technical Chemist.
1885. Staples, H. J., Spondon, Derby, Colour Manufacturer.
O.M. Stark, J. F., 9, Allfarthing Lane, Wandsworth, S.W., Works Superintendent.
1896. Statham, Noel, Penny Lane Farm, Cronton, Prescot, Lancashire, Engineer.
1895. Stead, J. Christopher, Mitre Works, Cordova Road, Bow, E., Chemist and Manager.
O.M. Stead, J. E., 11, Queen's Terrace, Middlesbrough-on-Tees, Analytical Chemist.
1898. Stearns, Theron C., 44, Montgomery Street, Jersey City, N.J., U.S.A., Consulting Chemist.
O.M. Stebbins, J. H., 80, Madison Avenue, New York, U.S.A., Analytical Chemist.
O.M. Steedman, R. H., Golftyn, Carric kRoad, Ayr, N.B., Chemical Manufacturer.
1896. Steel, Fred. W., c/o Cuming, Smith, and Co., Yarraville, Melbourne, Vic., Analytical Chemist.
1900. Steel, Jno. S., Fitzroy Meat Works, Lake Creek, Rockhampton, Queensland, Chemist.
1884. Steel, R. Elliott, Northampton and County School, Northampton, Headmaster.
O.M. Steel, Thos., Colonial Sugar Refinery, Sydney, N.S.W., Sugar Chemist.
1897. Stein, Sigmund, 323, Vauxhall Road, Liverpool, Sugar Refinery Manager.
1897. Steinhart, Dr. Oscar J., 4, Palace Street Mansions, Buckingham Gate, S.W., Manufacturing Chemist.
1887. Stenhouse, T., Townhead, Rochdale, Analytical Chemist.
1892. Stephens, M. E., 4, Carlton Gardens, London, S.W., Ink Manufacturer.
1884. Stephens, H. Chas., M.P., Avenue House, Finchley, N., Ink Manufacturer.
1889. Stern, Arthur L., 170, Ashby Road, Burton-on-Trent, Brewing Chemist.
O.M. Steuart, D. R., Broxburn, near Edinburgh, N.B., Oilworks Chemist.
1899. Stevenot, G. A., c/o Schoellkopf, Hartford, and Hanna Co., 100, William Street, New York, U.S.A., Chemist.
1898. Stevens, Arthur F., 61, Balfour Road, Highbury New Park, N.,Paper Examiner.
1894. Stevens, Jno. H., 295, Ferry Street, Newark, N.J., U.S.A., Manufacturing Chemist.
1884. Stevens, Wm., The Native Guano Co., Ltd., 29, New Bridge Street, Blackfriars, E.C., Secretary.
1899. Stevenson, Arnold, 4, Porchester Gardens, London, W., Chemist.
1884. Stevenson, Jas., 23, West Nile Street, Glasgow; and Hailie, Largs, N.B., Manufacturing Chemist.
O.M. Stevenson, Dr. T., Guy's Hospital, London, S.E., Chemical Lecturer.
O.M. Stevenson, W., Standard Works, 95A, Southwark Street, London, S.E., Chemical Manufacturer.
1893. Stewart, Alex. F., 1, Maybank Street, Crosshill, Glasgow, Assayer.
1891. Stewart, Jeffrey, Albert Mills, The Mall, Hammersmith, Sugar Works Manager.
1890. Stewart, Robt., c/o Boake, Roberts, and Co., Warton Road, Stratford, E., Chemical Works Manager.
1896. Stewart, R. Patrick, 21, Industry Place, Kirkintilloch, N.B., Analytical Chemist.
O.M. Stewart, S., c/o Michael Nairn and Co., Ltd., Linoleum Works, Kirkcaldy, N.B., Technical Chemist.
1899. Stewart, Saml., 16, Great George Street, Westminster, S.W., Managing Director (Explosives Co.).
1896. Stiebel, G. L., Manager.
1890. Stillman, Dr. T. B., Stevens Institute of Technology, Hoboken, N.J., U.S.A., Professor of Analytical Chemistry.
1884. Stillwell, Chas. M., 55, Fulton Street, New York, U.S.A., Analytical and Consulting Chemist.
1886. Stirk, Jos., Ferncliffe, Elm Bank, Nottingham, Brewer's Engineer.
1893. Stock, F. W. Keating, County Analyst's Office, Darlington, Analytical and Consulting Chemist.
1900. Stockdale, Edgar, Printworks, Birstall, Yorks, Colour Mixer.
1888. Stockdale, Wm., Irwell Printworks, Stacksteads, near Manchester, Calico Printer.
1887. Stocks, H. B., 6, Sydney Road, Churchtown, Southport, Analytical Chemist.
1885. Stoddart, F. Wallis, Western Counties Laboratory, Bristol, Analytical Chemist.
1899. Stoddart, Reginald T., Belgrave Terrace, Queen's Road, Cheetham, Manchester, Chemist.
O.M. Stoer, J., 6, Hanover Quay, Dublin.
O.M. Stoker, G. N., Government Laboratory, Clement's Inn Passage, Strand, W.C., Analytical Chemist.
1899. Stokes, Alf. W., Laboratory, Vestry Hall, Paddington Green, W., Public Analyst.
1898. Stokes, Dr. Henry N., U.S. Geological Survey, Washington, D.C., U.S.A., Chemist.
1892. Stone, Frank, Laboratory, 193, Collins Street, Melbourne, Victoria, Analytical Chemist and Assayer.
O.M. Stone, F. B., Eardley Villa, Picardy Hill, Belvedere, Kent, Technical Chemist.
1900. Stone, Geo. C., c/o New Jersey Zinc Co., 115, Broadway, New York City, U.S.A., Engineer.
1899. Stone, J. F., 157, Maiden Lane, New York, U.S.A., Chemical Merchant.
1888. Stone, Thos. W., Chemical Works, St. George, Bristol, Chemical Manufacturer.
O.M. Storey, I. H., Haverbreaks, Lancaster, Chemical Manufacturer.
1888. Stowe, W. T., Inland Revenue, Wellington, Salop, Analytical Chemist.
1883. Strangman, J. Pim, 38, Rue Desbordes-Valmore, Passy, Paris, Bleacher.
1887. Strong, Colin R., 13, St. Ann Street, Manchester, Oil Merchant.
O.M. Stuart, C. E., 29, Mosley Street, Newcastle-on-Tyne, Chemical Apparatus Dealer.
1896. Stuart, Harry T. R., Know Mill House, Entwistle, near Bolton, Printworks Sub-Manager.
O.M. Stuart, T. W., 7, Livingston Drive, Sefton Park, Liverpool, Alkali Works Manager.
1896. Stubbs, Augustus J., Cástaras, Prov. de Granada, Spain.
O.M. Studer, Dr. A., 10, Marsden Street, Manchester, Consulting Chemist.
1890. Studer, Simon J., Grappenhall Road, Stockton Heath, near Warrington, Technical Chemist.
1898. Styles, R. Curling, Knockhall, Greenhithe, Kent, Analytical Chemist.
1900. Suart, Arthur B., St. Paul's Works, Paul Street, Finsbury, E.C., Manager of Melting Department.
1896. Suckert, Dr. J. J., 253, Broadway, New York City, U.S.A., Manufacturing Chemist.
1895. Sudborough, Dr. J. J., University College, Nottingham, Lecturer in Chemistry.
1889. Sulman, H. L., 60, Gracechurch Street, London, E.C., Chemist and Metallurgist.
1895. Summers, Bertrand S., c/o McCormick Harvesting Machine Co., Western and Blue Island Avenues, Chicago, Ill., U.S.A., Electro-Chemist.
1890. Sumner, Harold, Worthington, near Wigan, Dyer and Bleacher.
1896. Sunderland, A., 84, Hainworth Wood Road, Ingrow, Keighley, Teacher of Chemistry.
1899. Sundstrom, Carl, c/o Solvay Process Co., Detroit, Mich., U.S.A., Chemist.
1895. Sundström, Karl J., Trenton, Wayne Co., Mich., U.S.A., Manufacturing Chemist.
1884. Sutherland, D. A., 28, Victoria Street, Westminster, S.W., Consulting Technical Chemist and Assayer.
1894. Sutherland, Geo., Croft Cottage, Bonhill, N.B., Chemist.
1887. Sutherland, Jas., c/o British Aluminium Co., Ltd., Larne Harbour, Co. Antrim, Ireland, Chemist.
O.M. Sutherland, R. M., Lime Wharf Chemical Works, Falkirk, N.B., Chemical Manufacturer.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1899. Sutherst, Dr. Walter F., Agricultural College, Holmes Chapel, Crewe, Science Master.
1901. Sutro, H. H., 60, West 49th Street, New York City, U.S.A., Chemist.
O.M. Sutton, Francis, Norfolk County Laboratory, Redwell Street, Norwich, Analytical Chemist.
1886. Sutton, F. Napier, 6, Grosvenor Gardens, Willesden Green, N.W., Alkali Works Inspector.
1900. Sutton, W. Lincelne, 11, Thorpe Dene, Norwich, Public Analyst.
O.M. Swan, J. Cameron, 4, Nicholas Buildings, Newcastle-on-Tyne, Manufacturing Chemist.
O.M. Swan, J. W., F.R.S., 58, Holland Park, London, W., Chemist and Electrician.
1898. Swanson, Jas. F. (Journals) c/o Gibbs and Co., Iquique, Chile; and (subsn.) c/o W. J. Andrew, Bank Buildings, Coatbridge, N.B., Technical Chemist.
1884. Swinburne, Geo., c/o J. Coates & Co., Planet Chambers, 8, Collins Street East, Melbourne, Australia; (subs.) Suffolk House, Laurence Pountney Hill, E.C., Gas Engineer.
1892. Sykes, James, Heckmondwike Oil and Chemical Works, Heckmondwike, Yorks, Oil Refiner.
O.M. Syme, W. B., c/o Young's Paraffin Oil Co., Addiewell, West Calder, N.B., Oil Works Chemist.
1900. Symes, Dr. W. H., 176, Worcester Street, Christchurch, New Zealand, Government Health Officer.

T

1895. Taber, G. H., jun., 4134, Girard Avenue, Philadelphia, Pa., U.S.A., Dept. Superintendent (Atlantic Refining Co.)
1895. Tait, Thos., S., Inverurie, N.B., Paper Maker.
1896. Takagi, T., c/o Sumitomo, Kobé, Japan, Chemical Engineer.
O.M. Takamatsu, T., Tokyo University, Japan, Analytical Chemist.
O.M. Takamine, Dr. J., 475, Central Park West, New York City, U.S.A., Engineer.
1890. Takayama, Jintaro, Imperial Geological Survey Office, Dept. of Agriculture, Tokio, Japan, Agricultural Chemist.
1898. Tanaka, Keishin, c/o Tokio Gas Co., 92, Sarnechō, Fukugawa, Tokio, Japan, Chemist.
1900. Tankard, Arnold R., 67, Surrey Street, Sheffield, Analytical Chemist.
O.M. Tate, F. H., 9, Hackins Hey, Liverpool, Analytical and Technical Chemist.
O.M. Tate, H., Sugar Refiner.
O.M. Tatlock, J., 40, Renfrew Street, Glasgow, Laboratory Furnisher.
O.M. Tatlock, R. R., 156, Bath Street, Glasgow, Consulting Chemist.
1892. Tatton, Reginald A., 44, Mosley Street, Manchester, Civil Engineer.
O.M. Taubman, R., 12, Eton Road, Haverstock Hill, N.W., Analytical Chemist.
1898. Taverner, W., Burnden, Hamilton Road, Burton-on-Trent, Brewers' Chemist.
1901. Tayler, Jno. Bernard, 2, Alma Terrace, Wavertree, Liverpool, Works Chemist.
1898. Taylor, B. Franklin, Lathrop Oil Mill Co., Hawkinsville, Ga., U.S.A., Manufacturing Chemist.
1895. Taylor, Edwin, 146, Hooper Street, Brooklyn, N.Y., U.S.A., Explosives Chemist.
1886. Taylor, G. Crosland, Ravenscar, Helsby, near Warrington, Electrical Engineer.
1894. Taylor, G. Midgley, 27, Great George Street, Westminster, S.W., Analytical Chemist.
1893. Taylor, G. W., Dinting Vale Printworks, Dinting, near Manchester, Printworks Chemist.
O.M. Taylor, H. E., 702, Alexandra Parade, Dennistoun, Glasgow, Lead Works Manager.
1883. Taylor, Jas., Department of Mines, Sydney, N.S.W., Government Metallurgist.
1888. Taylor, Jas. Davis, 9, Mincing Lane, London, E.C., Chemical Merchant.
1898. Taylor, Jas. M., 59, Kenmare Road, Sefton Park, Liverpool, Analytical Chemist.
1888. Taylor, J. Scott, c/o Winsor and Newton, Limited, 38, Rathbone Place, London, W., Technical Chemist.
1901. Taylor, Jno., 42, Thorndale Road, Waterloo, near Liverpool, Works Chemist.
1896. Taylor, Martin, Ingersley, Palmerston Road, Buckhurst Hill, Essex, Chemical Works Manager.
1898. Taylor, Newman, Linden House, Stamford Place, Sale, near Manchester, "Water Specialist."
1898. Taylor, Walter, Technical Chemist.
1892. Taylor, W. G. H., 56, Meanley Road, Manor Park, Essex, Analytical Chemist.
1885. Taylor, W. J., 55, Forsyth Street, Greenock, N.B., Technical Chemist.
1887. Teanby, G. W. A., Elvin Lodge, East Dereham, Norfolk, Analytical Chemist.
O.M. Teed, Dr. F. L., Chem. Laby., 9, Mincing Lane, London, E.C., Analytical Chemist.
O.M. Tennant, Sir Chas., Bart., 35, Grosvenor Square, S.W.; and Glen, Peeblesshire, N.B. (Journals to St. Rollox, Glasgow), Alkali Manufacturer.
1884. Tennant, Jas., United Alkali Co., Ltd., City Road, Newcastle-on-Tyne, Alkali Manufacturer.
1896. Tennille, Geo. F., c/o Southern Cotton Oil Co., Savannah, Ga., U.S.A., Chemist.
1888. Terry, Albert, Verulam, Mount Albert Road, Balwyn, near Melbourne, Victoria, Brewer.
1884. Terry, Hubert L., 14, Herbert Street, Moss Side, Manchester, Technical Chemist.
O.M. Tervet, R., 54, Penshurst Road, South Hackney, E., Oil Works Manager.
1893. Tetley, C. F., Messrs. Jos. Tetley and Son, The Brewery, Leeds, Brewer.
1897. Tetlow, Wm. E., Ash Cottage, Ashfield, Dunblane, N.B., Chemist.
1886. Thew, Walter H., Talbot House, Arundel Street, Strand, W.C., Director.
1897. Thiel, Dr. C. Walther, c/o F. Reddaway and Co., Ltd., Pendleton, Manchester, Chemist.
O.M. Thomas, C., Pitch and Pay, Stoke Bishop, near Bristol, Soap Manufacturer; Deputy Chairman, Midland Railway.
1894. Thomas, H. Russell, Broad Plain Soap Works, Bristol, Soap Manufacturer.
O.M. Thomas, J., Brook House, Wooburn, Wooburn Green, S.O., Paper Maker.
O.M. Thomas, J. W., 2, Hampstead Hill Mansions, London, N.W., Analytical Chemist.
1901. Thomas, Octavius, Gas and Water Offices, Pentre, Glamorganshire, Gas and Water Engineer.
1884. Thomas, R. Schofield, 4, South Road, Handsworth, Staffordshire, Chemical Merchant.
1888. Thomas, S. Percy, 2, Landrock Road, Hornsey, N., Technical Chemist.
1898. Thomas, Wm. Harrison, jun., Colonial Bleaching and Printing Co., St. Henry, Montreal, Canada, Printworks Chemist.
1892. Thomason, Wm., c/o Doulton and Co., Lambeth Pottery, London, S.E., Chemist.
1885. Thompson, Prof. Claude M., 38, Park Place, Cardiff, Professor of Chemistry.
1898. Thompson, Edw. C., 139, Church Lane, Charlton, Kent, Manufacturing Chemist.
1899. Thompson, Erwin W., Charlotte, N.C., U.S.A., Mill Engineer.
1893. Thompson, G. Rudd, 69, Dock Street, Newport, Mon., Analytical and Consulting Chemist.
1895. Thompson, Gustave W., c/o National Lead Co., Marshall Street, Brooklyn, N.Y., U.S.A., Chemist.
1885. Thompson, W., Sankey Hill, Earlestown, Lancashire, Sugar Refiner.
1884. Thompson, W. G., Tonge Springs Works, Middleton, near Manchester, Colour Manufacturer.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

O.M. Thompson, W. P., Patent Office, 6, Lord Street, Liverpool, Patent Agent.
1896. Thomsen, Alonzo L., 33, South Holliday Street, Baltimore, Md., U.S.A., Manufacturing Chemist.
1889. Thomson, Dr. Andrew, 8, Ardenlea, Pitcullen, Perth, Chemical Lecturer.
1884. Thomson, G. Carruthers, 53, Bedford Road, Rock Ferry, Birkenhead, Engineer.
1891. Thomson, Jas. M., Royal Gunpowder Factory, Waltham Abbey, Essex, Manager (Cordite Branch).
1894. Thomson, John, The Grange, Buckton Vale, Stalybridge, Printworks Manager.
O.M. Thomson, J. S., c/o Messrs. Grieve and Co., West Tower Street, Carlisle, Technical Chemist.
1884. Thomson, Robt. T., 156, Bath Street, Glasgow, Analytical Chemist.
1899. Thomson, Thos., Waterproofing Co., Barrhead, near Glasgow, Manufacturer.
O.M. Thomson, W., Royal Institution, Manchester, Analytical and Consulting Chemist.
1890. Thomson, Wm. Thos., Royal Gunpowder Factory, Waltham Abbey, Essex, Explosives Chemist.
1900. Thorman, J. Stanley, West Ham Gasworks, Stratford, E., Chemist.
O.M. Thorne, Dr. L. T., 8, Dynevor Road, Richmond-on-Thames; and (Journals) Southampton Wharf, Battersea, S.W., Technical Chemist.
O.M. Thorneycroft, Wallace, Rockdale Lodge, Stirling, N.B., Technical Chemist.
1891. Thornton, Christopher, Allen's Printworks, Providence, R.I., U.S.A., Printworks Manager.
1891. Thornton, David H., Brookfoot Dyeworks, Brighouse, Yorks, Dyer.
1887. Thornton, H., Redbourn, Ashford, Middlesex, Analytical Chemist.
1899. Thornton, Wm., (Journals) c/o Isaac Brandon & Bros., Panama, Central America; and (subsn.) c/o Thos. Thornton, Hermand, West Calder, N.B., Chemist.
1895. Thorp, Frank H., Mass. Inst. of Technology, Boston, Mass., U.S.A., Instructor in Industrial Chemistry.
O.M. Thorpe, Dr. T. E., F.R.S., Government Laboratory, Clement's Inn Passage, Strand, W.C.; and (Journals) 61, Ladbroke Grove, Notting Hill, W., Chief Chemist (Customs and Inland Revenue).
1898. Thurnauer, Gustav, c/o Aurora Metal Co., Aurora, Ill., U.S.A., Chemist.
1899. Tiemann, Hugh P., 125, West 43rd Street, New York City, U.S.A., Student.
1900. Tiffany, Walton C., 21½, Spruce Street, Manhattan, N.Y., U.S.A., President (Trade Chemists' Co.).
O.M. Tilden, Prof. W. A., F.R.S., The Oaks, Murray Road, Northwood, Middlesex, Professor of Chemistry.
1900. Tilley, Jas. W., 2, Stockwell Crescent, London, S.W., Research Chemist.
1886. Timmins, A., Argyll Lodge, Higher Runcorn, Civil Engineer.
O.M. Timmis, T. Sutton, Widnes, Chemical Manufacturer.
1894. Tipler, Fred. C., 48, Brooklyn Street, Crewe, Analytical Chemist.
1890. Tobey, C. H., Collingwood, Ontario, Canada, Tannery Chemist.
1894. Toch, Maximilian, c/o Toch Bros., 468–472, West Broadway, New York City, U.S.A., Chemist.
1893. Tocher, Jas. F., 1, Chapel Street, Peterhead, N.B., Pharmaceutical Chemist.
1886. Todd, A. M., 204, North Rose Street, Kalamazoo, Mich., U.S.A., Manufacturing Chemist.
1899. Tompkins, Vreeland, 533, Communipaw Ave., Jersey City N.J., U.S.A., Analytical Chemist.
O.M. Toms, F. Woodland, States Analyst's Office, St. Heliers, Jersey, Analytical Chemist.
1899. Tone, Jay E., 1427, Woodland Avenue, Des Moines, Iowa, U.S.A.
1896. Tonkin, John, 2603, East Broad Street, Richmond, Va., U.S.A., Manufacturing Chemist.
1889. Tothill, M. A. L., Castle and Buitengracht Streets, Cape Town, S. Africa, Manufacturing Chemist.
O.M. Towers, J. W., Brantwood, Allerton, near Liverpool, Analytical Chemist.
1893. Townsend, Chas. F., West View, Swanley Junction, Kent, Chemist.
1892. Townsend, Chas. W., 19, Crawford Street, Port Dundas, Glasgow, Chemical Manufacturer.
1892. Townsend, Oliver C., Kirkland Works, Leven, Fife, N.B., Chemical Manufacturer.
1897. Towse, Walter, Woodleigh, Holly Road, Retford, Technical Chemist.
1899. Trantom, Dr. Wm., 6, Newland Avenue, Hull, Chemist.
1894. Traphagen, Dr. Frank W., Montana Agricultural Experimental Station, Bozeman, Mont., U.S.A., Chief Chemist.
1900. Traquair, Jno., Glenfield Starch Works, Paisley, N.B., Analytical Chemist.
1893. Travers, Morris W., 2, Phillimore Gardens, Kensington, W., Chemist.
1889. Trechmann, A. O., Holborough Cottage, Snodland, Kent, Cement Works Chemist.
1885. Trechmann, Dr. C. O., Warren Cement Works, Hartlepool, Cement Manufacturer.
1895. Treharne, F. Gwilym, Wrangbrook, Llanishen, near Cardiff, Analytical Chemist.
O.M. Trench, G., Pilton Villa, Herne Bay, Kent, Explosives Works Manager.
1893. Trevaille-Williams, T., Assayer and Manager.
1885. Trewby, Herbert, 62, St. John Street, London, E.C., Analytical Chemist.
1883. Tribe, P. C. M., Oswego, New York, U.S.A., Secretary.
1901. Trigger, Oliver, Chem. Dept., Royal Arsenal, Woolwich, S.E., Analytical Chemist.
1898. Tripp, Dr. E. Howard, The Grammar School, Swansea, Science Master.
O.M. Trobridge, A., 28, Rectory Road, Gosforth, Northumberland, Technical Chemist.
1897. Trotman, Saml. R., University College, Nottingham, Public Analyst.
O.M. Truby, Charles, 20, High Street, Manchester, Chemical Manufacturer.
1900. True, Percival E., Bowker Chemical Co., Elizabeth, N.J., U.S.A., Chemical Engineer.
1887. Tsukiyama, S., Nippon Seito Kaisha, Osaka, Japan, Paper Mills Chemist.
1894. Tucker, Alex. E., 35, Paradise Street, Birmingham, Metallurgist and Chemist.
1897. Tucker, Samuel A., Columbia University, New York City, U.S.A., Tutor in Industrial Chemistry.
1886. Tuer, Arthur H., Thornhill, near Wigan, Analytical Chemist.
1899. Tufts, J. Lawrence, c/o General Chemical Co., Laurel Hill, Long Island, N.Y., U.S.A., Chemist.
1899. Tullis, John K., The Moorings, Kelvinside, Glasgow, Tanner.
1888. Tulloch, John, Rossie House, Hebburn-on-Tyne, Analytical Chemist.
1899. Turnbull, Dr. Andrew, Leather Industries Department, Yorkshire College, Leeds, Assistant.
1888. Turnbull, G. W., 35, Lancaster Road, Carnforth, Lancashire, Metallurgical Chemist.
1884. Turnbull, W. S., Place of Bonhill, Renton, Dumbartonshire, Chemical Manufacturer.
1889. Turner, H. B. H., 68, Upper Berkeley Street, Portman Square, W., Sugar Refiner.
1897. Turney, Fred. N., Whitemoor Leather Works, Nottingham, Leather Dresser.
1887. Turney, Sir J., Springfield, Alexandra Park, Nottingham, Tanner.
1891. Turri, Geo. G., Salisbury Building, cor. of Queen and Bourke Streets, Melbourne, Victoria, Patent Agent.
1896. Tuthill, Jos. B. T., Salem Gas Light Co., Salem, Oregon, U.S.A., Chemist.
1890. Tweedy, Jas., 1306A, Burdett Road, Limehouse, E., Metallurgical Chemist.
1891. Twitchell, E., Wyoming, Ohio, U.S.A., Candle Works Manager.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1897. Twynam, H., c/o Mount Morgan Gold Mining Co. Mount Morgan, Queensland, Mining Engineer.
O.M. Twynam, T., Elmhurst, Egham Hill, Surrey, Metallurgist.
O.M. Typke, P. G. W., Lawn House, New Malden, Surrey, Chemical Manufacturer.
1893. Tyrer, Chas. T., Stirling Chemical Works, Stratford, E., Manufacturing Chemist.
O.M. Tyrer, T., Stirling Chemical Works, Stratford, E., Chemical Manufacturer.
1899. Tysoe, Jos., South Metropolitan Gas Co., East Greenwich, S.E., M. Inst. C.E., Gas Engineer.

U

1894. Uhlig, E. C., 48, Barclay Street, New York City, U.S.A., Glass Works Chemist.
1900. Uhlig, W. C., c/o H. W. Johns Manufacturing Co., 39th Street, South Brooklyn, N.Y., U.S.A., Chemist.
1897. Ullman, Jas. A., c/o Sigmund-Ullman Co., 146th Street and Park Avenue, New York City, U.S.A., Chemist and Superintendent (Printing Ink Works).
1900. Ulmer, Geo. F., c/o Arbuckle Bros., Sugar Refinery, Foot of Pearl Street, Brooklyn, N.Y., U.S.A., Chemist.
O.M. Umney, C., 50, Southwark Street, London, S.E., Manufacturing Chemist.
1889. Underhill, Thos. J., H.M. Victualling Yard, Deptford, S.E., Inspector of Stores.
1885. Underwood, G. R., Box 460, Peabody, Mass., U.S.A., Glue Works Chemist.
1898. Unglaub, Oscar, c/o Thom, Domeier, and Co., Ltd., Pendleton, Manchester, Soap Manufacturer.
1883. Usmar, J. H., 22, Billiter Street, London, E.C., Chemical Merchant.

V

1896. Van der Linde, Harold, 61, Front Street West, Toronto, Canada, Chemist (India-rubber and Gutta-percha Manufacturing Co.).
1895. Vanderpoel, Dr. Frank, 153, Center Street, Orange, N.J., U.S.A., Chemist.
1897. Van Gelder, Arthur P., c/o Atlantic Dynamite Co., Rustic P.O., N.J., U.S.A., Chemist.
1891. Van Gundy, Chas. P., Laboratory, B. & O. R. R., Baltimore, Md., U.S.A., Metallurgical Chemist.
1896. Van Ingen, Dudley A., New Jersey Zinc Co., Newark, N.J., U.S.A., Chemist.
1896. Van Laer, Norbert, Black Eagle Brewery, Burton-on-Trent, Brewer's Chemist.
1897. Van Marken, J. C., 59, Seymour Street, Portman Square, W., Chemical Engineer.
1899. Van Slooten, Wm., 52, Sidney Place, Brooklyn, N.Y., U.S.A., Mining Engineer and Metallurgist.
1888. Vargas-Vergara, J. M., Apartado No. 237, Bogota, Republic of Colombia, S. America, Metallurgical Chemist.
1898. Varley, Reginald W., 2, Hyde Park Terrace, Headingley, Leeds, Steelworks Chemist.
O.M. Vasey, T. E., 5, South Parade, Leeds; Journals to P.O. Box 1149, Montreal, Canada, Chemical Engineer.
1900. Veitch, Alex., Clifton, Arizona, U.S.A., Acid Manufacturer.
1894. Veitch, Geo., Chemical Works, Crieff, N.B., Manufacturing Chemist.
1898. Verity, Ben, Magog, Prov. Quebec, Canada, Printworks Chemist.
1897. Verity, Victor, 83, Lexington Street, East Boston, Mass., U.S.A., Chemical Works Foreman.
1900. Verley, Albert, 7, Quai de Seine, Courbevoie, Paris, France, Chemist.
O.M. Vickers, W., Rose Hill, Smedley Lane, Manchester, Chemical Manufacturer.
1895. Vigelius, Carl, 175, Pearl Street, New York City, U.S.A., Shellac Bleacher.
1896. Vincent, Jos. A., Rooms 207–8, 421, Chestnut Street, Philadelphia, Pa., U.S.A., Mechanical Engineer.
1897. Vlies, Leonard E., Fernroyd, Wellington Road, Whalley Range, Manchester.
O.M. Voelcker, E. W., 22, Tudor Street, London, E.C., Agricultural Chemist.
1887. Voelcker, Dr. J. A., 20, Upper Phillimore Gardens, Kensington, W., Agricultural Chemist.
1897. Vogel, Julius L., 91, Blackfriars Road, S.E., Engineer.
1899. Vogeler, Gustav, 17, Philpot Lane, London, E.C., Merchant.
1900. Volney, Dr. C. H., 173, West 81st Street, New York City, U.S.A., Chemist (Smokeless Powder Co.).
1897. Voorhees, Louis A., P.O. Box 357, New Brunswick, N.J., U.S.A., Agricultural Chemist.
1899. Voorhees, Samuel S., c/o N.Y. Central and Hudson River R.R., West Albany, N.Y., U.S.A., Chemist.
1888. Vörster, Fritz, Cöln-Marienburg, Germany, Manufacturing Chemist.
1885. Voss, Hermann, 19, Beckenham Road, Beckenham, Kent, Manure Works Manager.
1899. Voss, Walter A., 16, Outram Road, Addiscombe, Manufacturing Chemist.
1899. Vreeland, Cornelius D., Chicago Heights, Ill., U.S.A., Manufacturing Chemist.

W

1885. Waché, Alf., 27, Rue Morel, Douai, France, Caustic Potash Manufacturer.
1896. Wachtel, Gregory, 6, Manejny Pereulok, St. Petersburg, Russia, Chemical Engineer.
1895. Waddington, Thos. W., 74, Blackburn Road, Padiham, Lancashire, River Inspector.
1898. Wade, Arthur Luvian, 28, West Kensington Gardens, W., Analyst.
1890. Wade, Jas. L., 28, West Kensington Gardens, London, W., Chemical Manufacturer.
1894. Wade, W. L., 28, West Kensingdon Gardens, W., and (Journals) Staines Linoleum Works, Staines, Chemist.
1889. Wadman, W. E., 102, Lord Avenue, Bayonne, N.J., U.S.A., Manufacturing Chemist.
1897. Wagner, Dr. Theodore B., 52, Walton Place, Chicago, Ills., U.S.A., Chemist.
1893. Wagner, W. G., Glyndhurst, Ealing Common, W., Analytical and Consulting Chemist.
1897. Wahl, André R., Institut Chimique, Nancy, France, Technical Chemist.
1884. Wainwright, Dr. J. H., 159, Front Street, New York U.S.A., Analytical Chemist.
1895. Wainwright, Wm., c/o Spooner and Bailey, Chemica Manure Works, Eling, near Southampton, Chemist.
1899. Wakefield, Wm. C., 3, St. Mary's Place, Savile Town, Dewsbury, Chemist.
1894. Waldman, Louis J., P. O. Box 162, Albany, N.Y., U.S.A., Aniline Dye Manufacturer.
1895. Waldstein, Dr. Martin E., 44, Trinity Place, New York, U.S.A., Manufacturing Chemist.
1887. Walker, Archibald, 8, Crown Terrace, Glasgow, Distiller.
1900. Walker, David C., Anaconda, Montana, U.S.A., Analytical Chemist.
1886. Walker, E. Robinson, 18, St. Ann's Street, Manchester, Patent Agent.
1897. Walker, H. V., 38, Clinton Street, Brooklyn, N.Y., U.S.A., Chemist.
1894. Walker, Dr. Jas., University College, Dundee, Professor of Chemistry.
1897. Walker, Jas. W., Messrs. Alex. Walker & Co., Irvine, N.B., Chemical Manufacturer.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

1884. Walker, S. R., 19, Wolsey Street, Radcliffe, Manchester, Foreman Dyer.
1895. Walker, W. Sloane, c/o Walker, Ltd., Litherland, near Liverpool, Tanner.
1900. Walker, Dr. Wm. H., 7, Exchange Place, Boston, Mass., U.S.A., Chemical Expert.
1897. Wallace, Edwin C., Foot of 6th Street, Long Island City, N.Y., U.S.A., Chemist.
1897. Wallace, Robt. A., Dorset Hall, Merton, Surrey, Chemical Manufacturer.
1883. Wallace, Robert, 20, Murrayfield Avenue, Edinburgh, Distiller.
O.M. Waller, Dr. E., 440, First Avenue, New York, U.S.A., Professor of Chemistry.
1899. Wallerstein, Dr. Max, 200, Worth Street, New York, U.S.A., Chemist.
1900. Walls, Arthur W., North Woburn, Mass., U.S.A., Chemist (Acid Works).
1886. Walsh, F. T., Lowell Dyeworks, Lowell, Mass., U.S.A., Colour Printer.
1900. Walters, H., Morrin College, Quebec, Canada, Professor of Chemistry.
1895. Want, W. Philip, 44, Bishopsgate Street Without, London, E.C., Pharmacist and Editor.
1896. Warburton, Thos., Clayton Aniline Co., Ltd., Clayton, Manchester, Chemist.
1899. Ward, Alf. B., 210, Trinity Road, Wandsworth Common, S.W., Bread-Improver Manufacturer.
O.M. Ward, G., Messrs. Hirst, Brooke and Hirst, Leeds, Chemical Works Manager.
1891. Ward, G. J., The Cottage, Hallam Fields, near Nottingham, Civil Engineer.
1884. Ward, Howard Chas., Yeatton, Hordle, Lymington, Hants, Deputy Chairman of Gas Co.
1898. Ward, John, Barnstone Blue Lias Lime Co., Ltd., Barnstone, Notts, Manager.
1888. Ward, Thos., Wadebrook House, Northwich, Salt Manufacturer.
1899. Ward, Wm. J., c/o Olive and Partington, Broughton Bridge Paper Mills, Manchester, Chemist.
O.M. Wardale, J. D., Redheugh Engine Works, Gateshead-on-Tyne, Engineer.
1892. Warden, Jno. B., Bank of B.N.A., Dawson City N.W.T., Canada; and (Journals) to 5, Eton Gardens, Glasgow, Analytical Chemist.
1897. Wardle, Sir Thos., Leek, Staffordshire, Silk Dyer.
1885. Warington, Robt., F.R.S., Harpenden, Herts, Agricultural Chemist.
1899. Warnes, Arthur R., c/o Major & Co., Ltd., Sculcoates, Hull, Soapworks Chemist.
1890. Warren, Fiske, 220, Devonshire Street, Boston, Mass., U.S.A., Paper Manufacturer.
1890. Warren, Jno. Davis, 7, Essex Road, Acton, W., Manufacturing Chemist.
1885. Warren, T. T. P. Bruce, Tamworth Villa, Earlham Grove, Forest Gate, Essex, Analytical Chemist.
1885. Waterfall, W. B., c/o Avon Manure Co., Bristol; and (Journals) Thirlmere, Clavering Road, Redland, Bristol, Manure Manufacturer.
1890. Waterhouse, Major-General Jas., Oak Lodge, Court Road, Eltham, Kent, Assistant Surveyor-General of India (retired).
1891. Waterhouse, Robt., Phœnix Chemical Works, Queen Street, Bradford, Manchester, Analytical and Agricultural Chemist.
1888. Wates, Edw. A., 56, Breakspeare's Road, Brockley, S.E., Metallurgical Chemist.
1893. Watkins, Willard H., 87, Poplar Street, Roslindale, Mass., U.S.A., Colourist.
1894. Watmough, B., 1, Ryeburn, Stanley Road, Wakefield, Analytical Chemist.
1894. Watson, Alex. Forbes, 22, Trafalgar Terrace, Monkstown, Co. Dublin, Chemist.
1894. Watson, Chas. Ernest, c/o Peter Spence and Sons, Manchester Alum Works, Manchester, Chemical Assistant.
1894. Watson, Chas. S., P.O. Box 27, Charters Towers, Queensland, Analytical Chemist.
1884. Watson, Chas., c/o English Literary Society, San Martin, 243, Buenos Ayres, Argentina, Manufacturing Chemist.
1890. Watson, Eric E., c/o Cia Explotadora de Lota y Coronel, Lota, Chile, Metallurgical Chemist.
1895. Watson, H. Ard, 17, Cavendish Road, Leeds, Tar Distiller.
1894. Watson, Jas., 60, West Park Terrace, South Shields, Alkali Works Manager.
O.M. Watson, Jno. C., c/o Brookside Printworks, West Leigh, Lanc., Technical Chemist.
O.M. Watson, Jno., Cement Works, Gateshead-on-Tyne, Cement Manufacturer.
O.M. Watson, Jno., Technical Chemist.
1891. Watson, Jno., Henham Villa, Cantwell Road, Plumstead, S.E., Analytical Chemist.
1898. Watson, Robt., Gasworks, Hertford, Gas Engineer.
O.M. Watt, A., c/o Macfie & Sons, 34, Moorfields, Liverpool, Sugar Works Chemist.
1883. Watts, A. J., 130, Caixa, Pernambuco, Brazil, Sugar Works Chemist.
1900. Watts, Chas. J., 40, City Road, London, E.C., Manufacturer.
1893. Watts, Jno. Isaac, Fairleigh, Hartford, Cheshire, Alkali Works Manager.
1900. Webb, Jno. Fred., Ormond House, 63, Queen Victoria Street, London, E.C., Mining and Electrical Engineer.
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SESSION 1900—1901.

Monday, Feb. 18th, 1901.—Discussion on the Occurrence and Detection of Arsenic in Manufactured Products.

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SESSION 1900—1901.

Friday, Feb. 8th, 1901.—Discussion on the Presence of Arsenic in Acids and other Commercial Products.

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Candidates for Election.

In the Journal for October 1900 will be found a Nomination Form and Prospectus for the use of those members who have a candidate for election to propose. Please keep for use in case of need.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

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London Section.

Meeting held on Monday, January 7th, 1901.

MR. OTTO HEHNER IN THE CHAIR.

THE EARLY MANUFACTURE OF SULPHURIC AND NITRIC ACID.

BY OSCAR GUTTMANN, M. INST. C.E., F.I.C., F.C.S.

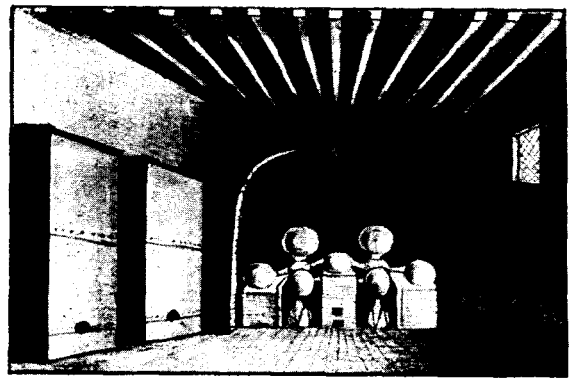
A. *Sulphuric Acid.*—Most of you are aware that sulphuric acid was in olden times made "by the bell." An earthenware dish with a burning charge of sulphur rested on an iron tripod in an earthenware pan, and a glass bell was suspended over it. It was recommended to work during the two equinoxes, because the air contains more moisture at these times of the year, and that of course helped condensation. Later on it was recommended (in 1683 by Sir Kenelm Digby) to put water into the pan, so as to condense the fumes. Glauber, in 1648, already taught to mix some nitre with the sulphur. Nevertheless, this method does not seem to have become universal, because in "The Chemical Works of Caspar Neumann, F.R.S., London, 1759," a standard work at this time, we still find the bell described as "the most common apparatus for this purpose." In a foot-note Neumann says: "This process has of late been so far improved by some particular persons as to furnish, at a very low price, almost all the acid now sold under the name of oil of vitriol. The improvement consists in employing very large glass vessels of the capacity of a hogshead or more, in which is placed a little water, whose steam collects and condenses the fumes; but principally in mixing with the sulphur a small portion of nitre, about 6 lb. to an hundredweight, which enables it to burn much more speedily than sulphur by itself, and without communication with the external air. By this means nearly all the fumes are preserved. It does not appear that the spirit thus collected contains any of the nitrous acid, for the acid of nitre is destroyed by deflagration."

This improvement, as described by Neumann in 1759, was patented in 1749 (No. 644, 23rd June) by Dr. Joshua Ward and John White in London, but, according to Lunge, Ward made oil of vitriol on a large scale at Richmond in 1736 already.

In 1746 Dr. Roebuck, of Birmingham, invented a "lead house," *viz.*, a square lead chamber, wherein the sulphur was burnt and the fumes collected in water placed below. Evidently there was some trouble with the glass bells on a large scale. In 1749 (the same year as Ward and White's patent) Dr. Roebuck and a Mr. Garbett erected works at Prestonpans, on the east coast of Scotland; these must be considered as the first sulphuric acid factory, because Ward's works in Richmond were merely a large laboratory.

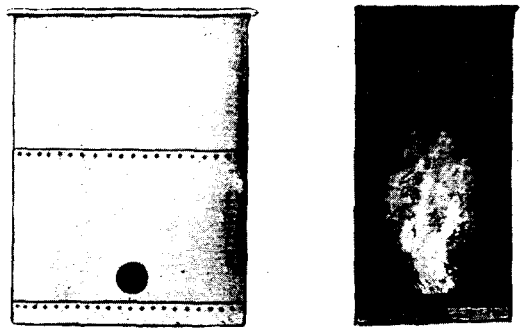
It has been my good fortune to find an old manuscript book, evidently recipes and experiments of a chemist named W. E. Sheffield, who lived in Birmingham from 1771 to 1790 (the dates occurring in the manuscript). The book contains, amongst various descriptions of chemical processes, an account of the manufacture of sulphuric and nitric acid at that time, together with beautifully executed drawings in Indian ink of the apparatus employed, and a general view of such a factory. This is reproduced in Fig. 1, where on the left are the "lead houses" for the sulphuric acid, and lower down, in the centre, the nitric acid plant.

Fig. 1.



I will give briefly, and partly in the quaint language of the manuscript, what he says "is the exact definition of Mr. Garbett; he has 30 in one room, each lies him in 8*l*." The "lead house" (Fig. 2) is 6 ft. wide in front at

Fig. 2.



bottom, 4 ft. broad from front to back, and "raised or cast in the solid, without any soldering, 6 ins. deep." The bottom is made of 9-lb. lead. Two sheets of milled lead, 3½ lb. to the foot, are riveted together and joined one upon the other, each 4 ft. broad and 20 ft. long, and also joined with lead rivets to the bottom. Thus the "house" is 8½ ft. high, 6 ft. long, 4 ft. wide. The top of the "house" is slightly convex, and fastened by "bresting over the sides." The whole is well supported with the back wall and wood framing, to which latter it is riveted with lead rivets both at the top and the sides. In the front, 8 ins. from the bottom, is a round hole of 10 ins. diameter, cut out with the edge turned up, so that a lead stopper may be inserted. The lead house stands solid on sand, and on the common floor of the building. To each belonged also a pedestal of lead 7 ins. high, and a dish of lead 10 ins. wide, turned up 1 in. to receive the sulphur and nitre, of which it

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held 1 lb. As stated above, the lead house cost 8*l.*, and, considering that it weighed nearly 10 cwt., lead constructions do not seem to have been expensive at that time.

In the lead house are put 5 cwt. of water for the first time, but only 4 cwt. at each subsequent operation, "because you can't crane it all out by 1 cwt." A mixture is made of 112 lb. of sulphur and 14 lb. of rough nitre (12·5 per cent.*) by first breaking up the sulphur and sifting it, until small enough for the mill, then mixing it with the well dried nitre, and grinding in a hand mill until as fine as meal. A ladle full, holding 1 lb., is put into the dish, and the mixture touched with a red hot iron bar. Then the stopper is put in, and after burning for two hours the hole is left open for an hour. This is twice repeated, after which the dish is taken out to remove the "salts." This operation is continued with 10 houses, served by one man, day and night for a month, or until the water weighs 20 oz.

Some explanation may be here interposed about the terms then used for expressing the density of a liquid. This is given as the weight of a volume of the liquid, which is equivalent to the volume of 1 lb. of water. Thus, if the acid "weighs 20 oz.," or is "4 oz. heavier than water," it means that a measure holding 1 lb. of water would hold $1\frac{1}{4}$ lb. of the acid.

It can be readily understood that by the way the sulphur and nitre were burnt, a large amount of unconsumed sulphur was left in the "salts." They were therefore carefully saved in a box, ground over again with 7 lb. of fresh nitre per cwt., and on burning they yielded as much acid as before. The "salts" now resulting were called "thirds," and were again ground together with $3\frac{1}{2}$ lb. of nitre per cwt., but those obtained from this operation were thrown away.

There is a note in a later handwriting that the "thirds" must be burnt in cast-iron pans about 8 ins. diameter, $\frac{1}{2}$ in. thick, turned up $1\frac{1}{2}$ in. The pans had to be made red hot before the salts were put in, because no doubt the mixture would not burn readily any more.

After a month's working the acid was craned out with a lead crane or a siphon. The water put in at first stood 4 ins. deep in the bottom. This increased by 400 oz. weekly, and in a month would be 5 ins. deep. We can thus arrive at an estimate of the work done. At six charges per day, in 26 working days, 156 lb. of sulphur would be burnt in a month, yielding 737 lb. of sulphuric acid of 1·250 sp. gr., or 33·43 per cent. H_2SO_4, which is a yield of 158 per cent. monohydrate for 100 sulphur burnt, against the theoretical $306\frac{1}{4}$ per cent.

The weak acid was boiled down in open lead pans, 6 ft. long, 2 ft. wide, 1 ft. deep, until it weighed 24 oz. (1·500 sp. gr.), and it was then called "weak spirit of salt" or "pickle." The manuscript then says: "In order to make it into oil of vitriol continue to boil away until 32 oz., which is the adopted standard of oil of vitriol."

This would mean that the standard sulphuric acid at that time had a specific gravity of 2·000. Mr. James Mactear, F.I.C., in two very valuable papers read before the British Association in 1876, and before the Glasgow Philosophical Society in 1881, respectively, gave a very detailed history of the manufacture of sulphuric acid from the earliest times, and more especially in the Glasgow district. He gives there a copy of a calculation made in 1799 about the temperature to be aimed at in burning the sulphur, and therein the strength of sulphuric acid is also mentioned at 2·000, "which Kirwan calls his standard acid." † Although in Neumann's Chemistry of 1759 it is already stated to be 1·8775 on the authority of Fahrenheit, which is approximately the maximum gravity as found by Lunge and Naef, yet Kirwan, in 1791,‡ still made the following statement, which is evidently the basis of the standard 2·000: "I neither could make nor procure oil of vitriol whose specific gravity is 2·000 in the temperature of 60°. Yet in cold climates this acid has frequently been produced, and as it is the strongest, or nearly so, than can be exhibited by art, I take it as the standard of the strength of all other acids of this kind." Kirwan was probably the first who made tables showing the gravity of various acids of different percentages and at varying temperatures. My informant, Mr. Sheffield, seems to have been equally puzzled, because he makes the following note: "N.B.—I have weighed both Mr. Skey's* and Mr. Garbett's, and it weighs but 30 oz. (1·875 sp. gr.), which is a very considerable profit."

At the end of the manuscript, perhaps also written about 1790, are particulars about a factory belonging to Mr. Margett, which are also very interesting. This "lead house" was already larger, 20 ft. square and 11 feet high, containing 4,400 cubic feet. It had three doors in front and a water-luted valve of $10\frac{1}{2}$ ins. diameter on the top. There were three rectangular pans, 29 ins. by 19 ins., charged with a mixture of 100 sulphur to 18 nitre, each pan receiving 12 lb. of sulphur and 2 lb. $2\frac{1}{2}$ oz. of nitre. Six charges were made in 24 hours, and thus in six working days 1,296 lb. of sulphur and 234 lb. of nitre were used. The time for burning each charge was three hours, but air was admitted for half an hour only, and the process was continued for six weeks, until the acid weighed $27\frac{1}{2}$ or 28 oz. (1·719 to 1·750). The bottom of some houses was divided by a partition, so that the acid of one compartment could be used whilst the other gained strength.

From the data given the cost of the acid was as follows:—

	£	s.	d.
1,296 lb. of sulphur at $2\frac{1}{4}$*d.* per lb.	13	10	0
234 „ nitre at 70*s.* per cwt.	7	6	3
	20	16	3
Deduct drawback on sulphur used for making O.V., paid every January, at 10*l.* per ton.	5	15	9
	15	0	6
Retorting, 1*d.* per lb. yield	10	16	0
	25	16	6
Yield, double the weight of sulphur employed = 2,592 lb., weighing $29\frac{1}{2}$ oz. (1·844 sp. gr.) Cost per ton, without reckoning labour	22	6	4

The acid was sold on four months' credit at $3\frac{3}{4}$*d.* per lb. = 35*l.* per ton, and at six months' credit for 4*d.* per lb. = 37*l.* 6*s.* 8*d.* per ton, which sum was paid at the end of the credit by a two months' bill; thus, giving long credit was then also known. The price was said to leave 25 per cent. profit.

The "retorting" (concentration) was done in glass vessels, but platinum vessels were also used, and Mr. Sheffield states that one, holding 30 gallons, cost about 300*l.*†

At the end occurs the following remark: "I think it would be an improvement to agitate the gases by placing a fan of lead in the house, and I suspect it is not necessary to let the gases escape indiscriminately."

The method of making oil of vitriol given here seems to have been in use all over Great Britain at this time. Mr. Mactear enumerates 23 factories in England alone in 1820, of which seven were in London. The oldest factory still in existence is that of Thomas Farmer and Co., Ltd., which was started at Kennington Common in 1778. Brick furnaces attached to the chambers for burning the sulphur were erected in 1807, and steam was introduced into the chambers in 1813 or 1814.

* Rough nitre in 1780 contained only about 70 per cent. of KNO_3 (Bottée et Riffault, Traité de l'art de fabriquer la poudre à canon, Paris, 1811).

† From a very interesting paper by Mr. Bennett H. Brough, F.I.C., published in the "Ars Quatuor Coronatorum" of 1900, I find that Richard Kirwan, F.R.S., lived in Dublin, and was a very eccentric scientist, who received the Copley Medal in 1782.

‡ Of the strength of acids and the proportion of ingredients in neutral salts. By Richard Kirwan, F.R.S., Dublin, 1791, p. 7.

* Skey's factory was in Dowles, in Worcestershire.

† This statement causes me to doubt whether this last note was written in 1790. Although the first platinum crucible was made by Achard in 1784, yet Mr. Sellon, of Messrs. Johnson and Matthey, has no knowledge of a platinum vessel for sulphuric acid having been made before 1804; the price of 300*l.* would correspond to the price of 14*s.* per ounce, which platinum cost at this time.

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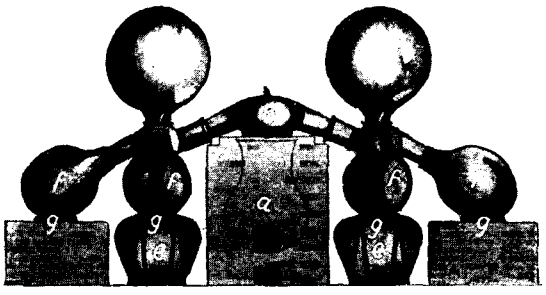
The character of sulphuric acid at that time is given by Kirwan* as follows: "Though pale, yet a little inclined to red. It contained some whitish matter, as I perceived by its growing milky on the affusion of pure distilled water. How far this may alter the result of the following experiments I have not tried; but believe it to be as pure as that which is commonly used in all experiments, and therefore the fittest for my purpose."

B. *Nitric Acid.*—Nitric acid seems to have been known in the earliest times. It is said that the black drawings on the clothes of mummies were made with silver nitrate, but the first description of the production of nitric acid (aqua dissolutiva, aqua fortis) is given by Geber in 778, who made it by distilling nitre with copper sulphate and alum. Raymond Lullius, in the 13th century, made it from nitre and iron sulphate, and Glauber, in 1648, taught us to make it from nitre and oil of vitriol. In 1759 it was still made, according to Neumann, by charging a tubulated retort placed on sand with powdered nitre, luting on a large receiver, and pouring in oil of vitriol in small quantities through the tubulure.

Mr. Sheffield's manuscript of 1771 gives many details about the manufacture on a large scale. The general arrangement is shown in Fig. 1; but instead of reproducing each part of the apparatus singly, as drawn by him, I have preferred to put them together, so that the function of each can be seen at a glance.

Fig. 3.



The retort was an iron pot *a* (Fig. 3), holding 37½ galls. and weighing 20 cwt. It could take a charge of 200 lb. of nitre and 104 lb. of oil of vitriol; thus neutral sulphate was aimed at, which was called "sal enixum." The pot was closed by a pothead *b*, with two arms, "made at Vauxhall" from earthenware. Each of these arms was connected to a condensing plant. This consisted of a kind of crosspiece *c*, called the pipe receiver, which was surmounted by a "ballon" or large globe receiver *d*, holding 60 gallons. The lower part was luted to a "perpendicular receiver" *e*, and the arms to "large common receivers" *f f*, holding 30 gallons each. The latter rested on "bosses" *g*, made of twine. The luting was made of equal parts of clean sand and "hufcap," a kind of clay, with one-quarter part of "sal enixum" and some water.

The distillation lasted four days. Towards the end the fire was raised "intensely high." The consumption of coal was 5 cwt., and the production 200 lb. of "gilder's aqua fortis" (1·375 sp. gr.; *see* later on), which works out at abcut 96½ per cent. of the theoretical yield.

The cost of production works out as follows: —

	£	s.	d.
200 lb. of nitre at 70*s.* per cwt.	6	5	0
104 „ O.V. at 3¾*d.* per lb.	1	15	1
5 cwt. of coal at 5*d.* per cwt.	0	2	1
For 200 lb. of gilders' acid	8	2	2

Cost without labour, per lb., approximately, 9¾*d.*

It will be noticed that the distillation of a 200 lb. charge lasted four days, which is explained by the fact that the condensing plant had no vent for the uncondensed gases, and had therefore to be worked very slowly.

* Philosophical Transactions of the Royal Society, 1781, p. 22.

There were many kinds of aqua fortis sold, which are enumerated in the following table:—

	Weight.		Sp. Gr.	Price per lb.	
	oz.	dr.		*s.*	*d.*
Pure spirit of nitre	23	12	1·485	3	6
Gilders' aqua fortis.....	22	0	1·375	1	8
Brass-founders' aqua fortis..	24	0	1·500	1	8
Syers' (assayers') aqua fortis } Refiners' aqua fortis ..... }	20	0	1·250	1	3
Best platina	24	15	1·559	1	1
Single aqua fortis, or weak platina.	23	0	1·437	0	10
Twelve-penny aqua fortis ...	24	6	1·523	1	0

Some explanation for this table is, of course, necessary, and given. The various receivers had generally some water put in before starting, but if no water was put into the perpendicular receiver, then "pure spirit of nitre" was obtained. If, on the other hand, 10 lb. of water are put into it, then gilders' acid resulted; and if this was not up to standard, pure spirit of nitre was added, whilst, if too strong, weak aqua fortis or water was used for dilution. Gilders' acid is the most useful, because most other sorts are made from it by mere mixing.

For making syers' and refiners' aqua fortis, 30 lb. of water are put into each of the other receivers, and the various acids mixed together.

Brass-founders' aqua fortis is made by mixing 60 parts of gilders' aqua fortis with 10 parts of oil of vitriol. The manuscript naïvely adds: "Sells for 20 pence, the same price of gilders', tho' lowered with 1/6 of oil of vitriol; this justly esteemed a very particular secret in this branch of business."

Platina aqua fortis is made from 16 parts of gilders' acid and 40 lb. of oil of vitriol lowered to 25 oz. "It is used for best dip for platina."

Single aqua fortis, or weak platina, is made from 16 lb. of gilders' acid brought down to 21½ oz., and 40 lb. of oil of vitriol lowered to 24½ oz. "Used for the first dipping of platina work."

Twelve-penny aqua fortis is the same as the weak platina, only the gilders' acid is of the proper strength. It is also used for finishing platina.

The manuscript also contains an account of the manufacture of nitric acid in glass retorts, 9 ins. diameter, 12 ins. high, and called quart retorts, which were made by Stocks, near Blackfriars Bridge, and could be charged with 14 lb. of nitre. The coal consumption was excessively high—about 11 lb. per pound of gilders' acid; yet there was a profit of about 25 per cent.

Improvements in plant for the manufacture of nitric acid were made in recent years only. Plain pots can still be found in some factories, and the condensing plant is also frequently of a very primitive nature.

Discussion.

Mr. Forbes Carpenter said that he had with him a few notes of one of the oldest sulphuric acid works in England, which had been in continuous operation since 1791. Messrs. Bealey, of Radcliffe, near Manchester, began as a bleach works in 1683, and in 1791 commenced the manufacture of vitriol for bleaching purposes. He had obtained from them some account of the operations carried on in those early years, and Mr. Mactear, in his paper read before the British Association in Glasgow in 1876, gave a description of working in use at Messrs. Bealey's in 1799, as follows:—"There were six chambers, 12 ft. by 10 ft. by 10 ft., roofed like a cottage. They were placed in houses having openings in the brick walls, leaving the lead to be exposed to the atmosphere. This is perhaps of more use in expediting the filling of the chambers with fresh air than in aiding condensation. Mr. Laird (a Glasgow manufacturer of that period) says that the hotter the chambers are kept the more perfect is the condensation. Each of these chambers has a valve, which is opened between the burnings. In them there is burned each week 1,386 lb. sulphur and 198 lb. nitre, burnt in double pans the larger

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above the lesser, and yielding 1,800 lb. of O.V. of 1·8 sp. gr. (equal to a produce of 130 per cent. on sulphur, with 14·28 per cent. of nitre); 8 to 9 ins. of water on the floor of the chamber. The sulphur and nitre are mixed in the proportion of one of nitre and seven of sulphur. Of this mixture 8 lb. are burned in each chamber every four hours. The mixture is burned on iron plates or trays, of which there are two sets only in each chamber (more not being found so productive), each set consisting of two plates, one placed over the other, about 3½ ins. apart. The iron is of best quality and very thin, so that they heat quickly. They are supported on a frame, which can be drawn out at the door of the chamber. 1 lb. weight of the mixture is put upon the lower plate, and 3 lb. on the upper plate. The plates being charged, the lower plates are first ignited, and, when fairly lit, then the upper plates; the frame is then pushed into the chamber and the door shut. The whole will be finished burning in one hour. Charge again three hours after the burning is over, or once every four hours, opening the doors and valves a quarter of an hour beforehand. The plates to be cleaned each time. By keeping this going on, they in six weeks made their O.V. attain a gravity of 20 oz. (1·250 sp. gr.), when it is run off for concentration to 22 oz. (1·375 sp. gr.), when it is used for bleaching liquors, &c. Having six chambers, therefore, affords one for drawing off each week.

State agreeable to the above.

	£	s.	d.
1,386 lb. sulphur at 22*l.*	13	12	3
198 lb. nitre at 64*l.*	5	13	1½
Labour	1	1	0
Tear and wear	1	1	0
	21	7	4½
Off for drawback on sulphur, at 6*l.* 12*s.* 8*d.* per ton	4	2	0½
Producing 1,800 lb. O.V., costing	17	5	4

Equal to 2⅔*d.* per lb., or 21*l.* 10*s.* per ton.
Interest on sunk capital omitted in this state."

As the works at Prestonpans had been mentioned, he might say that this was the first works of which Mr. Mactear had found any record. Dr. Roebuck, who erected them, was active in many branches of industry in Scotland, and, with some friends, set up, among other ventures, the Carron Ironworks, celebrated for the casting of "carronades." At the Prestonpans works there were 108 chambers, each 14 ft. long by 4 ft. wide and 10 ft. high, and at Burntisland they had 360 chambers, 8 ft. by 4 ft. by 6 ft. high. He himself had seen and talked with men who had seen such small chambers in use (described to him as of the size of tramcars), and whose fathers had worked them. Messrs. Bealey were unable to give the price of acids sold then, 1790—1800, as they made principally for their own use; but from inventories taken at different periods from 1802 to 1813 it was found that the price of brimstone varied from 20*l.* to 27*l.* per ton, and nitre from 49*l.* to 50*l.* per ton. The oil of vitriol bottles cost 4*s.* each, and the contents 2*l.* In Cornwall he had come across the remains of a work where the manufacture of sulphuric acid was attempted in chambers (and that seemed a solitary instance) whose sides were of dressed native granite, which was put together with as little tar and china-clay cement as possible. He had seen some of these dressed blocks still in existence, but of course used now for other purposes. The top and bottom of the chamber were of lead, he was told.

Mr. W. F. Reid said the members were very much indebted to Mr. Guttmann for rescuing from oblivion the interesting records of early days. In every new process that came out the first fight was with the development of the plant, and in an industry of that kind it was interesting to know how they got over their difficulties in the beginning. He had looked up some old authorities on the matter, and had come across some very early instances of the manufacture of nitric acid and sulphuric acid, and the methods were interesting. The knowledge of the subject seemed to have been widely spread in Germany about the beginning of the 16th century. In a book entitled "The Treasure of Euonymus," translated from the German in 1565, most of the references were to German writers, and the sources of some of the materials specified were in Germany. With regard to the manufacture of "oyle of brimstone," or "oyle of vitriol," the method chiefly used was to distil sulphate of iron, either alone or with some substances which liberated the acid, or to burn sulphur in very large vessels. They knew the use of nitric acid in connection with this manufacture.

"For the making of oyle of brimstone, a mā must chose out y^e^ which is pure and neuer touched the fire, chiefly aliue and of an ashy colour. This oyl is made many waies at Rome, by sublimatiō and discencion, &c. Take a vessell of glasse, not much unlyke to a little bel, daubed wyth potters claye, hang it the space of a cubit from the grounde, by a wyer of bras or yron, under y^e^ which thou shalt set a basē of glas of a great cōpas, wyth a pot turnde upsyde downe. Moreouver the bottom of the potte shal hold up an yron plate of four fingars broade, made redhoat, wherupon the brymstone may be brent. Whyles this is brēt new shalbe added upō it. Therupon it shal com to pas that by the smoke ascending, the hanging vessell in short space shall destill drop down into the basen that standes under, an oyl whych gathered diligently thou shalte serve in a phyal of glasse."

"The oyl of vitriol is maruelous, burning lyke a hoat irō without grief, and is made in this maner: 30 ounces of vitriol of Rome or of Cypres, sal nitrum, roche alum, of ether 4 ounces. When they are all beate let them be calcionated with fire according to art. Afterward put this calcionated in a croked bocia clayed for the fire of an alchymists fornace, and by the fyre thou shalt have the oyl incresed in the receiuer; whych is a meruelous cauterium or burning thing, and hath no pere in any operation, and chiefly in taking away of wens and great wartes. But the receiuer muste be greate, if thou wilt make the foresayd oyl."

"While y^e^ oyle is preparyng ye must take hede of y^e^ smoke: because it doth not onely kil men, but also y^e^ trees that be nye, it drieth thē vp."

There was a curious reference to "oil of salt" also, and they were thus evidently acquainted with hydrochloric acid in those days. With regard to *aqua fortis*, there was a very curious description. They distilled *aqua fortis* from vitriol, *sal nitrum* and alum. These products were chiefly used medicinally. "If a man put a drop of them into a wen or warte fyrst cut they take it away; of the which thyng I made a tryall in myself upon a warte on my fyngars end, and although it went not away by and by, yet within a fewe wekes it was gone."

The following appeared on page 320:—

"Aqua fortis or to separate metalles is thus made. One part of sal nitrum, liquid or molten alum (that they cal roche) three parts: sand half a part, whē they are dried diligently and purgeth with the fyre, let them be destilled in a vessell of glasse. It is gathered by itselfe, that which issueth out fyrst, at length whē yē glasse loketh lyke a saffron colour, increase the fyre and an other followeth: which is receaued in the fyrst for the moste parte, and yet if thou take it in water of the fountain or well, it is yet so sharpe that neuertheles it dissolueth siluer, and separateth it from golde."

He thought it might be interesting to the members to know that in those early times they made use of the same reactions; they practically liberated sulphuric acid from sulphate of iron and caught it in vessels of glass, and obtained the oil of vitriol. It would also be of great interest if they could determine when nitric acid was first discovered; he himself had not seen any article recording it.

NOTES ON THE SO-CALLED "HEAT TEST" FOR EXPLOSIVES.

BY W. CULLEN.

Few empirical tests have such an important influence on manufacturing processes as the so-called "heat test," which is used every day and all day in explosives factories. By it the stability or purification of the products is gauged at each successive stage of the manufacture.

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Mr. Guttmann, in a paper read before this Section of the Society in April 1897, proposed to substitute for it diphenylamine; and, later on, Dr. Giovanni Spica, in the "Rivista" of August 1899, finding serious objections to the use of this reagent, substituted for it hydrochloride of metaphenylenediamine, which he asserted was preferable.

On the occasion already referred to, Mr. Guttmann, among others, made the following statement:—

"The iodide test as at present prescribed is absolutely inapplicable for most of the modern smokeless powders and also some blasting explosives."

This is rather a sweeping assertion, but at the same time it must be admitted that the "test" leaves something to be desired. The object of the present paper is to show, however, that it is not quite so bad as it is made out to be, and to make an endeavour to remove some of the admitted defects.

At the present moment most firms engaged in the manufacture of explosives make their own test papers in as nearly as possible the manner prescribed by the Home Office. A point to be very particularly observed, however, is that it is a very rare occurrence for "test papers" obtained from different sources to give the same result, and sometimes the differences are very great.

Two separate series, carried out within the past twelve months with "cordite," may prove of interest. The papers were obtained from six separate sources:—

Paper.	Series I.	Series II.
		Minutes.
A	22	19
B	27	24
C	40	37
D	21	25
E	50	46
F	37	37

Maximum difference in first series, 28 minutes.
" " second " 27 "

Examples like these could be multiplied *ad infinitum*, but with explosives, which do not withstand the "test" for such a long time as cordite, the differences are not so marked.

In investigating the subject I have come to the conclusion that the primary factor to be considered is the filter paper employed. The best English filter paper ought to be used, and it is prescribed that it must be washed in distilled water, then dried. Now, I can say with almost absolute certainty that if anyone will take the trouble to go to three different manufacturers, and from each procure a sample of filter paper, three different "heat-test" papers will be made from them, even although the same chemicals be used throughout. As has already been shown, the difference is not infrequently 50 per cent., and the question naturally arises which test ought to be taken. With empirical tests of this sort the only thing to be done is to standardise as far as possible, and it does not at all follow, as many assume, that because a batch of "test" papers gives low results the papers themselves are faulty. Thick papers invariably give a longer test than thin papers, but even the difference in texture has its influence. Again, papers which contain traces of the chemicals used in purifying the pulp, invariably give low "heat-test" papers.

In a general way, these facts are known to manufacturers, but it has been left to the War Office to recognise them in a practical manner, by having only one source of supply for their factories in this country and inspecting officers abroad. One source of filter paper alone is made use of, and enough is put on one side to last for a number of years. By this means, continuity is as far as possible attained, and each fresh batch, or "mark" as it is called, is standardised against previous issues. By the courtesy of Dr. Kellner and Major Nathan, I am able to reproduce the records for the past few years; but the following results, carried out in August of this year at Waltham Abbey, will illustrate the system of testing. It is observed that Mark O is a little more insensitive than M or N, but in the more elaborate table which follows, it is seen to mellow with age:—

TABLE I.

Date of Test, 29th August.

Gun-cotton.			Mixed Material.			Nitro-glycerin.			Cordite.			Date of Receipt of Papers.
M.	N.	O.	M.	N.	O.	M.	N.	O.	M.	N.	O.	
14			8			21			68			25.11.1899
	15			11			22			68		22.8.1900
		19			18			24			70	22.8.1900
15			10			24			81			25.11.1899
	16			10			24			81		22.8.1900
		19			12			24			83	22.8.1900
16						19			55			25.11.1899
	17						19			55		22.8.1900
		20						20			58	22.8.1900
15	16	19½	9	10½	11½	22½	21⅔	22⅔	68	68	70½	Mean

The "mixed material" referred to in the foregoing table is the same as the "paste" of the next table, and is in reality the mixture of nitroglycerin and guncotton used in making cordite. The more elaborate table will well repay careful perusal, as it embodies all "standardising" results from 1897.

One point in connection with these records is that sensitiveness appears to diminish with age, while most experimenters find the opposite. On one point, however, all are agreed, *viz.*, that up to the age of six weeks results are erratic, but after this, for some reason at present unexplained, the papers settle down, and can be kept for years without alteration.

It may be of interest here to state that the paper used by the Government, or at least the War Office, is like ordinary thin blotting paper. The average thickness is 0·0082 in. thick, and the air-dry weight per square metre is 75 grms.

My proposal is that all engaged in carrying out this test ought to combine and have one source of supply only, the source, whoever or whatever it is, being under the direct control of an experienced explosives chemist. It would also form part of my scheme to buy or have prepared a special lot of paper, sufficient to last for at least five years, possibly longer. This central supply would naturally be in a favourable position for standardising its papers against those of the various Government departments, and of course, if they could be brought to join in the federation, matters would be still further simplified.

Such, then, in brief, is the proposal to rehabilitate the "heat test" in the eyes of many who even now look on it as more or less of a farce, and I think it will greatly assist in doing so. Even in its new form, abnormal results will sometimes be obtained, but it will certainly apply to 999 cases out of every 1,000. I am at present experimenting with very thin sheets of unglazed earthenware instead of paper, but the results are not yet sufficiently far advanced to be given.

The "heat test" does not claim, as many think, to measure the relative stability of *different* explosives. For instance, it is ridiculous to assert that, by the mere assembling together of the different ingredients which go to form cordite, an explosive is produced which is four times as stable as the guncotton used. The whole matter is one of the physical condition of the new explosive, its state of division, as also the temperature at which the test is carried out. We know that, given raw materials, such as those referred to in the tables, and a certain state of subdivision, a certain test is obtained. If the test is abnormal, then there is something which has to be looked for. The addition of vaseline altogether alters the physical condition of cordite, and, while it does act as a retarding agent for the gases of decomposition to a certain extent, it also increases the toughness and makes subdivision more difficult.

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TABLE II.

Comparative Testing of Heat-Test Papers.

Date of Test.	New Papers received from Woolwich.					Previous Supply in current use.				
	Mark and Date of Receipt.	Heat Tests with				Mark and Date of Receipt.	Heat Tests with			
		Gun-cotton.	Nitro-glycerin.	Paste.	Cordite.		Gun-cotton.	Nitro-glycerin.	Paste.	Cordite.
		Mins.	Mins.	Mins.	Mins.		Mins.	Mins.	Mins.	Mins.
16.1.97	H	16	26	..	42	I	16½	30	..	46
20.5.97	H	13½	36, 35	..	..	H	13½	36, 35	..	..
19.7.97	H	13, 16	26	..	..	H	14, 17	25	..	..
26.8.97	K	16, 16	35, 35	16	..	H	15, 15	32, 32	16	..
15.10.97	K	14, 15, 16	27, 30	20	36	K	14, 16, 15	27, 30	20	33
3.12.97	K	15, 14½, 14, 14, 15.	28, 21	15	50, 42, 46	K	13, 13, 12, 12, 13.	24, 17	13	43, 35, 38
3.3.98	K	15, 15	31, 25	15, 15	82, 54	K	13, 13	31, 25	13, 13	82, 54
„	L	„	30, 36	15, 17	58, 86	K	„	25, 31	13, 15	54, 82
7.6.98	K	15, 16, 13½	25, 27, 32, 25, 34.	15, 15	90, 102	K	15, 15, 15	25, 27, 24, 23, 22.	15, 15	90, 102
„	L	15, 16, 14	26, 28, 24, 24	„	„	L	..	37, 27, 26	..	..
28.9.98	L	16, 16	21, 21	17	72	L	15, 15	19, 19	17	66
11.1.99	L, 11.1.99	14, 14	19, 25	15	62, 64	L, 28.9.99	14, 14	19, 25	15	62, 64
3.3.99	M, 3.3.99	18, 14	35, 34	..	70, 71	„	16, 13	30, 29	..	65, 65
6.3.99	„	16, 16	..	24	80	„	14, 14	..	20	74
8.5.99	M, 6.5.99	19, 19	24, 26	20	78, 69	M, 3.3.99	19, 19	24, 26	20	78, 69
28.8.99	M, 26.8.99	18½, 19½	25, 24	20	80, 76	M, 6.5.99	18, 19	25, 24	20	80, 76
29.11.99	M, 25.11.99	18, 18	25, 25	23	84, 84	M, 26.8.99	17, 17	24, 24	22	84, 84
26.1.1900	N, 26.1.00	21, 22, 27, 20, 20.	32, 33, 28, 30	17	102, 68, 122, 126.	M, 25.11.99	17, 17, 22, 15, 15.	31, 32, 26, 27	13	83, 48, 102, 105.
1.6.1900	N, 31.5.00	16½, 15, 14	25, 24, 24½	16	78, 79, 46	„	16, 15, 14	24, 24, 24	15	78, 78, 46
4.7.1900	N, 2.7.00	20, 21, 22	22, 21, 25	12	38, 54, 60	„	21, 20, 21	21, 20, 24	12	38, 54, 60
29.8.1900	N, 22.8.00	15, 16, 17	22, 24, 19	11, 10	68, 81, 55	} „	14, 15, 16	21, 24, 19	8, 10	68, 81, 55
„	O, „	18, 19, 20	24, 24, 20	11, 12	70, 83, 58					
25 & 26.9.1900	O, 25.9.00	15, 20, 24	19, 19, 20	16, 16	45, 66, 42	„	15, 20, 24	19, 19, 20	16 16	47, 67, 42

In other cases the converse takes place, and the heat test is lowered. Experience has shown, therefore, that by the assembling of certain materials a certain test is generally obtained, and is to be expected. If it is lower, instability may be looked for; if higher, then "masking," deliberate or accidental.

The presence of vaseline in cordite does not hide evidences of instability when this explosive has been stored in India for a time. But the test does fall to a most alarming extent, although it does not enter into the scope of this paper to discuss the causes.

Undoubtedly the advent of the horny smokeless powders of modern times has made it a little difficult to give the test the same scope as it had when first introduced; but here again it is only a question of adapting it in a commonsense manner to the special circumstances arising. As a rule, a simple explanation can be found for every apparently abnormal result, and, in the accidental retention of a portion of the solvent used in the manufacture, will frequently be found an explanation of the trouble experienced.

I have frequently found the heat test of the interiors of grains and cords to be quite different from the surfaces, and no doubt this is common enough. In cases of doubt it would certainly be advantageous to have some other verification test, and perhaps that of Mr. Guttmann or Dr. Spica would form a very valuable adjunct to the present test. Most manufacturers know to their cost that a batch of explosive made from perfectly stable ingredients will frequently give a test much below the normal, and experience has led them to assume that bodies other than the products of decomposition do sometimes affect the papers adversely. What these bodies are remains yet to be discovered, but the mention of facts like these merely shows that there is still a field for research in this already much-investigated sphere.

Some years ago now, when carrying out a very comprehensive series of experiments in connection with this same subject, I found that a very good check was to carry out the following test. The explosive to be examined was subdivided as required and placed in a U tube, which was heated for 30 minutes in a water-bath kept at the requisite temperature. Through the tube purified air was passed, and the escaping gases made to bubble through absorption bulbs containing *m*-phenylamine-diamine. I tried iodide and starch, as well as diphenylamine, by the same method, but the *m*-phenylamine-diamine turned out the most satisfactory. At the expiry of the 30 minutes the depth of colour was ascertained in much the same method as Nessler's test is carried out; and, of course, by doing a blank or standard explosive, or both, a ratio was established between this test and the heat-test results.

When all is said and done, however, I do not think it will be necessary to resort to a confirmatory test of this sort in one case in a thousand.

DISCUSSION.

The CHAIRMAN, in inviting discussion, said that it was a matter on which much discussion had already taken place, and it was of the utmost importance to manufacturers.

Major NATHAN said that he entirely agreed with Mr. Cullen as to the desirability of having standard test papers made in some central establishment, from whence all interested could obtain their supplies, for that would do away with the variabilities incidental to the manufacture of test papers at different establishments, of which Mr. Cullen had given examples. In the old days, before an arrangement had been come to with the Chemical Department at Woolwich there were endless arguments and discussions as to whether the heat tests at Waltham Abbey or those at Woolwich were right, but they eventually adopted one source of supply for test papers, and since then there had been no trouble. It was a fact that freshly made test papers were not reliable, but after a month or six weeks they had settled down, and remained constant for a considerable time. They had ascertained this by employing a standard explosive and testing the test papers with it, and they had found the results pretty constant. When one supply was nearly exhausted they obtained another supply from Woolwich, and tested the new papers against those previously in use, with the results shown in Mr. Cullen's tables. He thought that the heat test left a great deal to be desired. The chief difficulty arose from the fact that they did not know what it was in the explosive that affected the test paper. They did know that samples of apparently safe explosives would give a very low heat test; for instance, samples of cordite from India had gone

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down to an alarming extent, alarming only because the heat-test figure was low; but that explosive, when tested for composition or ballistics, was found not to have suffered in the slightest degree, and having reached the low point of four or five minutes it did not seem to get any worse. He had had samples of cordite that had failed to stand the heat test, and had then subjected them to considerable temperatures, with the idea that if decomposition had set in it would have been aggravated, and something much more alarming would have resulted. Strange to say, the heat test of those explosives had gone up in the process of heating, perhaps from five to twenty-five minutes. Therefore it did not follow than an explosive that had dropped in the heat test was dangerous. There were factors which affected the heat test which were still unknown, and until they were known one could not regard the test as infallible. At the same time it was most valuable, as it undoubtedly did give an intimation whether the manufacturer had thoroughly purified the raw materials and the finished nitro-explosives. He did not think, however, that a subsequent drop in the test meant that an explosive had gone bad. There were many remarkable things about the heat test. For instance, guncotton mixed with nitroglycerin would sometimes stand only a very low test, though the tests of both were good separately. Separate them again and they both came back to their original heat tests. That, in his opinion, required explanation. With regard to the other tests mentioned by Mr. Cullen, the diphenylamine test was a very good one when applied to explosives of the guncotton type. Some four years ago, when the question cropped up, he made a great number of experiments, and the diphenylamine solution for them was made by Mr. Guttmann himself. As long as he stuck to guncotton explosives he got concordant results, but when he used it for testing nitroglycerin, or explosives containing it, he obtained neither the reaction he ought to have got nor any consistent results. Subjecting a volatile explosive to a heat test in which the reagent was dissolved in sulphuric acid probably had something to do with the unreliability of the results obtained. The metaphenylendiamine test referred to he had also tried, and although the results were claimed to be four times as sensitive as the Abel test, yet his results did not confirm that claim. He found that the heat tests were much the same when testing guncotton and nitroglycerin, whether he used Dr. Spica's reagent or the Abel reagent. But when he came to an explosive like cordite, or explosives containing much nitroglycerin, the results differed widely. Of the three tests, he considered the Abel test the most reliable, but there was much still to be found out about the subject. The most important point to be cleared up, in his opinion, was, what are the volatile bodies that affect the heat test? for it was evident that free acid, as at first supposed, was not by any means the only one.

Mr. O. GUTTMANN said that Mr. Cullen started by saying that the diphenylamine test he had indicated some years ago was not a better test than the iodide one, and that his statement as to the value of the iodide test was a sweeping one. He (the speaker) begged leave to repeat that statement in the most emphatic manner. The diphenylamine test could not be bad, because four Governments had adopted it, either as the sole test or to control others, and because the British Government had modified the iodide test so that the objections made to it were to some extent removed. If there was a justification needed for his statement, it was to be found in Mr. Cullen's table No. 1. One had only to look at the column "cordite paste" (a mixture of nitroglycerin and guncotton), standing only eight minutes, and the same, *plus* vaselin and acetone, standing 68 minutes, to show that the iodine test was fallacious for smokeless powders. The acetone and vaselin masked the heat test, and made it go up to ten times what it ought to be. Major Nathan had said, and perhaps there was some justification for it, that the diphenylamine test was not so reliable as he had expected. He was quite ready to admit that it had some faults, and he had never claimed to have found the test. He was not the inventor, but had simply adapted it to the purpose. What he claimed as a distinct merit was not the invention of a new test, but to have shown that the old one was bad, and why. He had pointed out several other tests which might be used. Recently a foreign Government had reported to him that they found the guncotton supplied to them going up surprisingly in the heat test, which they could not explain, until, on making an examination, they found that the guncotton before being supplied to them was dried in a room in which smokeless powder with acetic ether as a solvent had been dried. That showed that the diphenylamine test was sufficient to reveal such a slight difference. He would not go very deeply into the objections made by Major Nathan; personally, he owed a great deal to that gentleman for his support in the early investigations. He had given him every opportunity, and had assisted him to the fullest extent. A paper was published in 1879 by General Hess, who had occupied himself very much with the heat tests of various descriptions. In that paper were stated the advantages and defects of the heat tests; and all that General Hess said 20 years ago still held good. Major Nathan had said that he found the diphenylamine test good for testing the prime materials, but failed when he came to cordite, because it gave such extraordinarily low results; this was exactly the reason why the diphenylamine test was good and the iodide test bad. Major Nathan thought the vaporised nitroglycerin was decomposed by the sulphuric acid used for dissolving the diphenylamine, but it was very strange that powders made with ether alcohol gave identical results with both tests, whilst whenever a masking solvent like acetone or acetic ether was used, a decomposition theory was necessary to explain the enormous discrepancies. He wished briefly to mention the present state of the question. The first man who made a test based on the development of nitrous acid on heating was Sir Frederick Abel. Very shortly after, the then Captain Hess made a test by which he aspirated air, very much in the way Mr. Cullen had described, through a bottle containing iodide, then through a tube with the explosive, then allowed it to bubble through a solution of iodide and observed the first appearance of the colour reaction, then the formation of a ring, and then coloration of the whole liquid. Later, he heated the explosives at high temperatures, and observed them from a distance through a telescope, and noted the time in which coloration took place, and also the time of explosion. Still later, but based on the same idea, he proposed that explosives should be heated at 75° under pressure, and for so long that perfect decomposition took place or an explosion. He published tables showing remarkable differences which could not be explained. Guncotton was found to stand the test for an incredibly long time—600 minutes—whereas dynamite would stand only 15. Within the last few years, probably because all the other heat tests failed, the French Government, and also the Dutch Government, had heated the explosives up to 130° C., exposing the vessels to that temperature in a sand bath, or otherwise, and noting the time in which the brown fumes would appear. That time was sometimes days, sometimes hours. The inherent fault of that plan was, that it was very difficult to maintain the same temperature for days and days, and to make sure of observing it. Quite recently a new method had been devised by the Central Institution for Technical Research at Neu Babelsberg, instituted by half a dozen manufacturers of explosives, mostly of the Nobel group, and which laboratory was under the direction of Professor Will. They heated the explosive to 135° C., probably in amyl alcohol, the boiling point of which is 137° C., and collected the gas in the usual way, measuring the time in which it was developed and the quantity developed in a certain time. That was rational, and gave a true indication of the possibility of an explosion through decomposition, but at the same time it is not a test adapted to the actual conditions of storage. On the other hand, when one heated an explosive to 70°, they did not get an indication of actual decomposition, but generally an indication that there were certain impurities in it. With guncotton and similar explosives which had a low heat test, after being kept for a long time the test improved, whilst, again, other explosives decomposed. When one heated to 135°, which was nearing the point of explosion, one had a possibility of a quick and reliable test, in, say, 30 or 40 minutes. He considered the

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position was not yet exactly defined; more experiments would have to be made; possibly both tests would have to be combined. What was wanted was a quick means of knowing whether an explosive was suitable or not, and a means that would not be bound to show fallacious results, as the present one did in so many cases.

Mr. W. F. Reid said that he considered the last remarks made by Mr. Guttmann of great importance, because, taken in conjunction with what Major Nathan had said, they showed a possibility of obtaining reliable tests. He would not say that the test just described was reliable, because if one heated an explosive to very much above the temperature it would ever be exposed to in practice, it would be subjecting it to conditions which were not natural. The same thing had been done with Portland cement; it was heated to a temperature that it would never require, and fallacious results were obtained. The heat test introduced into the explosives industry required modification, for one really did not know upon what the test was based, and he thought it was rather hard upon manufacturers that they should be bound by a test that, after all, might be erroneous. He believed it was in some cases absolutely fallacious. He had had explosives prepared with the greatest care, and had subjected them to all sorts of conditions, and they would not explode under practical tests, and yet they would be condemned by the heat test. Even the distinguished author of that test was unable to find the connection between the test and the danger of the explosive. With regard to the conditions of testing, Mr. Cullen had given a large number of figures, which represented much work done by himself or at Waltham, and he (the speaker) was very loth to find fault with anything which represented so much labour, but he could not see that the figures were of any earthly use to anybody who read them. The various test papers employed were represented by letters with no reference to their composition. If Mr. Cullen could give any information with reference to the papers themselves, some estimation of, say, the chlorine in them, which no doubt was very often present, and possibly went off after some time, or if he gave the percentage of pure cellulose in the papers, or any other means of identification, they would be useful. With regard to the impurities in the papers, they were very likely due to the bleaching of the pulp, and that was corroborated by the well-known fact that the thick papers gave a worse test than the thin ones. The fact had long been well known that different papers gave different results. He understood that the chief point Mr. Cullen wished to advocate in his paper was that there should be a place where uniform paper could be procured. That was a most difficult thing to bring about; but perhaps it could be arranged, and it would be a great benefit to those who had to use them. There was a firm on the Continent which guaranteed their paper as absolutely pure, but if compared with some English papers it might be found that the English papers came out at the top. What was wanted was not so much absolute purity as uniformity, and if Mr. Cullen could secure that it would be a good thing. He himself was not sure that paper was the best thing that could be used for the purpose. If it were possible to get the reagents on another substance they might eliminate one of the greatest sources of irregularity. He hoped the investigation would not stop until some relation had been found between the explosive and the test.

Mr. H. de Mosenthal said that no doubt a number of members present were not able to follow the discussion, as he himself had found to be the case on previous occasions when no explanatory remarks had preceded a paper on a subject with which he was not acquainted. He would perhaps be allowed to explain that in examining an explosive by the heat test, it was placed in a finely divided condition into a test tube, and suspended over it was starch iodide of potassium test paper prepared in a prescribed manner. The explosive was then heated and kept at a fixed temperature, and the test consisted in no coloration appearing within a prescribed time. If the coloration appears prior to the time fixed, the explosive is regarded as dangerous. The test was first applied to guncotton and dynamite, then to blasting gelatin and so-called gelatin explosives, and lastly to cordite. An explosive which did not stand the test was, as already remarked, considered dangerous, and in some countries it was thrown into the sea. If, as Major Nathan had remarked, the fact that an explosive did not stand the test was not an indication of its dangerous nature, there ought surely to be a change in the test, or considerable hesitation on the part of the authorities to destroy large quantities of valuable merchandise.

Mr. J. M. Thomson said that when one began to speak of the heat test one had to be very careful to avoid dogmatism. There were so many things which affected the question that one could not speak confidently. Fortunately, Mr. Cullen's paper had not raised in itself any questions that might tend to discussion to any great extent. He quite agreed with Mr. Cullen that so long as the heat test was used as a standard for explosives a central supply would be a good thing, and would do away with many of the varying results shown under the present system. The difficulties of the heat test were not new. For 20 years past—for so long as dynamite had been manufactured—those difficulties had cropped up. Even when carbonate of ammonia had been present in the dynamite a very low heat test would often occur, and therefore was not due to any acid present in the substance or in the atmosphere of the tube, so that one was forced to the conclusion that it was volatile nitro bodies which affected the iodide of starch paper. So far as the heat test by diphenylamine was concerned, there were many tests made several years ago on the suggestion of Mr. Guttmann, and it was pointed out that they applied very well to guncotton, but when used for nitroglycerin, which was to some extent volatile, the diphenylamine paper could not be relied on. That was accounted for by the fact that the diphenylamine was in dilute sulphuric acid solution, so that when the volatilised nitroglycerin came in contact with it a reaction took place. If that were the case, it might be taken to apply also to cordite as well as to nitroglycerin, and he believed the heat test of cordite approximated very closely to that of nitroglycerin. The question therefore arose as to whether they could depend upon this heat test, or whether they should look upon it with a certain degree of suspicion as being affected by the volatile nitroglycerin. He considered that so long as the heat test was used—and they had nothing better at the present time—they were greatly indebted to it, and especially for its services in the past. No doubt some other test would be discovered, and the sooner the better; but one had to be very careful in casting aside a test of purity. He understood that with the present test the standard of minutes for each explosive was based on tests of samples of the explosive which had been prepared from carefully purified materials, a fair margin being allowed for manufacturing conditions. He considered that at present they were quite justified in relying on the heat test so far as it went, and he hoped that some better test would soon be forthcoming.

The Chairman said that he would not like it to be thought that the meeting was opposed to the application of either Abel's heat test or modifications of the same. Every manufacturer of explosives must acknowledge that the heat test had been of inestimable service; that until the heat test was introduced and enforced, the manufacture of high explosives had been on a most insecure footing, and that only by its continuous use had the high security of manufacture of explosives become possible. At the same time it appeared to him that the time was approaching for an alteration in the test, and he believed that the discussion that evening would assist to that end. The discussion had somewhat strayed from the main point which Mr. Cullen had brought before them, namely, that while iodide paper was to be used, there should be one uniform supply of the test paper for the whole country. Mr. Reid had lightly touched upon the question whether paper was a desirable substratum for the iodide. He (the Chairman) equally had his doubts on that point. The text-book knowledge, that paper consisted of cellulose, should be disregarded, and it should be recognised that paper contained substances liable to alteration, whereby the sensitiveness of the reagent might be altered. It did not follow that because a large stock of

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uniform paper might be obtained for the purpose of preparing heat-test papers, that stock would be of the same nature after a lapse of years. A substance less liable to alteration should be sought after.

Mr. W. CULLEN, in reply, said that he considered that the Chairman had struck the keynote in his last remark, as the discussion had wandered away from the original purpose of the paper, which was simply to make the best of a test which admittedly had defects. He did not think that the heat test as at present carried out was altogether a bad one. After 20 years' experience it was the best they had, and it might be another 20 years before a better test came into use. He had conducted many thousands of those tests, and had found that one got very much into a circle in carrying out experiments of the sort. Mention had been made of the point of explosion as an indication of the stability of an explosive, but exhaustive experiments had shown this to be quite fallacious, and no ratio had ever been established between it and any other recognised method. Mr. Guttmann had referred to Hess's work. He was not familiar with it, but it seemed very similar to that of Abel on guncotton, which formed the subject-matter of communications to the Royal Society 20 years ago. Abel heated guncotton at various temperatures *in vacuo*, collected the gases, and observed the amount given off in a certain time. The experiments sometimes took weeks and sometimes months, but one could not wait for six weeks in a manufacturing works in order to know whether an explosive was suitable or not. They must be able to obtain a result in half a day. Mr. Reid considered it would be difficult to get manufacturers to combine. He might say that already most of the manufacturers had agreed to the proposal, and were very thankful for it. He was very sorry Dr. Dupré was not present, but the scheme had his hearty approval, as also that of Dr. Kellner. He could not agree with Mr. Reid that the tables shown were not intelligible. They certainly required a little study, which would repay the trouble. After all, the heat test did not pretend to indicate the relative stability of a number of explosives, and a most important point about it was that the physical condition was a function of the utmost moment. In one instance in the tables the two bodies, guncotton and nitroglycerin, had been brought together. The former possessed a heat test of 14 and the latter 20; combined they gave an average of 8; but that was because the surface exposed in the one case was very different from the other. The heat test, as at present carried out, was, therefore, among other things, in a great measure dependent on the physical condition of the explosive. One could not assume that because the cordite stood 68 minutes as against eight minutes, that it was nine times as stable, for the physical conditions were altogether different. The same applied to dynamite. Nitroglycerin would, as a rule, stand the test for 20 minutes; dynamite would seldom stand more than 10 or 12 minutes. In his opinion, that was principally because the physical state was altered. Replying to Mr. Reid, he might say that all the tests shown were made with the one paper. He rather regretted that the discussion had strayed away from the main point which he had intended to bring out.

Manchester Section.

Meeting held on Friday, January 11th, 1901.

DR. J. GROSSMANN IN THE CHAIR.

PATENT LAW.

BY IVAN LEVINSTEIN.

IN March 1900 I addressed, as delegate of the Manchester Chamber, the Associated Chambers of Commerce of the United Kingdom, on the defects of our patent laws.

The meeting unanimously resolved that preliminary examination into novelty was desirable. In the same month I read a paper on the same subject before the Manchester Section of our Society, when resolutions were passed in favour of preliminary examination, patents of addition, and amendment of section 18 of the Patent Act of 1883.

This paper, with some additions, was issued in pamphlet form by the Manchester Chamber of Commerce, after the Board of Directors had placed, by special resolution, the *imprimatur* of the Chamber upon it, certifying thereby its approval and adoption.

In deference to these important representative bodies, I cannot ignore a paper by Mr. C. D. Abel, which was read before the Manchester Section in December last year.

A few years ago, Mr. Abel published a paper in which he was anxious to prove what other patent agents have attempted before and after him, *viz.*, that preliminary examination into novelty was not desirable, and that it did not conduce to confer greater security on German patents. He supported his arguments by certain figures showing that the proportion of litigated patents to annulled patents was practically the same in both counties; in England 29:13, and in Germany 102:43. I challenged his figures, as well as his conclusions, and gave some reasons for my objection, which I now briefly repeat:—

(1) Probably half the patents granted in this country are not worth fighting for.

(2) Patent litigation for a man of small capital spells ruin.

(3) Patent litigation in Germany is cheap; if an inventor or manufacturer believes that an injustice has been done to him, redress is open to him, even if possessed of only small means.

(4) That Mr. Abel does not take account of the respective life of British and German patents.

Mr. Abel now says my first reason is only an assertion; my second he accepts as true, but adds "wisely so"; to the third he rejoins that German litigation is "cheap and nasty"; to the fourth he attempts to give some explanation. I contend that he has not disproved any of these assertions.

Putting, however, aside, for the moment, my reasons, and assuming for the purpose of argument that Mr. Abel's figures are correct and represent a fair average of years, even then his conclusions as to the security of German patents will be fallacious. Mr. Abel says that I have overlooked the main point of his argument, that the proportion of litigated patents to annulled was practically the same in both countries. It does not matter, however, whether they are the same or not; the greater security or better title of a German patent lies in the fact that out of about 15,000 applications to the German Patent Office, less than 6,000 are granted. It is this weeding out of 9.000 patents by preliminary examination, carried out by a competent court, that enhances the value of a German patent.

I will, however, further show that little reliance can be placed on Mr. Abel's figures and conclusions, and for this purpose I reproduce his own table, and another table compiled from official sources. This latter table goes a little further back than Mr. Abel's. In covers 1896, the year selected by him, and four years preceding. I point out, however, that my table, for obvious reasons, has been somewhat differently arranged from Mr. Abel's. I do not show patents litigated nor patents partially invalidated, as no reliable statistics exist, and can only be at the best guesswork. Our leading authority in this country is the official report of patent cases, but this publication only reports decided cases of public interest, and a good deal of patent litigation is carried on without coming into court.

It is also misleading to classify under one heading patents wholly or partially invalidated.

Mr. Abel's Table.—Patents, 1896.

——	Great Britain.	Germany.
Patents granted	14,105	5,410
Patents litigated.....	29	102
Patents wholly or partially invalidated.	13	43

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Table compiled from German Official Sources for 1892 *to* 1896.

	1892.	1893.	1894.	1895.	1896.
Applications.....	13,126	14,265	14,964	15,063	16,486
Patents granted.....	5,900	6,430	6,280	5,720	5,410
Patents invalidated, including patents withdrawn.	10	12	22	18	32

It will be seen from the official table that 32 patents were withdrawn and invalidated in 1896, Mr. Abel's year, whilst the average for the four preceding years is less than half of this number, *viz.*, 15·5 per annum.

I leave it to Mr. Abel to explain—

(1) Why he has picked out for his arguments the year 1896.

(2) Whether or not any fair or reliable conclusions can be drawn from a single year's patents statistics.

(3) What value can be attached to his statistics for patents partially invalidated and for patents litigated.

Mr. Abel having, in his opinion, disposed of my criticism of his figures and conclusions, contributes some information about German patent law; and to make this more forcible he refers to his lifelong experience. This does not, however, mean much, as the German patent law has existed only since 1877; whilst the new German patent law, which can only be the one under discussion, has only been in force since October 1891.

In 1886 the German Government appointed a commission consisting, not only of a few Government Officials, patent agents, and patent counsel, similar to that recently appointed here, but including, besides, members of the Patent Office, men eminent in science and largely interested in trades and industries, and also technical, industrial, and scientific experts. This commission was appointed for the purpose of advising the Government to amend the law of 1877. It is interesting and important to state that it was the unanimous opinion of this commission that preliminary examination should be retained. The new patent law of 1891 is a material improvement over that of 1877. It is not a mere addition or enlargement of the latter, but, as expressly stated in the preamble, is an entirely new Act.

Now, Mr. Abel is eminent in his profession. He is a member of a firm occupying a high position among patent agents. He ought to be well aware of the sources from which reliable information on German patent law and procedure can be obtained; yet he says: "In the first place when a patent action is commenced in the Landgericht (county court) where the patentee is domiciled, both parties to the suit are obliged to employ a barrister appointed to that particular court, and no other. Another feature of German litigation is that only written evidence can be produced in court, and the assessors' and lawyers' reports have to be in writing, the payment for such reports being at the rate of 2*s.* per hour occupied."

Most of these statements are absolutely erroneous.

(1) The Landgericht does not correspond to our county court; it is a higher court, consisting of a president and four judges. To the Landgericht, for example, in Berlin, about 500 qualified barristers are admitted. The employment of a barrister attached to this court is therefore no hardship, and the whole procedure is, after all, not dissimilar to our own practice.

(2) It is quite incorrect to state that only written evidence can be produced in court. In an action before the Patent Office, Reichsgericht, or Landgericht, the plaintiff, as well as the defendant, may personally appear to give evidence, together with their witnesses and experts.

(3) It is also quite erroneous to state that assessors and lawyers are paid at the rate of 2*s.* per hour. Barristers in Germany are feed proportionately to their professional standing, and to the importance of the case upon which they are engaged.

I now come to Mr. Abel's illustration of the German method of litigation, of which he says "that this is positive evidence of the absence of security of a German patent."

It is the Schlich case which he cites. I submit that this illustration is unfortunately chosen, as it proves nothing more or less than the security of a German patent, which is the very reverse of Mr. Abel's contention.

The patent was granted to Schlich by the first division of the Patent Office. Schlich brought an action for infringement of his patent against a manufacturing firm. The defendant thereupon applied to the second division of the Patent Office for an annulment of Schlich's patent on the ground of want of novelty. The defendant succeeded. Schlich thereupon appealed against this decision to the Reichsgericht, which quashed the decision of the second division and upheld the patent.

Mr. Abel then cites the well-threshed-out illustration of the Siemens case against the German system of examination, but this illustration is also unfortunately chosen. As the Siemens case has been so often wrongly quoted by patent agents and others as a blot on the German system of preliminary examination, it may be useful information to our members to briefly refer to the various single German States prior to the establishment of German patent law.

Most of the single German States, before the foundation of the German law, had their own patent laws. For example, Prussia established patent laws in the year 1815, Bavaria in 1825, Wurtemberg in 1836, Saxony in 1853. The laws of each of these States differed from each other, and each of them was widely different from German patent law. The patent laws of the various States have been defunct since 1877. The German patent law of 1877, as I have already stated, has been replaced by the law of 1891. The procedure of the defunct Prussian law was most arbitrary. The grant for inventions of great importance was often refused whilst smaller ones were accepted. My personal experience dates back to 1864, when I obtained a patent in Prussia. It is this defunct Prussian law which has been probably confused by Mr. Abel and other opponents to preliminary examination with German patent law.

Only recently Mr. Lloyd Wise, the well-known patent agent, in a paper read before the London Section and published in our Journal, November 1900, on preliminary examination into novelty, said: "It is almost superfluous to recall the facts that in Germany patents were refused for the Bessemer process and for the Siemens regenerative furnaces." Mr. A. G. Bloxam, who, I believe, is also engaged as a patent agent, said in the discussion: "Mr. Wise's interesting reference to the celebrated case of Siemens was most *apropos*."

But from the facts already stated it is quite evident that there never was a German patent refused to either Mr. Siemens or Mr. Bessemer by the German Patent Office and under German law.

Mr. Siemens' application for his regenerative furnaces was made more than 25 years before the existence of the German patent law, and Bessemer about 20 years previous to it. It is therefore waste of energy on the part of our patent agents to cite these cases against preliminary examination as carried out by the German law.

I have been, since its existence, and I am now, constantly in contact with the German Patent Office. I fought my own battles, and I have personally pleaded before it. My experience is that it is now of very rare occurrence that patents are refused which contain any novelty, provided that one perseveres, and also fully replies to the opposition raised by those interested.

In my pamphlet, however, I was not so much concerned to prove the superiority of the German patent system, although I do consider it as the best. On the other hand, I concede that preliminary examination is a controversial subject; but every unbiassed student of patent law will agree with me that the want of conformity existing between our laws and those of our industrial rivals is doing an incalculable harm to our trades and industries.

For example, the grant of a patent to a foreign applicant which has been refused to him by his own country, benefits

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the foreign country at our expense, the loss to us being proportionate to the value of the invention.

That the patent laws of Germany have been of the greatest possible aid to the growth and development of German industries is freely admitted by those who know the facts.

It is only recently that Privy Councillor Dr. Otto Witt, the eminent Professor of Technology in the Charlottenburg High School, said in his very admirable report on the collective chemical exhibits of Germany: "The beneficial effects which the German patent laws have exercised on the development of German industries, particularly of the chemical industries, are simply incalculable." I wish the same could be said of our patent laws.

I am, however, not in the least sanguine that we shall easily succeed in getting preliminary examination introduced, as it would be costly. Our present Government is already saddled with financial burdens, and any addition to these would no doubt be strenuously objected to, especially if there were the slightest opposition. The consequence, therefore, will be that speculative, bogus, bluff, and block patents will be taken out as hitherto, to the great disadvantage to inventors and manufacturers alike. The title of an English patent will continue to be valueless until established in a court of law; extortion and abuse will continue to flourish to the detriment of our traders.

The question then arises, Can no means be devised to amend, at least to some extent, this deplorable state of things? Is it within the range of practical politics to ameliorate the disadvantages under which we are labouring? I am quite alive to the fact that to carry any proposed amendment it must meet the interests of *bonâ fide* inventors and manufacturers; it must not be diametrically opposed to the interests of patent agents and counsel, and it must not seriously complicate the present machinery of patent legislation.

I submit to you, with some diffidence, some suggestions which, if carried out, will, in my opinion, amend the present chaotic state of our law.

(1) That in all patents which cannot be defined by drawings an applicant shall be permitted to claim in one patent only one single substance or compound, and, if demanded by the Patent Office, he shall deposit samples or specimens of his invention.

(2) That every patentee shall mark each article, or the package in which said article is made up and sold, "patented," together with the number of reference to the patent under which the article has been manufactured.

(3) If the patented article consists of a mixture, of which only a part is patented, it shall be so stated.

Now, in regard to the first proposition, it contains nothing more or less than what is law already in the United States, and partly so in Germany. If carried out, it would remove the fraud which is frequently practised on the public by patentees.

I have already shown in my pamphlet, under section 18, how this section is abused. It is quite a common procedure for a patentee, if he has really invented one thing, to include hundreds, nay, thousands, of others. It is also common practice to make, say, 50 claims, and when the time comes to establish the validity of the patent, to strike out, by help of the said section 18, say 49, and still retain a valid patent. I have also shown that, for example in organic chemistry, one may, by theoretical deduction, fix the potential existence of a large and almost unlimited number of substances which may never have been seen or made by anyone.

I have referred in my last pamphlet to several foreign patents, of which one covered 38 pages of print, whilst its corresponding German patent only covered three pages. I have referred to another German patent, which included in its claims thousands of possible products. This latter patent holds the unique position in as far as it only exists in England.

I had quite recently some unpleasant experience with this identical patent, which shows the widespread mischief which is done by this kind of speculative patents. It is not many weeks ago that we applied to the German Patent Office for a patent for a new colouring matter. We got a reply that our invention was not new, and were referred to the very patent in question, granted to the foreign company in this country, but nowhere else. We at last convinced the German Patent Office that our invention was not anticipated by the speculative patentee. Whether we would have been so successful in our own courts is another question, but certainly not without first spending a small fortune.

Many of you are no doubt aware that, thanks to the efforts of the Manchester Chamber of Commerce, supported by you, and to the first test petition which my company lodged with the Board of Trade, section 22, which deals with compulsory licenses, has been made much more effective.

Now, the adoption of my propositions ought to be a natural sequence. It will be otherwise most difficult to ascertain whether the patent is worked in this country or not.

A foreign patentee, for example, has taken a patent in this country, claiming a thousand and one articles. How will it be possible to find out whether he works his whole patent or not, and, if worked, what part of it? Further, it is illegal in this country to mark an article patented if it is not protected by a patent, but the difficulty often occurs to discover whether the article so marked is patented or not. It further happens that an article is a mixture containing only perhaps 10 per cent. of a patented article, and I hold it is a deception of the public to mark such an article as patented unless the whole mixture has been patented.

To sum up: the advantages which I believe will follow if my suggestions were approved and adopted, are:—

(1) They would assist in the carrying out of section 22.

(2) They would amend section 18.

(3) Litigation and search would be simplified.

(4) The security of an English patent would be substantially increased, as the taking out of bluff, block, and other fraudulent patents would be made much more difficult.

(5) The public would readily know, which is often very difficult, what the patentee has patented and what not.

I cannot conceive that *bonâ fide* inventors could raise any objection to these propositions, whilst their adoption would be conducive to honest trading and of benefit to our industrial and commercial interests. A patent is a public document, and should not be surrounded by any secret; its widest circulation and publication is a boon to all concerned.

The amendment of our patent laws will be again discussed at the annual meeting of the Associated Chambers of Commerce of the United Kingdom, which meeting takes place in March next.

Some important resolutions will be submitted. I venture to appeal to the Council of our Society to reappoint a patent committee and to support the efforts of our chambers of commerce.

Manchester has always done so, but little support has, so far, been given by London.

Discussion.

The Chairman said the subject was not only very interesting, but of great importance. As Mr. Levinstein had stated, there were many different interests—many clashing interests—connected with the patent law, and it was a highly controversial subject. It had been before them at the March meeting. They had discussed the importance of search, and had come to the almost unanimous agreement that an official search for novelty was desirable. The practical difficulties, however, which stood in the way were enormous. Germany, before 1871, consisted of a number of independent states, some of which had patent laws. After 1871 the states became amalgamated, and it became possible to have one patent law for the whole. In 1877 Germany started with a clean sheet, and started in the right way. If the alterations which were advocated with regard to official search were carried out, it would be appalling to think of the litigation to which they would lead during the next 15 years. The difficulties were

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enormous in the way of alteration, but alteration was desirable.

Mr. J. H. BUTTERWORTH, barrister, said he was a lecturer on the subject of the patent laws. The law of the country could create a right. Taking the land laws as the basis for argument, why could they not, in the matter of patents, have a search back, say, for 50 years? Anything further back should be taken no notice of. The Government might undertake the 50 years' search, and give the inventor a guarantee. The law could give a valid title. As to amendments the clause was vague. They might go to the Patent Office for amendments, and the result has been an omnibus clause in its specifications. His suggestion was that they should only do what was done with regard to leasehold and freehold properties. Only such amendments should be allowed as clerical errors and errors of description.

Mr. HEYS read from a speech recently delivered by the President of the German Patent Office, in which he said that they hoped to grant more than 30 per cent. of the applications for patents in future. Many of the patents applied for were valueless. The limit of anticipation in Germany was 100 years. Anyone making and working a patent at the time a patent was applied for was entitled to continue working it.

MR. E. HELM, Secretary of the Manchester Chamber of Commerce, said that if Mr. Abel's paper had been read before any statistical society in the country it would have received a severe and hostile handling. It was the commonest form of the misuse of statistics to take the figures of one year and use them as averages, and it showed the fallacy of Mr. Abel's paper in that respect. He had been disappointed with Mr. Abel's paper. In the course of his duties he had studied the question very closely. The difference between the patent laws of this country and Germany operated to the serious disadvantage of the British people. He did not think they could judge of the importance of the question unless they called to mind the principles which underlay it. Monopolies, *per se*, were an injustice and an abomination. They knew that James I. was made to abolish monopolies. Our forefathers retained, for the benefit of the whole community, a certain class of monopoly. This was retained for the benefit of the people, but primarily for the benefit of the inventor. One reason why they should be careful as to the protection they gave to an inventor was, that many of the greater inventions were evolved from men's intelligence, which could not be protected, and which had benefited the nation highly. The protection they gave should be on the ground that it should be for the benefit of the nation. A good patent affected the interests of the whole nation. When they saw patents given to men for things which had no novelty, and which prevented rather than encouraged further improvements, they had to go deep down to consider the basis of the whole system. He had paid many visits to the Board of Trade, and had seen its work, and he did not know how it was, but from some occult influence what ought to be an assistance to the trade of the country was in some respects a serious hindrance to it. Powers had been conferred on that Board which it would not exercise. He contended that the principle of granting monopolies, and the obstruction they had to meet with at the Board of Trade in one way or another, should make them feel that this was not a question to be played with, but one to be pursued with all the energy possible.

Mr. GRIMSHAW agreed with Mr. Helm that patents were supposed to be primarily for the benefit of the trade of the country, the next person to be benefited being the inventor and the tradesman who used it. The difficulty was that in this country patents seemed to exist in great part for the benefit of the lawyer, and a Government department did not like to be irritated. Time after time statements were made by responsible men and no notice was taken of them. Mr. Goschen once said in a budget speech that the income of the law was greater than that from the cotton, iron, and coal trades put together. He had since seen no allusion to it, but the statement was so astounding that he thought it could not be true. With regard to the 50 years' limit, did Mr. Butterworth mean that if somebody patented a thing over 50 years ago, somebody could patent it over again? He considered the three points put by Mr. Levinstein as desirable. They would tend to prevent fraud, whether a patent was novel or not. It was a source of infinite harm for a patent to be refused in Germany and granted here. The result was that anybody in Germany could make it in Germany. It was constantly recurring that a German manufacturer, developing his industry, had a free market, whereas the English manufacturer had to buy from a protected market.

Mr. BUTTERWORTH said there ought to be a separate court presided over by a special judge dealing with compulsory licenses. In the commercial court the whole proceedings were simplified, and cases were expedited. That was what they wanted in reference to patent cases. The 50 years' limit would cause difficulty. The patent law was an industrial measure for the benefit of the trade of the country.

The CHAIRMAN said that whilst they had heard a great deal about the interests of the public, little had been said in favour of the inventor. A patent was certainly a monopoly, but, in order to obtain the monopoly, the inventor had to disclose his methods, and after a certain number of years anybody could use his invention. Besides this, during that period, the publication of his invention might often direct others into lines of thought which might lead to other inventions.

Mr. LEVINSTEIN said, in reply, that they were all practically agreed. There were many patentees who were not inventors. A patent was a monopoly, but the country had to get something in return for setting aside the ordinary principles of law to benefit the inventor. Under the statute of monopolies the patentee had to make the article, and a patent was refused if it was mischievous to the State. After commenting upon the threatened ruin of natural indigo, India's most important industry, for which, he said, the nation gave its destroyer a reward by the grant of a patent, Mr. Levinstein said that he was against fraudulent patentees who went in for blocking progress and blocking inventors. He desired to protect honest inventors.

New York Section.

Meeting held on Friday, November 23rd, 1900.

DR. V. COBLENTZ IN THE CHAIR.

THE ANALYSIS OF OILS CONTAINING CARVONE.

BY EDWARD KREMERS, PH.D.

ABOUT five years ago the writer was interested in the more detailed examination of the non-ketone constituents of the oils containing carvone. A. v. Baeyer had, during the several years preceding, made a special study of carvone and its isomers and their reduction products. Among other things, he had demonstrated the readiness with which some of the reduction products decomposed, especially when exposed to somewhat higher temperatures. Thus, *e.g.*, tetrahydrocarveol, the isomer of menthol, designated carvomenthol by v. Baeyer, readily splits up into a hydrocarbon and water. That a stereo-isomer of the common menthol also splits up readily in the same manner has been demonstrated more recently.

Those who have worked with oils containing carvone know that upon fractional distillation, which is very imperfect at its very best as a method of separating the individual constituents of a complex mixture, a resinous residue is apt to remain in the flask, thus indicating decomposition. A method, which has been employed to separate the carvone in a pure state from the oils that contain it, consists in converting this ketone into its crystalline hydrogen sulphide addition product from which, after recrystallisation, carvone can readily be regenerated in a fairly pure state. This method, however, is scarcely applicable as a means of obtaining the non-ketone constituents of oils containing carvone, as everyone knows who has prepared carvone hydrosulphide. Not only does

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a part of this compound remain in solution, but some of the other constituents of the oil are apparently acted upon by the hydrogen sulphide. The product is what German chemists so characteristically designate a "Schmiere."

It occurred to the writer, therefore, to remove the carvone from the oils of caraway and spearmint by converting it into carvoxime. In this reaction hydroxylamine hydrochloride, sodium bicarbonate, alcohol, and the temperature of the water-bath are employed. The resulting product is distilled with water vapour. According to the age of the oil employed a relatively pure carvoxime remains behind and the distillate is an agreeable product in every way to work with. The principle non-ketone constituent of the oils of caraway and spearmint is limonene, the former oil containing the dextro-rotatory variety—corresponding to the dextro-rotatory carvone—the latter the lævo-rotatory variety—corresponding to the lævo-rotatory carvone which it contains. From the non-ketone fraction of spearmint oil an alcohol of the formula $C_{10}H_{17}OH$ was isolated by the calcium chloride method, first applied by Jacobsen to the study of the alcohols of geranium oil.

At this early point these investigations were interrupted. Dr. Chas. Rice, then and now the able Chairman of the U.S. Pharmacopœia Revision Committee, had requested the writer to give some of his time and attention to questions of more direct practical import, *viz.*, to the analysis of volatile oils. The apparent quantitative character of the carvoxime reaction, mentioned above, suggested the possibility of its application to the carvone determination in these oils. The attempt was made, and seemed to prove an unqualified success, for in four determinations the following results were obtained, *viz.*, 50·22 per cent., 50·83 per cent., 50·41 per cent., and 50·00 per cent.

For an analysis of a complex organic mixture these results were remarkable indeed. When the preliminary experiments were repeated in Leipsic, the results there obtained seemed to throw considerable doubt upon the value of the method, which otherwise seemed almost ideal as to its chemical simplicity. It, therefore, became necessary to go over the ground repeatedly, so that the following papers on this subject have been published during the past five years. As in all analytical methods, great care must be given to details. This paper is to be a kind of *résumé* of the work done, the results of which are scattered and, therefore, not in a convenient form for anyone who wants to apply the method in actual practice or who may want to test it still further.

The first paper was published in April 1896 and bears the title "The Quantitative Estimation of Carvone in Volatile Oils" (Pharm. Rev. **14**, p. 76). The experimental work was done by Mr. O. Schreiner. The paper contains a brief review and criticism of the various methods previously suggested for the analysis of the oils of caraway and spearmint, *viz.*, the following :—

1. By fractional distillation.
2. By means of the crystalline hydrogen sulphide addition product.
3. By Huebl's iodine absorption method.
4. By means of the specific gravity.
5. By means of the rotatory power.

The paper further describes the method of purification of the carvone and limonene for an artificial mixture, the preliminary methods of determination as carvoxime and the application of one of the three modifications tried to commercial oils.

The second paper was published in November of the same year, and is entitled, "Application of the Carvoxime Method for the Quantitative Estimation of Carvone to Adulterated Spearmint Oil" (Pharm. Rev. **14**, p. 244). The experimental work of this is also by Mr. Schreiner. The method was put to a severe test, oil of spearmint, scientifically adulterated in such a manner as to defy detection by physical tests or even a combination of physical tests being used. The carvoxime method gave satisfactory results, revealing the low carvone content of the adulterated oils.

The third paper (Pharm. Arch. **2**, p. 81) was published in May 1899, the experimental work having been done by Mr. F. W. Alden and Mr. S. Nolte.

The fourth paper (Pharm. Arch. **3**, p. 9) appeared in January of this year, and the experimental work was done by Mr. Alden and Mr. F. G. Ehlert.

The third and fourth papers contain reports on details of the method of determination, such as uniformity of results; volatility of carvoxime; moisture in air-dried carvoxime; volatility of carvoxime with water vapour; effect of alcohol and water vapour upon carvoxime; solubility, real and apparent, of carvoxime in water; time of reaction; influence of solvent; influence of resinous matter; influence of amount of hydroxylamine, of sodium bicarbonate, &c.

For the purpose of testing the method in its simplest form, a mixture of equal parts of carvone, regenerated from its crystalline hydrogen sulphide addition product, and of limonene, purified by repeated fractional distillation under diminished pressure, was made. To a solution of 10 grms. of this 50 per cent. carvone mixture, dissolved in 25 c.c. of alcohol, 5 grms. of hydroxylamine hydrochloride and 6·5 grms. of sodium bicarbonate were added. This mixture was boiled upon a water-bath in a flask connected with a reflux condenser for half an hour, 25 c.c. of water were then added, and the alcohol, which carries over a large quantity of limonene, was distilled off from a water-bath. Steam was then passed through the liquid until traces of carvoxime came over. The last portions of the distillate were collected separately in test-tubes, and, when traces of crystals of carvoxime appeared on the surface, the operation was interrupted. The tube of the condenser was then washed with a little hot water, and this, as well as the last collected distillate containing some carvoxime, was returned to the flask. The contents of the flask were then allowed to cool, and, after the carvoxime had completely solidified, it was removed from the sides of the flask by means of a loop of stiff wire, thrown upon a force filter, washed and dried by suction. The air-dried carvoxime was then transferred to a tared glass dish and heated for one hour on the water-bath, and when cool, weighed. To the weight thus obtained 0·100 grm. was added, as this is about the quantity lost during heating. From the weight of the carvoxime that of the carvone may be readily calculated :—

$$C_{10}H_{14}NOH \quad C_{10}H_{14}O$$
$$164{\cdot}67 \; : \; 149{\cdot}66 = 1 : 0{\cdot}9088,$$

or the weight of carvoxime expressed in grammes, when multiplied by 0·9088, gives the weight of the equivalent amount of carvone.

The 50 per cent. carvone mixture * gave, by this method, the following figures :—

		Per Cent.
I.	5·525 grms. carvoxime	= 50·22 carvone.
II.	5·592 „ „	= 50·83 „
III.	5·579 „ „	= 50·71 „
IV.	5·503 „ „	= 50·00 „

From these figures it will be seen that the results obtained by this method come within 1 per cent. of the true carvone content.

Two slight modifications of this method had been previously tried. The one gave results several per cent. too low (maximum, 2·40 per cent.), the other results too high (maximum, 4·27 per cent.). It is not necessary here to go into details about these modifications. They will be found in the first paper referred to above.

Applied to commercial caraway and spearmint oils, the method gave satisfactory results. In one instance spearmint oil was adulterated by way of test in such a manner with 50 per cent. of a mixture of 66⅔ per cent. of cedarwood oil, and 33⅓ per cent. of gurjun balsam oil that specific gravity and angle of rotation corresponded closely with the corresponding factors of genuine oil. The method revealed the low carvone content very nicely.

The method was then tested by the chemists of Schimmel and Co., of Leipsic, who reported rather unfavourably on the results obtained by them (Bericht, Schimmel and Co., October, 1896, p. 49). A careful perusal of their report, however, will reveal the fact that they did not apply the precautions specified as to details. If the distillation, *e.g.*,

* When more carvone is present a larger quantity of hydroxylamine must be used.

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of the carvoxime-oil-alcohol mixture, is not conducted with due regard to small fractions, it will be difficult to learn when to stop. Carvoxime may be lost in the distillate, or oil be retained in the carvoxime residue, thus causing very appreciable differences in the results. In order to put the method to severer and more careful tests, it was studied in almost all of its details. The first question to be answered was whether uniform results could be obtained by a person or persons who had but a moderate experience in analytical work. The question whether the results were either too low or too high did not enter into consideration in this particular series of experiments,

Uniformity of Results. As stated, the first question to be investigated was to ascertain whether uniform results could be obtained with the exercise of the necessary precaution.

The following table gives the results obtained by two operators, each making five determinations under apparently the same conditions:—

—	Grammes of Oil used.	Carvoxime weighed.*	Carvone Equivalent.	Percentage of Carvone.
1	10·0325	4·8818	4·5275	45·13
2	10·0081	4·8846	4·5300	45·26
3	10·0074	4·8300	4·4804	44·77
4	10·0118	4·7418	4·4002	43·95
5	10·0018	4·8704	4·5171	45·16
6	10·308	4·873	4·519	43·84
7	10·113	4·387	4·078	40·32
8	9·657	4·713	4·374	45·29
9	10·216	4·898	4·542	44·46
10	10·997	5·387	4·987	45·35

* From several of the tabulated series of results obtained in testing other details, the same conclusion as to uniformity of results can be drawn. It need not be concealed that in certain instances widely deviating results were obtained. But in almost every such case the product weighed showed that something had gone wrong. Thus, *e.g.*, an oily oxime was several times obtained.

With but one exception (No. 7) these results vary but slightly, the highest being 45·35 per cent., the lowest 43·84 per cent., a difference of only 1·51 per cent. for the two extremes. For the analysis of so complex a substance as caraway oil such a result leaves little to be desired. In each case the oxime was firm and well crystallised. In but one instance was there more than a trace of colour.

Influence of Solvent.—In the preparation of the pulegone oxime of Beckmann and Pleissner it has been noticed repeatedly that with the use of the alcohol-ether mixture as solvent, as directed by them, a crystalline oxime does not always result even upon standing for days and weeks. This difficulty was overcome by the mere substitution of petroleum ether for alcohol ether as solvent and medium for reaction. Inasmuch as occasionally difficulty was encountered in obtaining a good crystallisable carvoxime, a few experiments in the change of solvent were made. When petroleum ether was substituted, although freshly rectified spearmint oil was employed, not a trace of crystalline oxime resulted. In another instance, chloroform was tried, to which, after heating for ten minutes, alcohol was added and the heating continued for forty minutes. This also resulted in a failure as far as crystalline oxime was concerned. In a third experiment a mixture of 20 parts alcohol and five parts chloroform was tried. 47·44 per cent. of oxime resulted, or about 3 per cent. less than in any of the other assays of the same oil. Besides, the oxime was soft and sticky. Methyl alcohol has also been tried, and it proved a failure as far as quantitative work is concerned. In addition, it has been considered worth while to study the influence of the amount of alcohol used, which, so far, proved the best medium in which to carry on the reaction. The following table (II.) gives the results of a number of experiments in this direction, from which it becomes apparent that no conclusions can be drawn as to any special effect attributable to the amount of alcohol used as solvent:—

TABLE II.

No.	Oil taken. Kind.	Oil taken. Quantity.	Alcohol.	Weight of Oxime.	Carvone Equivalent.	Melting Point of Oxime.	Percentages. Calculated.	Found.	Loss.
			C.c.						
1	Carvone and limonene taken in approximately equal quantities.	11·0230	25	4·5542	4·1387	49—56	45·41	37·55	7·86
2		10·0264	25	4·6755	4·2490	?—57	49·95	42·38	7·57
3		10·0457	25	4·6000	4·1805	39—51	50·00	41·61	8·39
4		10·0009	50	4·6401	4·2170	52—59	50·00	42·17	7·83
5		10·0185	50	4·7322	4·3003	?—52	49·98	42·93	7·05
6		9·9964	50	4·6914	4·2636	53—60	49·92	42·65	7·27
7	Oil of spearmint	10·0076	25	5·1628	4·6919	38—48	..	46·88	..
8		10·0193	25	5·2909	4·8084	?—49	..	47·99	..
9		10·0165	50	5·3336	4·8472	34—48	..	48·39	..
10		10·0241	50	5·7578	5·2328	35—46	..	52·20	..

Influence of Amount of Hydroxylamine.—It has been shown by Wallach and Schrader (Ann. **279**, p. 368) that when an excess of hydroxylamine is employed under certain conditions, a compound, $C_{10}H_{14}NOH.NH_2OH$, and not the simple carvoxime, $C_{10}H_{14}NOH$, is formed. In the method of analysis as previously outlined sufficient oxime is directed to be used to theoretically convert all of the oil into carvoxime should it

TABLE III.

No.	Kind of Oil used.	Reagents sufficient for	Weight of Oil taken.	Oxime obtained.	Carvone Equivalent.	Description of Oxime.	Melting Point.	Carvone found.
		Per Cent. Carvone.					°.	Per Cent.
1	Spearmint freshly rectified.	50	10·0058	3·5514	3·2275	Good	47—57	32·26
2		50	10·0043	3·5188	3·1979		42—55	31·97
3		60	10·0171	4·8079	4·3694		50—58	43·62
4		60	10·0112	4·5463	4·1317		43—57	41·27
5		70	10·0152	4·6623	4·2371	Poor	?—52	42·31
6		70	10·0969	4·2452	3·8581		40—52	38·55
7		100	10·0064	4·9110	4·4631		30—44	44·60
8		100	10·0032	5·3098	4·8254		25—45	48·24
9	Carvone and limonene in equal quantities.	50	9·9974	4·4315	4·0274	Good	45—57	40·28
10		50	9·9934	4·2179	3·8333		59—65	38·36
11		60	10·0109	4·7457	4·3129		50—58	43·08

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be carvone. It seemed desirable, therefore, to ascertain in how far an excess of hydroxylamine might prove advantageous or disadvantageous. The amount of sodium bicarbonate was varied accordingly, but so that the ratio remained the same. The results of a series of eleven experiments are given in Table III. That the theoretical amount of hydroxylamine is not sufficient becomes fully apparent from the results, but the variation in the results for like amounts of hydroxylamine is too great to allow of anything more than a rather general conclusion to be drawn. The melting point of the oxime, however, clearly shows that the larger excess of hydroxylamine does not combine with the carvoxime to form the compound, $C_{10}H_{14}NOH.NH_2OH$, of Wallach and Schrader, for the latter melts at 174°—175°. The quality of the oxime nevertheless suffers from an excess of hydroxylamine in some way or another, as shown by the grades marked "good" and "poor."

Influence of Amount of Sodium Bicarbonate.—In order to set the hydroxylamine free from the hydrochloride, sodium bicarbonate is employed. For 5 grms. of hydroxylamine, 6·5 grms. of sodium bicarbonate are directed to be used, an excess of about 0·5 grms. This renders the aqueous solution resulting after the distillation with water vapour decidedly alkaline. The effect of neutralising this excess of sodium bicarbonate and of avoiding it was, therefore, tried.

In experiments 1 and 2 (Table IV.) a mixture of equal parts of carvone and limonene was used. Experiment 1 was left alkaline, experiment 2 was rendered slightly acid with dilute hydrochloric acid. In experiments 3, 4, and 5, spearmint oil was used. Although the quality of the oxime from the acid solution is better than that from the alkaline solution, yet the results from experiments 4 and 5 vary considerably. Inasmuch as the neutralisation of the sodium bicarbonate with alcoholic hydrochloric acid—for the neutralisation should be effected while the mixture of reaction is still alcoholic—is somewhat troublesome, and inasmuch as an excess of acid may prove harmful, it was thought desirable to avoid the excess of bicarbonate from the beginning. In experiments 6, 7, and 8 the exact amount of sodium bicarbonate calculated to be necessary to liberate the hydroxylamine was taken. Freshly rectified spearmint oil was employed. In experiments 9 to 13 inclusive an insufficient amount of bicarbonate, only 5·5 grms. to 5 grms. of hydroxylamine hydrochloride was used. These proportions seem to give the most all round satisfactory results yet obtained, although there is still a difference of 4·18 per cent. between the minimum and maximum percentage. Attention should be called to the fact that spearmint oil does not give as good results as does caraway oil. With these modifications it may be expected that caraway oil will yield results with but slight variations. Furthermore, the oxime in these experiments was much better than that obtained previously.

TABLE IV.

No.	Amount of Oil taken.	Weight of Oxime.	Carvone Equivalent.	Description of Oxime.	M. Pt.	Per cent. Carvone found.
					Degrees.	
1	9·9932	4·7071	4·2778	Poor	42—52	42·81
2	10·0059	4·9171	4·4687	Good	53—56	44·66
3	10·0184	5·0799	4·6166	Poor	53—60	46·08
4	9·9951	5·1026	4·6372	Fair	48—59	46·40
5	10·0046	5·6395	5·1252	Good	50—63	51·23
6	10·0067	5·8420	5·3093	,,	44—58	53·06
7	9·9993	6·0694	5·5150	,,	47—57	55·16
8	10·0026	5·9877	5·4410	,,	45—59	54·40
9	10·0099	6·1346	5·5770	,,	44—59	55·72
10	10·0006	5·9004	5·3623	,,	49—61	53·62
11	10·0128	6·3269	5·7499	,,	48—59	57·43
12	10·0100	6·3661	5·7856	,,	43—57	57·80
13	10·0008	6·0383	5·4876	,,	39—56	54·87

Time of Reaction.—The effect produced by changing the time during which the reaction between the oil (carvone) and the reagents was allowed to take place was studied in two series of experiments. The first series was conducted with spearmint oil, the results being recorded in the following table:—

No.	Grm. Oil taken.	Carvoxime obtained.	Carvone Equivalent.	Per Cent.	Time.	Quality of the Oxime.
					Mins.	
1	10·0073	5·9303	5·3895	53·86	30	Good
2	10·0041	5·5388	5·0337	50·32	30	Fair
3	10·0002	5·7771	5·2502	52·50	30	,,
4	10·0007	5·5600	5·0529	50·53	30	,,
5	10·0302	6·2472	5·6775	56·60	30	,,
6	10·0033	6·3480	5·7691	57·67	20	Very good
7	10·0050	5·9082	5·3694	53·67	20	Good
8	10·0027	6·3799	5·7981	57·96	15	Very good

The second series was made with fraction 228° to 228·5° of Schimmel and Co.'s "extra-starkes Kuemmeloel," which is supposed to be pure carvone. This was mixed with an equal part of fraction 175° to 176° of "carvene." The results are recorded in the following table:—

No.	Grm. taken.	Grm. Carvoxime.	Carvone Equivalent.	Per Cent.	Time.	Quality of Oxime.
					Mins.	
1	10·0304	4·9782	4·5242	45·10	30	Excellent
2	10·0068	5·0495	4·5863	45·83	30	,,
3	10·0276	5·0602	4·5987	45·86	16	,,
4	10·0227	5·0683	4·6061	45·96	16	,,
5	10·0198	4·9373	4·4870	44·78	10	,,
6	9·9978	4·9509	4·4994	45·00	10	,,
7	10·0188	4·5577	4·1420	41·34	5	,,
8	9·9952	4·6930	4·2650	42·67	5	,,

Whereas in the first series two of the results in the 30 minutes group are rather low, nevertheless the general conclusion that 15 minutes is sufficient for heating the mixture evidently can be drawn from the somewhat irregular figures. In the second table, the results are much better, and they strongly support the conclusion. Even 10 minutes seem to be almost long enough, whereas five minutes indicate a decided drop in the percentage of oxime obtained.

Solubility, Real and Apparent, of Carvoxime in Water.—Attention has been called to the fact that it is difficult to know just when to stop the distillation with water vapour, that not only non-carvone oil passes over, but that carvoxime is also volatile with water vapour; and, moreover, that the carvoxime does not always crystallise readily, and cannot be readily distinguished from the oil proper. Another objection might have been added, *viz.*, that the carvoxime collected in the test tubes does not always readily solidify completely, but that some at times remains oily and passes through the filter when the oxime is washed with water. A record, therefore, was made in one instance. After distillation with water vapour, the mixture in the flask and the distillate were allowed to stand for 24 hours before being filtered. The aqueous filtrate was then set aside, and from it small crystals of carvoxime separated. These were collected, and their weight found to be 0·0129 grm., or 0·23 per cent. of the carvoxime employed.

The filtrate from assays *d* and *e* (see below) was distilled fractionally. The first fractions were very turbid, but the last ones were perfectly clear. After standing for some time, the turbid fractions separated fine crystals, which, after being dried, were weighed. In assay *d*, 0·0209, and in assay *e*, 0·0132 grm. of oxime were separated, corresponding to 0·379 per cent. and 0·240 per cent. respectively of the oxime employed.

Effect of Alcohol and Water Vapour upon Carvoxime.—In order to get some idea of how the solvents employed and the limonene of the oil might affect the oxime under the ordinary conditions of the assay, the following experiments were made:—

Experiment 1.—To the carvoxime equivalent of approximately 5 grms. of carvone, about 5 grms. of limonene were added, then 25 c.c. each of alcohol and water. This mixture, approximating to that obtained as the product of

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reaction of the hydroxylamine on the alcoholic solution of the oil, to which 25 c.c. of water had been added, was heated in a flask on a water-bath to drive off the alcohol. Then steam was passed through the mixture, and the distillate collected as usual in the corresponding step of the assay. When crystals of carvoxime began to come over, the distillation was stopped, all of the oxime collected as directed in the process of the assay, air-dried, and heated in a tared capsule on a water-bath. To the weight of the oxime thus obtained, 0·100 grm. was added. The following table shows the results obtained in three experiments:—

	Quantities taken.			Quantities regained.		Percentage of Carvone.		
	Carvoxime.	Carvone Equiv.	Limonene.	Carvoxime.	Carvone Equiv.	Calculated.	Found.	Difference.
a.	5·5000	4·9984	5·1500	5·3806	4·9808	49·25	49·09	0·16
b.	5·5096	5·0071	5·0736	5·4006	4·9989	49·67	49·59	0·08
c.	5·5034	5·0015	4·9962	5·3134	4·8288	50·03	48·30	1·73

The carvoxime was the purified oxime obtained from spearmint oil; the limonene was the "carvene" obtained from Fritzsche Bros. The recovered oxime was nearly white before being heated on the water-bath. After heating, it was hard and crystalline, but of a brownish colour. The loss of carvoxime is therefore but slight, and the oxime seems to have changed but very little in this operation.

Experiment 2.—The limonene, fraction 174·5° to 175·5°, freshly distilled from Fritzsche Bros.' "Carvene," was not weighed accurately, about 5 grms. being taken. Instead of driving off the alcohol at once, as was done in the foregoing experiment, the mixture was heated for 15 minutes in a flask connected with the reflux condenser, as is done in the assay. The oxime used was caraway carvoxime. The results are recorded in the following table:—

d.	5·5090	5·0066	5·0	5·1574	4·6870	50·03	46·84	3·19
e.	5·5022	5·0004	5·0	5·1563	4·6860	50·00	46·86	3·14

Experiment 3.—In order to ascertain whether this difference in the loss (average loss in Experiment 1 = 0·66 per cent., in Experiment 2 = 3·16 per cent.) was due to the additional heating, the same limonene was used, but the mixture was not heated 15 minutes previous to distillation.

f.	5·5034	5·0015	5·0	5·0768	4·6138	50·01	46·13	3·88
g.	5·5032	5·0013	5·0	5·1270	4·6594	50·01	46·59	3·42
h.	5·5025	5·0007	5·0	5·1446	4·6754	50·00	46·75	3·25

The average loss in this case is 3·52 per cent. of carvone, thus showing that the loss in Experiment 2 is not attributable to the additional heating.

Volatility of Carvoxime with Water Vapour.—In order to ascertain the volatility of carvoxime with water vapour, quantities of the oxime usually resulting in the reaction were distilled with water vapour for fifteen, thirty, forty-five, and sixty minutes respectively. The remaining oxime was collected and dried as usual, and weighed. The difference in weight before and after distillation gave the result sought. This result was checked by collecting the oxime that had distilled over, drying and weighing this also.

No.	Weight of Oxime in Distilling Flask.		Oxime Removed by Distillation.	
	Before Dist.	After Dist.	Weight.	Percentage.
1	5·072	4·010	1·062	20·94
2	4·765	2·399	2·366	49·65
3	4·772	0·408	4·364	91·45
4	5·375	0·379	4·996	92·95

No.	Oxime Distilled over and Collected.		Experimental Error due to Solubility in Water and other Loss.	
	Weight.	Percentage.	Weight.	Percentage.
1	0·824	16·24	0·238	4·69
2	2·106	44·20	0·260	5·46
3	4·059	85·06	0·305	6·39
4	4·702	87·48	0·294	5·47

Volatility of Carvoxime.—Mr. Schreiner had carefully weighed somewhat over 5 grms. of carvoxime, an approximation of the quantity generally obtained in the assay, in a glass capsule; heated the capsule on a boiling water-bath for an hour at a time, the time that seemed necessary for drying the oxime; and weighed after each period of heating to note the loss of weight due to volatilisation. He found that the average came near 0·100. These experiments were repeated, with the following results:—

Experiment I.—3·8671 grms. of caraway carvoxime were heated in a glass capsule on a boiling water-bath for an hour at a time, weighed, when cooled, in a desiccator, and the following losses recorded. (1) 0·0634; (2) 0·0693; (3) 0·0958; (4) 0·0907; (5) 0·0760; (6) 0·0958.

Experiment II.—5·5002 grms. of spearmint carvoxime, when treated in like manner, gave the following results: (1) 0·1127; (2) 0·1019; (3) 0·0582; (4) 0·1117; (5) 0·1067; (6) 0·583.

Experiment III.—4·470 grms. of spearmint carvoxime in a control experiment yielded the following data: (1) 0·103; (2) 0·180; (3) 0·160; (4) 0·156; (5) 0·145; (6) 0·141.

Experiment IV.—4·414 grms. of caraway carvoxime in a control experiment yielded the following data: (1) 0·109; (2) 0·177; (3) 0·162; (4) 0·161; (5) 0·152; (6) 0·165.

When compared, these results show rather surprising differences. These differences, however, are readily accounted for if the diameter of the opening of the water-bath is taken into consideration, as shown by the following tabular arrangement:—

Time.	Loss of Caraway Carvoxime.			Loss of Spearmint Carvoxime.		
	35 mm.	43 mm.	65 mm.	35 mm.	43 mm.	65 mm.
Hours.						
1	0·0634	..	0·109	..	0·1127	0·103
2	0·0693	..	0·177	..	0·1019	0·180
3	..	0·0958	0·162	0·0582	..	0·160
4	..	0·0907	0·161	..	0·1117	0·156
5	0·0760	..	0·152	..	0·1067	0·145
6	..	0·0958	0·165	0·0583	..	0·141

Moisture in Air-dried Carvoxime.—From the foregoing it becomes apparent that the loss of carvoxime due to volatility of the oxime itself is a fairly constant quantity for the same time and surface of exposure to heat. That this heating on the water-bath is a necessity is brought out by a series of experiments in which the oxime was weighed when air-dried and after drying on the water-bath for an hour. The results are recorded in the following table, which shows that the air-dried carvoxime evidently

No.	Weight of Air-dried Carvoxime.	After Drying on a Water-bath.	Total Loss.	Loss attributable to Moisture.
1	5·1807	4·9768	0·2039	0·1039
2	5·1912	5·0269	0·1643	0·0643
3	5·1825	5·0446	0·1379	0·0379
4	5·2103	4·9233	0·2870	0·1870
5	5·2925	5·1193	0·1732	0·0732
6	6·0294	5·7674	0·2620	0·1620
7	6·1717	5·7869	0·3348	0·2848
8	6·2250	5·7707	0·4543	0·3543

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contains variable quantities of water, and that it would not do to weigh the air-dried oxime for purposes of assay.

Influence of Resinous Matter.—Attention has several times been called to the various ways in which non-volatile resinified matter in the oil may affect the reaction. If the oil has been badly "resinified" by continuous exposure to air and sunlight, the carvoxime resulting in the reaction may be so impure as to prevent its crystallisation. Such a result is not to be deplored, for it shows up at once the impurity of the oil and the necessity of its rectification before it is put to use. In order to ascertain the percentage of carvone in such a resinified oil, it is but necessary to distil it with water vapour and to analyse the rectified oil according to the usual process.

As long as the amount of resin is not sufficient to prevent the oxime from crystallising, it is apparent that its presence in the carvoxime will add to the weight of the latter, and thus make the oil show up more favourably than it ought to. This was demonstrated experimentally by a series of three experiments each with pure carvoxime on the one hand and colourless "carvene" and "resinified carvene" respectively on the other. The experiment with the colourless carvene yielded 49·09, 49·59, and 48·30 per cent. of carvone respectively, in place of 50 per cent. as calculated. The resinified carvone yielded 53·32, 53·47, and 53·34 per cent. respectively, in place of 50 per cent. as calculated. Thus the resin in the oil made it appear about 3 per cent. richer in carvone that it was in reality.

It also became necessary to pay more attention to the melting point of the carvoxime, and to learn how it would be influenced by the presence of this "resin." Two series of experiments were therefore made, the one with colophony or rosin, the other with so-called resin from resinified caraway oil.

I.—In the first series of experiments carvoxime was mixed with limonene to which a known quantity of rosin had been added, and the qualitative and quantitative effect of the rosin on the oxime, recovered according to the directions of the process of analysis, studied. The qualitative effect was judged by the change in melting point. The melting point of the pure recrystallised oxime is given as 71° by Goldschmidt and Zürrer (Ber. 18, p. 1730). The melting point of the oxime used in these experiments was determined, and found to be 70·5°—72°; 71°—72°; 71·5°—73°; 72°—73° in four different determinations. From the table given above it will be seen that the melting point of the oxime, after having been mixed with pure limonene, subjected to steam distillation, and to the heat of a water-bath for an hour, is lowered several degrees, even if no rosin is present. Whereas in a general way it may be stated that the melting point is lowered by the presence of rosin, and that the lowering is dependent on the amount of rosin present, yet the practical utility of this observation is impaired by two facts. First, it is

No.	Rosin in Limonene.	Quantities taken.			Quantities regained.		Percentage.		Melting Point of Oxime.
		Oxime.	Carvone Equivalent.	Limonene Containing Resin.	Oxime as Weighed† (+ Resin).	Carvone Equivalent.‡	Calculated.	Found.	
	Per Cent.								Degrees.
1	0	5·5057	5·0036	5·0096	5·2846	4·8026	49·97	47·96	67—70
2	0	5·5014	4·9997	5·0000	5·2671	4·7867	50·00	47·87	69—69·5
3	1	5·5042	5·0022	5·0113	5·3032	4·8195	49·95	48·13	63—66
4	1	5·5000	4·9984	5·0069	5·3153	4·8305	49·96	48·28	64·5—68
5	1	5·5065	5·0043	5·0114	5·2786	4·7972	49·96	47·90	64·5—68
6	2	5·5065	5·0043	5·0090	5·3751	4·8849	49·93	48·78	..—67
7	2	5·5027	5·0009	5·0072	5·3899	4·8983	49·97	48·94	..—66
8	2	5·4991	4·9976	5·0034	5·4026	4·9099	49·97	49·09	63—68
9	2	5·5039	5·0019	5·0093	5·4088	4·9155	49·96	49·10	63—68
10	3	5·5024	5·0006	5·0083	5·2724	4·7916	49·96	47·87	62—67
11	3	5·5019	5·0001	5·0089	5·4235	4·9289	49·96	49·24	62—66·5
12	3	5·5032	5·0013	5·0092	5·3939	4·9020	49·96	48·97	62—67
13	3	5·5024	5·0006	5·0023	5·4075	4·9143	49·99	49·13	61—66
14	3	5·5025	5·0007	4·9964	5·4683	4·9696	50·02	49·71	61—67·5
15	4	5·5029	5·0010	5·0010	5·4524	4·9551	50·00	49·54	61—65·5
16	4	5·5054	5·0033	5·0015	5·5159	5·0128	50·01	50·10	61—67
17	4	5·5096	5·0071	5·0001	5·4417	4·9454	50·04	49·42	60—66·5
18	5	5·4999	4·9983	5·0006	5·5097	5·0072	49·99	50·03	62—66·5
19	5	5·5045	5·0025	4·9949	5·4983	4·9969	50·04	49·98	63—67
20	5	5·5044	5·0024	4·9989	5·5491	5·0430	50·02	50·42	62—67
21	1	5·500	4·9984	5·000	5·3010	4·81755	49·99	48·18	..
22	1	5·500	4·9984	5·000	5·2995	4·81619	49·99	48·16	..
23	2	5·500	4·9984	5·000	5·3215	4·8360	49·99	48·36	..
24	2	5·500	4·9984	5·000	5·2830	4·8011	48·99	48·00	..
25	3	5·500	4·9984	5·000	5·3550	4·8666	49·99	48·67	..
26	3	5·500	4·9984	5·000	5·3105	4·8261	49·99	48·26	..
27	4	5·500	4·9984	5·000	5·3640	4·8750	49·99	48·75	..
28	4	5·500	4·9984	5·000	5·3255	4·8398	49·99	48·40	..
29	5	5·500	4·9984	5·000	5·3100	4·8257	49·99	48·26	..
30	5	5·500	4·9984	5·000	5·3005	4·8170	49·99	48·17	..

† Corrected by adding 0·10. ‡ Including the resin.

TABLE XII.

No.	Weight of Resin present.	Weight of Oxime* (− Resin).	Carvone equivalent.	True Percentage of Carvone found.	Loss.
					Per Cent.
1	0·0000	5·2846	4·8026	47·96	2·01
2	0·0000	5·2671	4·7867	47·87	2·13
3	0·0501	5·2531	4·7740	47·68	2·27
4	0·0501	5·2652	4·7850	47·81	2·15
5	0·0501	5·2285	4·7517	47·44	2·52
6	0·1002	5·2749	4·7938	47·86	2·12
7	0·1001	5·2898	4·8074	48·04	1·93
8	0·1001	5·3025	4·8189	48·18	1·79
9	0·1002	5·3086	4·8245	48·19	1·77
10	0·1502	5·1222	4·6551	46·51	3·45
11	0·1503	5·2732	4·7923	47·87	2·09
12	0·1503	5·2436	4·7653	47·60	2·36
13	0·1501	5·2574	4·7779	47·77	2·22
14	0·1499	5·3184	4·8334	48·45	1·57
15	0·2000	5·2524	4·7734	47·72	2·28
16	0·2001	5·3158	4·8310	48·29	1·72
17	0·2000	5·2417	4·7636	47·60	2·44
18	0·2500	5·2597	4·7800	47·81	2·18
19	0·2497	5·2486	4·7699	47·70	2·34
20	0·2499	5·2992	4·8160	48·16	1·86
21	0·05	5·2510	4·7721	47·73	2·26
22	0·05	5·2495	4·7707	47·71	2·28
23	0·10	5·2215	4·7452	47·46	2·53
24	0·10	5·1830	4·7103	47·11	2·88
25	0·15	5·2050	4·7303	47·31	2·68
26	0·15	5·1605	4·6898	46·91	3·08
27	0·20	5·1640	4·6930	46·94	3·06
28	0·20	5·1255	4·6581	46·59	3·40
29	0·25	5·0600	4·5985	45·99	4·00
30	0·25	5·0505	4·5899	45·90	4·09

* Corrected by adding 0·10.

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difficult to state where the impure oxime begins to melt. Different observers may well be of different opinion. Secondly, the point at which the mixture is completely liquid is sharper, but the difference here for different percentages of rosin present is but slight.

With regard to the increase in weight of the oxime produced by the presence of the resin, it will be seen that with the increase in the percentage of resin, the percentage of oxime found gradually increases to about 50 per cent., but in no case goes materially above the theoretical amount, even when 5 per cent. of resin are present.

The influence of the presence of the resin on the weight of the oxime is better demonstrated by the figures in Table XII. With but one exception, *viz.*, experiment 10, it will be seen that the actual loss of oxime in the series of experiments by Mr. Alden (1—20) is quite uniform, varying from 1·57 per cent. as minimum to 2·52 per cent. as maximum. The loss in the series by Mr. Ehlert (21—30) who had no previous experience with this method was greater, the greatest loss being 4·09 per cent.

II.—The above experiments were supplemented by taking the so-called resin from resinified caraway oil. A badly resinified oil of caraway was distilled with water vapour and the residue heated on a water bath until it no longer lost weight. The non-volatile resin was dissolved in limonene, a 4·65 per cent. saturated solution resulting. Even upon the application of heat a stronger solution could not be obtained. From this concentrated solution the more dilute solutions were prepared. The results obtained in a series of 10 experiments are recorded in Table XIII. As will be seen upon comparison, much the same results were obtained as in the experiments with the colophony.

TABLE XIII.

No.	Per Cent. Resin in Limonene.	Quantities taken.			Quantities regained.		Percentages.		Melting Point of Oxime.
		Oxime.	Carvone equivalent.	Limonene containing Resin.	Oxime weighed* (+ Resin).	Carvone equivalent.	Calculated.	Found.	
									Degrees.
1	1	5·5031	5·0012	4·9986	5·3235	4·8380	50·01	48·38	64—67·5
2	1	5·5040	5·0020	5·0004	5·2983	4·8151	50·01	48·14	66—69
3	2	5·5035	5·0016	4·9966	5·3233	4·8378	50·02	48·39	?—62
4	2	5·5039	5·0019	4·9946	5·2839	4·8020	50·04	48·04	65—67·5
5	3	5·5063	5·0041	5·0414	5·3236	4·8381	49·82	48·16	64—67
6	3	5·5041	5·0021	5·0405	5·3515	4·8634	49·81	48·42	61—66
7	4	5·5056	5·0035	5·0422	5·3729	4·8829	49·81	48·61	58—66
8	4	5·5051	5·0030	5·0376	5·4468	4·9500	49·83	49·30	?—66
9	4·65	5·5053	5·0032	5·0290	5·4365	4·9407	49·87	49·25	64—67·5
10	4·65	5·5057	5·0036	5·0376	5·4504	4·9533	49·83	49·33	64—66·5

* Corrected by adding 0·10.

Table XIV., like Table XII., shows the actual loss of oxime. Inasmuch as this method of analysis is still in the experimental stage, these figures should be worth recording.

III.—In the series of experiments reported under I. and II. the conditions were chosen as simple as possible by using carvoxime already formed, mixing it with limonene to which rosin or resin had been added, and recovering the contaminated carvoxime by steam distillation in the usual manner. A third series of experiments was undertaken in which the effect of the resin from caraway oil on the reaction between the carvone and hydroxylamine, as well as on the ultimate carvoxime was studied. The carvone employed was a fraction 228—229 of Schimmel and Co.'s "Carvol." The limonene used was a fraction 175° of "Carvene" from the same firm. The oxime of the eleven experiments recorded in Table XV. was soft and somewhat sticky, but could be manipulated without difficulty. It will be seen from this table that the melting point is lower than in the previous experiments. Table XVI. also shows that the loss is much greater.

TABLE XIV.

No.	Weight of Resin present.	Weight of Carvoxime* (− Resin).	Carvone equivalent.	True Percentage of Carvone found.	Loss Per Cent.
1	0·0500	5·2735	4·7925	47·93	2·08
2	0·0500	5·2483	4·7697	47·69	2·32
3	0·0999	5·2334	4·7470	47·48	2·54
4	0·0999	5·1840	4·7112	47·13	2·91
5	0·1512	5·1724	4·7007	46·79	3·03
6	0·1512	5·2003	4·7260	47·06	2·75
7	0·2017	5·1712	4·6996	46·78	3·03
8	0·2015	5·2453	4·7669	47·48	2·35
9	0·2388	5·1977	4·7237	47·08	2·79
10	0·2342	5·2162	4·7405	47·20	2·63

* Corrected by adding 0·10.

TABLE XV.

No.	Percentage of Resin in Limonene.	Quantities taken.		Quantities regained.		Percentages.		Melting Point of Oxime.
		Carvone.	Limonene containing Resin.	Oxime.	Carvone equivalent.	Calculated.	Found.	
								Degrees.
1	0	5·0058	6·0172	6·5542	4·1389	45·40	37·54	49—56
2	0	5·0078	5·0186	4·6755	4·2491	49·95	42·38	?—57
3	1	5·0090	5·0304	4·5997	4·1802	49·79	41·64	?—56
4	1	5·0276	5·0234	4·6134	4·1927	50·03	41·72	47—55
5	2	5·0180	5·0190	4·6751	4·2487	50·00	42·33	50—57
6	2	5·0037	5·0107	4·6696	4·3437	49·97	42·38	?—54
7	3	5·0193	4·9921	4·6570	4·2323	50·14	42·27	?—53
8	3	5·0715	4·9785	4·8794	4·4344	50·46	44·12	52—59
9	4	4·9920	5·0195	4·7744	4·3390	49·86	43·34	47—55
10	4	4·9894	4·9991	4·7003	4·2716	49·95	42·87	48—59
11	4	5·0192	4·9956	4·8710	4·4268	50·19	44·20	37—48

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TABLE XVI.

No.	Weight of Resin present.	Weight of Carvoxime.	Carvone equivalent.	True Percentage of Carvone found.	Loss Per Cent.
1	0·0000	4·5542	4·1389	37·54	7·86
2	0·0000	4·6755	4·2491	42·38	7·57
3	0·0503	4·5494	4·1345	41·18	8·61
4	0·0502	4·5632	4·1470	41·26	8·77
5	0·1004	4·5747	4·1575	41·42	8·58
6	0·1002	4·5694	4·1527	41·47	8·50
7	0·1498	4·5072	4·0961	40·90	9·24
8	0·1494	4·7300	4·2986	42·77	7·69
9	0·2008	4·5736	4·1565	41·52	8·34
10	0·2000	4·5003	4·0899	40·94	9·01
11	0·1998	4·6712	4·2652	42·59	7·60

To conclude that these low results are due solely to the influence of the resin on the carvoxime while being formed, would not be correct, for other experiments have shown that the alkalinity of the reaction mixture during the steam distillation has much to do both with the yield and the quality of the carvoxime formed.

IV.—The highest percentage of resin in the experiments recorded under I., II., and III., is 2·5 per cent. (colophony) and 2·3 per cent. (resin from caraway oil) respectively. It requires but little experience with volatile oils, however, to know that resinification of oils may proceed much farther. Thus a commercial sample of caraway oil was found to contain as much as 11 per cent. of resin when rectified by steam distillation. The specific gravity of the oil before distillation was 0·957, after distillation 0·910. Before rectification it assayed 40·96 per cent. carvone (melting point of oxime 49°), after rectification 43·54 per cent. (melting point of oxime 55°). A sample of spearmint oil was found to contain 8·8 per cent. of resin when rectified in like manner. The specific gravity of the resinified oil was 0·9015, of the rectified oil 0·8953. Before rectification it assayed 46·88 per cent. (melting point of oxime 38°—48°) and 47·99 per cent. (melting point of oxime ?—49°) respectively. After rectification the oil assayed 44·60 per cent. (melting point of oxime 30°—44°) and 48·33 per cent. (melting point of oxime 25°—45°) respectively. These data are not sufficiently accurate to admit of drawing any very definite conclusions.

Conclusion.—Although the method of determining the carvone content of volatile oils, containing this ketone, as carvoxime is by no means perfect, this method is unquestionably a step in the right direction. The more recent method of shaking out the carvone is subject to the same criticism which is applicable to the shaking out of phenols by alkali solutions. The one great advantage in the method proposed is that the analyst weighs a definite crystalline compound.

Meeting held on Friday, December 21st, 1900.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

COLORIMETRIC DETERMINATION OF TITANIC ACID.

BY JAMES BRAKES.

IN the estimation of TiO_2 by the colour method, I have modified the method as used by Dr. Charles Baskerville (this Journal, 1900, 419) as follows:—

Fusing the residue left from the first filtrate with the mixed carbonates. Fusing the chemically pure TiO_2 with the above carbonates instead of $KHSO_4$ in preparing the standard solution. Also in standardising of the same.

The method is as follows:—

Fuse 5 grms of ore with an equal amount of NaF and ten times the weight of the ore of $KHSO_4$ in a platinum crucible at a low heat until the fusion is quiet, and finally heat 15 or 20 minutes at a low red heat to expel the last traces of fluorine. Cool crucible and lid, place in small beaker, and cover with 50 c.c. of 10 per cent. solution of H_2SO_4, and heat until dissolved. Filter into 500-c.c. flask, washing the filter and residue thoroughly with hot water, and fuse (if necessary) with a small quantity of the mixed carbonates. Cool and dissolve the mass in the crucible with strong H_2SO_4. Heat carefully until the ore is decomposed, cool, place in beaker, cover with water, and heat until dissolved. Filter, allow the filtrate to run into the 500-c.c. flask, cool, dilute to 500-c.c. mark with water, and mix thoroughly.

Take 100 c.c. of the solution with pipette, place in 100-c.c. Nessler tube, add 5 c.c. of hydrogen peroxide, and mix thoroughly with mixing rod.

To a second Nessler tube add 100 c.c. of 10 per cent. solution of H_2SO_4; add the number of c.c. of $FeSO_4$ solution equivalent to the amount of iron present in 0·1 grm. of the ore; add now 5 c.c. of hydrogen peroxide, mix thoroughly, and add standard TiO_2 solution until the desired tint is obtained, comparing the colours by reflected light.

Standard TiO_2 Solution.

Fuse 1 grm. of chemically pure TiO_2 in platinum crucible with 8 grms. of the mixed carbonates (Na_2CO_3 + $K_2C\,O_3$), cool, place in beaker, add 100 c.c. of water, and add slowly 30 c.c. of concentrated H_2SO_4, and heat until dissolved. Filter, and should the filtrate be turbid, refilter through the same filter until the filtrate is perfectly clear. Ignite the filter and contents, and fuse with 2 grms. of the above carbonates. Place in beaker as before, and add 100 c.c. of water and 20 c.c. of strong H_2SO_4, and heat until dissolved. Filter, allowing the filtrate, if clear, to run into first filtrate, and, after the solution has become cold, dilute to 500 c.c. and mix.

To standardise the solution take 10 c.c. of the solution with pipette, place in 150-c.c. beaker, add 25 c.c. of water, add an excess of NH_4HO, filter, and wash thoroughly with hot water until free from sodium and potassium salts. Ignite, cool, and weigh.

To the crucible add one or two drops of water and the same amount of strong H_2SO_4 and a few c.c. of HF, and evaporate to dryness. Ignite and weigh, and calculate the TiO_2 contained in 1 c.c. of the solution.

$FeSO_4$ Solution.

Dissolve 50 grms. of $FeSO_4 7H_2O$ in 500 c.c. of water, and add 100 c.c. of H_2SO_4, and dilute to 1 litre, and standardise with $K_2Cr_2O_7$ solution.

The results obtained from a sample of iron ore by the above method were 0·738 per cent. TiO_2 and from the same sample Dr. Charles Baskerville's results were 0·740 per cent. TiO_2 (gravimetric).

Nottingham Section.

Meeting held at the Municipal Technical College, Derby, on Tuesday, November 20th, 1900.

PROF. STANLEY F. KIPPING, F.R.S., IN THE CHAIR.

THE VALUATION OF GAS LIQUOR.

BY F. J. R. CARULLA.

ALTHOUGH ammoniacal liquors are being obtained in increasing quantities from the operations connected with coke ovens and blast furnaces, the large bulk of the make is still produced at the gas works. At one time it used to be worked up almost exclusively by chemical manufacturers, but gradually this process has become part of the gas manager's business.

The reasons for this change, and for the apparent encroachment, must interest this Society, representing, as it does, chemical manufacturers as distinguished from the gas industry.

Clearly, a raw material such as gas liquor, that, on an average, contains no more than 2 per cent. of ammonia, the

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remaining 98 per cent. being practically waste, is not an article that can be dispatched to long distances. It will not stand heavy carriage charges, and, consequently, large gas works not conveniently situated in regard to chemical works are compelled to work the liquor up themselves. Occasionally, however, a chemical works close to a gas works is suddenly deprived of a commodity that is perhaps necessary to its very existence. Such a state of things can only be due to some serious misunderstanding, and the question is, How can it have occurred?

The chief cause of dissatisfaction is the system of sale and purchase that is generally adopted. The chemical manufacturer generally buys the liquor at a fixed price, but cannot sell his make of sulphate of ammonia ahead in the same way. As the price of sulphate varies enormously, without the manufacturer being able to influence it, the time is sure to come when he is selling at a loss. The gas company then has no cause to complain. On the other hand, sulphate prices may rise when the chemical manufacturer has a low-priced contract for gas liquor. The gas company—not unnaturally—regrets the loss of the considerable profits that it might be making, regardless, however, of the periods of low prices—sure to recur—when the chemical manufacturer has been losing money.

It is surprising that no great effort has ever been made by those manufacturers interested in this industry to bring about a change, making affairs more satisfactory to all concerned. It must be evident that a sliding scale instead of a fixed price would get over the difficulty.

The first consideration that arises, whatever the method of sale may be, is how the strength of the liquor is to be ascertained. The most usual method is to take the specific gravity by means of Twaddell's hydrometer.

Strange as it may appear, this is in many cases, especially with the low strengths, a perfectly fair estimate of the contents of ammonia in the liquor. It is not always so, but with the coals used in this district, and the strengths usually produced, the cases in which the indication is not a fairly true one are very rare indeed.

The Burton Gas Works, for instance, producing a liquor that seldom exceeded 4° Tw., yielded results accurate absolutely to the first decimal point.

The following are some tests made to check a certain lot of liquor:—

Tw. Degrees at 60° F. Actual.	Ounce Strength by Distillation.	Equivalent Tw.
3·3	6·73	3·36
3·9	7·93	3·96
3·9	7·83	3·91

Mr. F. L. Ramsden, the engineer and manager of the Burton Gas Works, informs the author that nearly all the coal and cannel from which this liquor was obtained was from the North Derbyshire district.

These and other analyses referred to in this paper were made by Mr. E. M. Glover, who has had a very long experience in this particular test.

Considering that free ammonia lowers the specific gravity, it is a remarkable fact that as the density of gas liquor rises, the contents of ammonia also increase. The rate of increase is, however, not always even, and there is no doubt that, with strengths of 7° and 8° Tw., the hydrometer test is only an approximation, but as there is usually an increase of real strength over that indicated, it is a matter easy of adjustment when fixing the price, and does not prevent the use of the hydrometer, which is an immense convenience wherever this instrument can be employed. In some cases where the hydrometer is inapplicable or objected to, and where yet expedition has been desired, a method known as the "saturation test" has been applied. This test is only of interest as having given origin to the expression "ounce strength," for in reality it does not always yield reliable results. The test, conducted as it is by the direct saturation of 1 gallon of the gas liquor with sulphuric acid, the number of ounces used being noted, will fail to give the ammonia combined with strong acids.

An actual analysis becomes, therefore, the only alternative where the hydrometer is inapplicable, as, for instance, in liquor containing free ammonia, or in those from tarstills, &c., or where the liquor supplied is very variable. Such an analysis is always carried out by the well-known method of distillation.

By the kindness of Mr. John Phillips, secretary of the Bristol Gas Co., the author is able to give particulars of the modification they adopt. The description is of special interest, as it is issued to would-be contractors for the purchase of their gas liquor, with the forms of tender to be filled in with prices on a sliding scale based on the market value of sulphate of ammonia.

(The full description, with illustration of the apparatus, has been published in the Journal of Gas Lighting, of Dec. 4 and 11, 1900, pp. 1397 and 1462.)

Having fixed on the method for ascertaining the strength of the liquor, the next point is, what basis should be taken for the price of sulphate of ammonia. As this price is published weekly in the Chemical Trade Journal, the Journal of Gas Lighting, and a number of others, it is easy to agree upon some publication from which to take it. Then comes the question, What proportion of the current value of sulphate of ammonia shall be allocated to the chemical manufacturer, and what to the gas company? Whatever the price of sulphate may be, the cost of its manufacture from any particular strength of liquor, apart from the cost of the liquor itself, varies very little. Of course, it varies considerably when coal doubles in price, as has recently occurred, but one is speaking of normal times, disregarding accidents and abnormal occurrences, for which, nevertheless, some provision in the nature of insurance should be made.

It is unnecessary here to enter into the details that go to make up the cost. A fair sum where the gas liquor is close to the chemical manufacturer's works, or where it is delivered free, might be 5*l.* 5*s.* per ton of sulphate, and if this sum is deducted from the current price of sulphate, the remainder would fairly represent what the gas company should receive for the ammoniacal liquor used in the manufacture.

Having reached this agreement, it is easy to fix the price per ton for the various strengths of gas liquor that may be supplied.

The Twaddell scale is convenient, in that the number 60 divided by the strength in degrees Tw. gives the number of tons of liquor required to make 1 ton of sulphate of ammonia. Thus, of 6° liquor, 10 tons are required; of 5° liquor, 12 tons are required; of 4° liquor, 15 tons are required; of 3° liquor, 20 tons are required. The strength in Tw. degrees multiplied by the tons required always being 60.

Suppose that sulphate is at 11*l.* per ton. From these data it might appear that the price that the manufacturer should be able to pay for liquor delivered to his works would be—

$$\text{For } 6^\circ \frac{11l. - 5l.\ 5s.}{10} = 11s.\ 6d. \text{ per ton.}$$

$$\text{For } 5^\circ \frac{11l. - 5l.\ 5s.}{12} = 9s.\ 7d. \text{ per ton.}$$

$$\text{For } 4^\circ \frac{11l. - 5l.\ 5s.}{15} = 7s.\ 8d. \text{ per ton.}$$

$$\text{For } 3^\circ \frac{11l. - 5l.\ 5s.}{20} = 5s.\ 9d. \text{ per ton.}$$

But it would really not be so, as, *e.g.*, the cost of manufacture from 3° liquor is much greater than from 6°, in consequence of the much larger quantity that has to be dealt with—*viz.*, double—to produce the 1 ton of sulphate. Obviously it cannot fairly be asked of him to pay one-half the price of 6° for 3°, although the latter yields one-half the quantity of sulphate.

The manufacturer can protect himself by making it a condition that no liquor shall be less than 4° Tw., or, what might be more convenient to both buyer and seller, to adjust the cost of manufacture to the varying strengths.

This may be done in the following manner:—

Let a = price of sulphate of ammonia.

Let b = cost of carriage of gas liquor per ton.

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Let c = constant manufacturing charges, including acid, bags, carriage to port of shipment, &c., per ton of sulphate made.

Let d = variable manufacturing charges, including fuel, lime, wages, repairs, &c., also per ton of sulphate made, but their amount depending on the strength of the liquor. We will suppose that d = this value for 5° Tw.

Let T = strength of gas liquor in degrees Tw.

Let x = value per ton of gas liquor of any strength at the gas works.

A fair manufacturing profit should evidently be included in the value d, not in the value c, as otherwise the sulphate maker is not sufficiently protected in the event of deliveries of weak gas liquor, and, on the other hand, the gas company would not derive sufficient benefit when delivering strong liquor.

Remembering that 60 divided by the Twaddell strength of any liquor is equal to the number of tons of that liquor required for 1 ton of sulphate of ammonia, it will be evident that

$$x = \left\{a - \left(\frac{60\,b}{T} + c + d\right)\right\} \times \frac{T}{60} \ldots\ldots\ldots\ldots(1).$$

But we are supposing that the value d is for liquor of 5° Tw.; hence, as the equation stands, it would only be true for liquor of this strength. To make it applicable to liquor of any strength, it is necessary to consider that it will take just as long for, say, 100 tons of liquor to pass through the ammonia still if the strength is 4° Tw. as when it is 5°. The process can certainly be hastened or delayed in a certain measure, but this is not of sufficient importance to be taken into account in this calculation. We may therefore safely say that

$$\frac{5\,d}{T}$$

will represent the variable manufacturing charges per ton of sulphate made from liquor of any given strength.

Substituting this value for d, in equation (1), we get

$$x = \left\{a - \left(\frac{60\,b}{T} + c + \frac{5\,d}{T}\right)\right\} \times \frac{T}{60} \ldots\ldots\ldots(2),$$

and, simplifying, we obtain

$$x = \frac{T(a-c) - (60\,b + 5\,d)}{60} \ldots\ldots\ldots\ldots(3).$$

Of course, there will be no two manufacturers who could give the same values to b, c, and d. Nevertheless, we may, for purposes of illustration, assign values to these factors, and easily construct a table to make the matter more clear.

Suppose b, the carriage per ton of liquor from the gas works, to be 2*s*.

Let c, the constant manufacturing charges per ton of sulphate, be 50*s*., and let d, the variable manufacturing charges, be 55*s*.

Using the formula (3), we get for x the prices given in the following table for liquor of different strengths at the various values of sulphate of ammonia indicated :—

x = Price per Ton of Liquor at Gas Works.

Tw. Strength of Liquor.	When Sulphate is valued at				
	8*l*.	9*l*.	10*l*.	11*l*.	12*l*.
	s. *d*.	*s*. *d*.	*s*. *d*.	*s*. *d*.	*s*. *d*.
3°	..	..	0 11	1 11	2 11
4°	0 9	2 1	3 5	4 9	6 1
5°	2 7	4 3	5 11	7 7	9 3
6°	4 5	6 5	8 5	10 5	12 5
7°	6 3	8 7	10 11	13 3	15 7
8°	8 1	10 9	13 5	16 1	18 9

It will be evident from this table how unprofitable the working of low-strength liquor is to the manufacturer. At the low prices of 8*l*. and 9*l*. per ton for sulphate, the manufacturer might actually be losing money if liquor of 3° Tw. were *given* to him, and he had a carriage of 2*s*. per ton to pay upon it. As low-strength liquor is frequently worked up, and considerably higher prices than those indicated by our table are paid for it, it is clear that the liquor must be passed as rapidly as possible through the still with probable loss of fixed ammonia in the spent liquor. At the same time, it must be added that low-strength liquor within reasonable limits commends itself to those who have to handle it many times, because any losses by leakage are not so serious as when the liquor is of a high strength.

A comparison may be made of the prices obtained in the earlier calculation for 6°, 5°, 4°, and 3° liquor, deducting the 2*s*. per ton supposed to be paid for carriage, and the prices in the table for the same strengths when the price of sulphate of ammonia is 11*l*. :—

Strengths Tw.	6°	5°	4°	3°
	s. *d*.	*s*. *d*.	*s*. *d*.	*s*. *d*.
Price of liquor per ton, assuming 5*l*. 5*s*. as cost of making sulphate.	9 6	7 7	5 8	3 9
Price of liquor per ton, dividing the same cost into a constant and a variable portion ($c+d$) as per table.	10 5	7 7	4 9	1 11

The fairness of the suggested formula by which the table has been prepared will be seen from the comparison. The sellers would get 11*d*. more per ton for liquor of 6° strength by the table, whilst the buyer would pay 11*d*. less per ton for 4° strength. Of course 5° is not altered, as we have supposed d to represent the variable portion of the cost of manufacture for this strength of liquor.

In conclusion, the author would state that, although figures have been used for the sake of clearness and illustration, he only wishes to draw attention to a principle of valuation, that may be modified according to the circumstances of each case, but which he believes, when properly appreciated and understood, to be capable of introducing harmony amongst the contending interests of the gas and the chemical industries.

Discussion.

The Chairman said he was surprised to hear that anyone used the hydrometer as a test for gas liquor. He understood that the liquor was bought and sold by the "ounce strength."

Mr. Carulla remarked that the ounce strength obtained by saturation of the liquor with sulphuric acid also failed to give a true indication in many instances.

The Chairman said that the ascertainment of the ounce strength by the distillation test is what he referred to.

Mr. Carulla said that he had experience of more than a dozen gas companies by whom the hydrometer was found a convenient and reliable instrument. Of course, when buying liquor from tar distillers, a distillation test was indispensable, as in that case the hydrometer gave no indication of the strength.

Obituary.

LORD ARMSTRONG.

By the death of Lord Armstrong, the Society of Chemical Industry loses one of its most distinguished members, and the world one of its greatest men. In whatever way the character of Lord Armstrong is regarded, whether as a scientific man and inventor, as a man of affairs, or as a public benefactor, he stands out among the great men of his time as a towering personality.

Lord Armstrong's father began life at Wreay, a small place near Carlisle, with no brilliant prospects, and was induced to remove to Newcastle, where he became partner in a firm of corn merchants, and eventually mayor of the town. His son at a very early age began to show a strong inclination to mechanics, but when he left

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the Bishop Auckland Grammar School he was placed with the family solicitor as an articled clerk, and in due time became a partner in the firm. In 1834, he married Margaret, daughter of William Ramshaw, of Bishop Auckland. For thirteen years he adhered to the legal profession, but in his leisure he sedulously studied engineering problems; in fact, it was to mechanics rather than law that he gave his mind. One of the earliest of his mechanical inventions was the hydraulic crane, a type of hydraulic machine which has now become of world-wide utility. But what first drew the attention of the world to the ingenuity of this north-country solicitor with a mechanical genius was the successful and brilliant experiments he made in elucidation of a mysterious phenomenon reported to him as frequently occurring in connection with a steam engine at Seaton Delaval Colliery.

It was said that when the engineman was adjusting the safety valve while the steam was blowing off, sparks of fire darted out of his fingers. This strange phenomenon interested Mr. Armstrong; he carefully examined into it, found it to be new—the first instance known of the generation of electricity by effluent steam. This led him to the invention and construction of what was, at that time, by far the most powerful means known of generating high-tension electricity—the hydro-electric machine. Chiefly in recognition of the merit of this discovery, Mr. Armstrong, while still a young man, was elected to the fellowship of the Royal Society.

Between 1845 and 1850 Mr. Armstrong invented the "accumulator," by which an artificial "head" of water is substituted for the natural "head" gained by altitude only; and he extended the application of hydraulic power to hoists of every kind, dock-gates and swing-bridges, turntables, capstans, waggon-lifts, &c. For the manufacture of this machinery the Elswick Engine Works were started in 1847–8, the founders being Mr. Armstrong, Mr. Donkin, Mr. Potter, Mr. George Cruddas, and Mr. Richard Lambert. These gigantic works are monumental evidence of the great capacity of Lord Armstrong, not only as an inventor, but as the organiser of a great industrial enterprise—where, for the first time, was attempted the entire construction and armament of great ships of war as the product of one works, and that not a Government establishment. Lord Armstrong used to speak of Elswick as a national arsenal that might in time of war be of great importance in aid of the defence of the country, and recent history has shown the truth of his forecast. The modern cruiser class of fighting ship was evolved at Elswick. During the Crimean war, the difficulties of bringing up heavy artillery engaged Mr. Armstrong's attention. Lighter guns with a longer range, he saw, was the object to be attained. The work he had set himself to do was arduous; it was no less than to completely remodel the ordnance of the Army and Navy. Many details, of course, had to be worked out and trials to be conducted at remote spots on the moors or the shore. In 1856 the Armstrong rifled ordnance was ready for official inspection. A three-pounder was first submitted, then a five-pounder, afterwards heavier pieces. Finally, in 1858, the Rifled Cannon Committee recommended the Armstrong gun for special service in the field, and the Adjutant-General of Artillery pronounced it the best field-gun then known. Mr. Armstrong generously gave his invention to his country without fee or consideration. But such a service could not go unrewarded; he was knighted, made a C.B., and appointed Engineer of Rifled Ordnance with 2,000*l.* a year. Woolwich being unable to turn out the gun with the secrecy or rapidity desired, it was arranged that it should be made at Elswick.

In 1863 Sir William Armstrong was President of the British Association meeting at Newcastle, and drew attention to the increasing consumption and waste of coal, and the nearness of the time when our coal-fields will be exhausted. This resulted in a Royal Commission, of which Sir William was made a member. He was president of the Institution of Mechanical Engineers in 1861, 1862, and 1869, and of the Institution of Civil Engineers in 1882.

Sir William Armstrong was raised to the peerage in 1887. LL.D. of Cambridge (1862), D.C.L. of Oxford (1870), and M. Inst. Eng. of Dublin; Grand Officer of the Order of San Maurizio e Lazzaro of Italy, Knight Commander of the Danish Order of the Dannebrog, of the Austrian Order of Francis Joseph, the Spanish Order of Charles III., the Brazilian Order of the Rose, and Second Class of the Rising Sun of Japan. His presidency of the Newcastle Literary and Philosophical Society extended over many years, and continued to the time of his death.

His public spirit and philanthropy were large and widespread. A lecture hall for the Literary and Philosophical Society, an operating theatre for the Infirmary, 10,000*l.* to the Natural History Museum, a Mechanics' Institute, schools for the Elswick men, and a banqueting hall and public parks—these were among his many gifts to Newcastle. He was a man who richly deserved his great popularity.

Lord Armstrong died in his ninety-first year, at Craigside, Rothbury, Northumberland, on Thursday, Dec. 27. The funeral took place on Dec. 31, 1900, and the burial, in the churchyard at Rothbury. All the principal learned and scientific societies were represented, the Society of Chemical Industry by its President, J. W. Swan, F.R.S., who in the name of the Society placed a wreath upon the grave.

Lord Armstrong has been a member of this Society since 1884, when he was elected as Sir W. G. Armstrong.

He leaves no heir, and his peerage dies with him.

Journal and Patent* Literature.

* Any of these specifications may be obtained by post by remitting 8*d.*—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

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I.—PLANT, APPARATUS, AND MACHINERY.

PATENTS.

Solid Materials; Method of and Apparatus for Treating ——; applicable to the Manufacture of Gas, Coke, and to other Purposes. P. Naef, New York, U.S.A. Eng. Pats. 23,415, also 23,415A, 23,415B, and 23,415C, Nov. 23, 1899. (Under Internat. Convent.)

HEAT is applied to (or abstracted from) the material to be treated, by circulating gases or vapours in heaters (or coolers) forming a part of the apparatus. The gases are passed through the material until they are cooled to a temperature at which the operation to be carried out ceases for practical purposes. Then the gases are again heated and brought into contact with the material. A continuous circulation of heated gas through the material is thus obtained, the material itself being preferably also moved through the apparatus. The excess of the gases or vapours produced during the operation is conducted through the material to be treated, and all the heat is abstracted from the same, and the reaction is completed. The invention also comprises improved means for charging the material to and for discharging it from the apparatus.

The claims, 25 in number, partly relate to applications of the method to such purposes as the distillation of bituminous fuel for the production of gas and coke, the manufacture of water-gas, the destruction of sewage matter and the recovery of ammonia therefrom, the calcination of limestone and cement, the production of carbonic oxide and carbonic acid, and to the carrying out of catalytic reactions requiring a constant temperature, such as the manufacture of sulphuric acid from sulphurous acid.

In specifications 23,415A, 23,415B, and 23,415C, which bear the same title and date as the above patent, the inventor describes some modifications in the processes of treatment, together with novel devices for effecting the same.—D. B.

Filtering Medium; Improved ——. H. Nordtmeyer, Germany. Eng. Pat. 2961, Feb. 14, 1900.

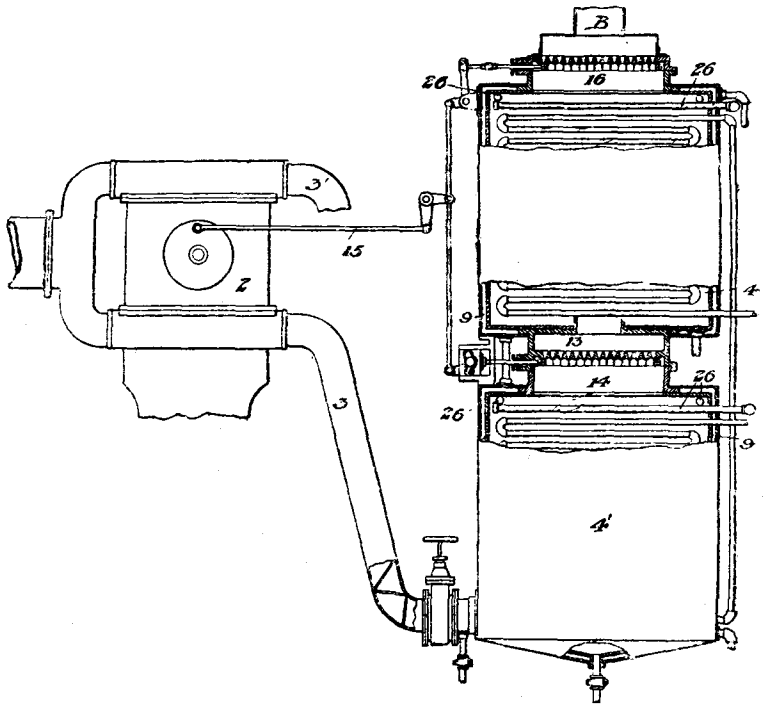
A CALCINED or baked filtering medium of fossil meal, "free from crazings" or surface cracks, "of a uniform porosity, and of the desired strength and solidity," is produced by mixing the fossil meal with asbestos, or asbestos-like minerals, such as asbestine or amianthus. The mixture, with or without the addition of organic substances, is moulded or shaped to form, and then baked or burnt.—R. A.

Linings for Protecting Vessels, Tubes, and the like from Corrosive Fluids. A. G. Bloxam, London. From R. Panzl and A. Troetscher, Waterville, Maine, U.S.A. Eng. Pat. 3975, March 1, 1900.

A PROTECTIVE lining is made of a mixture of hydraulic cement, pulverised chamotte, siliceous material (preferably pulverised quartz), water, and silicate of soda. Tanks, &c. may be provided with partitions, formed by applying the lining composition to a grate of bars or a strong wire netting, or they may be constructed entirely in this manner. —R. A.

Drying Air, and Apparatus therefor; applicable for Extracting Moisture from Air for Use in Blast Furnaces and Steel Converters, and other Purposes in the Arts for which Dry Air is Useful. J. Gayley, Pittsburg, U.S.A. Eng. Pat. 11,091, June 19, 1900.

THE air is dried by passing it through a cooling chamber and intermittently interrupting its flow therethrough, so that the air has alternate periods of rest and motion. The air is cooled by contact with the cooling surfaces of the chamber, and deposits its moisture thereon in the form of water or snow, after which it is delivered to the furnace, &c. By rarefying the air in the cooling chamber, the lowering of the temperature and the consequent deposit of the moisture are facilitated. The figure illustrates an apparatus for carrying out the drying process. The blast engine 2 is connected by pipes, 3, 3′, to two or more cooling chambers, each of which consists of two or more sub-chambers, 4, 4′, provided with a cooling jacket, 9, and cooling tubes or other cooling surfaces, 26. The two sub-chambers can be put in communication through the valve 14 in the neck 13, and the inlet B is controlled by the valve 16. The valves 14, 16 are operated by connections, 15, &c., synchronously with the stroke of the engine, so that one valve is opened when the other is closed, and *vice versâ*. During one half-stroke of the engine, air is



drawn from the part 4′ of one cooling chamber, while air enters the part 4 through the valve 16. Simultaneously, in the other cooling chamber, the valve 16 is closed and the valve 14 opened, and, after equalisation of pressure, the air in the parts 4′, 4 remains stationary in contact with the cooling surfaces, the connection with the engine being closed.

On the return stroke of the engine, the conditions with respect to the two cooling chambers are reversed. By employing a third chamber, one or other of the three may be cut out for the removal of the products of condensation without interfering with the working. Each chamber may consist of more than two sub-chambers, arranged in multiple effect, and one or more of the valves between the sub-chambers may be kept open. If all the valves are kept open, the cooling is effected without the aid of rarefaction. In a modification, each chamber consists of only one part, in which rarefaction can be obtained by closing the inlet valve. In another arrangement, rarefaction is obtained without the use of valves, by making the outlet larger than the inlet. Deposited snow may be melted by heating, while the chamber is cut out, or, without interfering with the operation, by washing it off with cold brine.—R. A.

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Treating Liquids with Gases, and Heating or Cooling Liquids for Distillatory and other Purposes; Method of and Apparatus for ——. P. Naef, New York, U.S.A. Eng. Pat. 23,404, Nov. 23, 1899. (Under Internat. Convent.)

According to this invention it is proposed to supply heat to or abstract heat from the liquid to be treated, chiefly or partly by passing hot or cold gases through and directly in contact with the said liquid. For this purpose, apparatus is employed comprising one or more chambers having partitions provided with apertures, through which the liquid is passed, and which partitions serve to distribute the liquid or the gas. Means are provided for conducting gas or vapour through the chamber or chambers, and also through heating or heat-absorbing devices. The arrangement is preferably such that the gas is conducted out of the chamber, is reheated or cooled, and is returned to the chamber one or more times before it finally leaves the latter. The liquid is also preferably subjected to a preliminary heating or cooling by being passed through or around pipes, around or through which is conducted the gas from the chamber, or the fluid employed for heating or cooling the gas. In some cases the liquid may itself be passed through heaters or coolers.

The apparatus may be used for the distillation of ammonia liquor, for carrying out operations which require the abstraction of heat from a liquid, such as the precipitation of bicarbonate from brine saturated with ammonia by means of carbonic acid gas, and for the evaporation of liquids. 29 claims are made.—D. B.

Air Pyrometers. B. J. B. Mills, London. From The Bristol Company, Waterbury, Connecticut, U.S.A. Eng. Pat. 17,912, Oct. 9, 1900.

Two tubes of flattened section are coiled in the same direction into spiral form, and are attached together at their free ends, without being in communication. The one end of one of the tubes is fixed, and is in connection with the pyrometer bulb, while the other end of the second tube is connected to the indicating or recording arm. The tubes are moved axially in opposite directions by barometric or thermometric changes, the second tube serving as a compensator for the first, so that corrections for barometer and thermometer are not required.—R. A.

Steam Boilers; Composition for the Prevention or Removal of Incrustation in ——. J. Garside, Ashton-under-Lyne; and G., J., and A. Saxon, all of Manchester. Eng. Pat. 19,734, Nov. 3, 1900.

One pound of palm oil is melted and mixed with 1½ oz. of graphite. This product is to be put into the boiler through the manhole, or "may be dissolved by heat and fed in through the pump or injector." It is stated to float at first, but gradually to attract deposited solid matter until it becomes heavy enough to sink, when it lies quietly at the bottom of the boiler. It is claimed that all formation of scale is prevented, and that any existing scale is broken up and converted into removable flakes.—F. H. L.

II.—FUEL, GAS, AND LIGHT.

Coal Industry in Saghalien Island. F. F. Kleye. Chem. Zeit. Rep. 1900, **24**, [94], 352.

Knowledge of the existence of coal-fields in the island of Saghalien dates from 1787. Coal from Due (air-dried) gave the following numbers on analysis:—Moisture, 1·71; ash, 1·56; sulphur, 0·17; carbon, 83·39; hydrogen, 5·60; oxygen and nitrogen, 7·57 per cent. This coal gave 65 per cent. of coke, whilst the volatile constituents amount to 35 per cent. The coal gives 8,249 cal., and belongs to the anthracite class. For factories and forge work it is the best coal in the East. Huge coal strata are also to be found on the west coast of the island, near the river Mgatsch. The coal is of large size, and is not lustrous. Mgatsch coal is only slightly inferior to Cardiff coal, and a mixture of Due and Mgatsch coals gives excellent results for heating purposes. The output of Due coal amounted in 1899 to 1,500,000 pud (24,745 tons), and of Mgatsch and Sertunai coal to 800,000 pud (12,897 tons). Both classes of coal are certain to find a considerable market in Eastern harbours.—T. A. L.

Electric Furnace [Calcium Carbide]; Development of the. M. Keller.

See under XI. A., *page* 48.

Coal-Gas and Water-Gas; Supply of Mixtures of ——. H. Bunte. J. Gas Lighting, 1900, **76**, [1959], 1332—1335.

In England and America, carburetted water-gas is made from the residual oils obtained in the manufacture of lamp oil from crude petroleum, but in Germany the heavy import duty practically doubles the cost of such oils, and quite prohibits their use for gas-making. Illuminating water-gas can, however, now be produced by the Dellwik process by carburetting with benzol.

The author points out that, in view of the wide extension of the incandescent system of lighting, the illuminating power in flat-flame or Argand burners can no longer be regarded as the sole standard for the valuation of the gas. Von Oechelhaeuser has shown that coal-gas, of which the illuminating power has been reduced from 16 to 1 or 2 candles when consumed in flat-flame burners, will not have an appreciably lower efficiency in the incandescent burner. The author therefore proceeds to discuss the subject from the standpoint of the calorific power of the gas. Coal-gas has a calorific power of 136 to 141½ calories per cubic foot, according to the quality of the coal used and the method of carbonising. Water-gas, with 10 per cent. of impurities—nitrogen and carbon dioxide—has a calorific power of 68 to 73½ calories per cubic foot, or about half that of good coal-gas. If coal-gas be mixed with 20 per cent. of water-gas, the calorific power will be reduced by about 10 per cent., or from 141½ to 127½ calories per cubic foot, but there will be practically no change in the illuminating duty obtainable from the gas in the incandescent burner. The calorific power of the mixed gas may be considerably improved by addition of benzol, but this improvement is expensive compared with the cost of the gas, even when the price of benzol is low. Furthermore, a limit to the employment of benzol for carburetting is very soon reached, as in cold weather, the saturation point is easily passed, and then the benzol condenses in the mains. Enrichment with oil-gas is preferable, but it is pointed out that this method can only be economically adopted if the oil be duty-free. Oil-gas has, on the average, a calorific power of 277½ calories per cubic foot, and a mixture of one-third oil-gas and two-thirds water-gas forms a product which has about the same calorific power as coal-gas, and which may be mixed with the latter without appreciably affecting its calorific power. The author points out that the water-gas process may also be regarded as a means of diminishing the coal requirements of a gasworks. A ton of coal yields, on carbonisation, about 10,250 cb. ft. of gas, which quantity of water-gas would be produced by a consumption of 0·115 to 0·170 ton of coke. Thus, every million cubic feet of water-gas made, means the setting free of about 100 tons of gas-coal.

The author finally discusses the question as to whether the carbonisation process or the water-gas process will predominate in the future. He concludes that the carbonisation system, which industrially and economically is by no means out of date, must be further developed, and the more recent oil-gas and water-gas systems accepted as useful auxiliary processes.—A. S.

Carbide and Acetylene Industries in Germany; Rise, Progress, and Present Condition of ——. F. Rose (Stuttgart). Consular Report. Foreign Office Miscellaneous Series, No. 540, Nov. 1900. (See also this Journal, 1900, 1158.)

At the present time acetylene in Germany is a rather cheaper illuminant than petroleum, as the following figures indicate. Carbide is assumed to cost 32 pf. per kilo. (it now costs less, even in small quantities), and 3⅔ kilos. yield 1 cb. m. net of acetylene. Other charges raise the

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price of 1 cb. m. of acetylene to 1 mark 50 pf. In lighting power, 1 cb. m. of acetylene is equivalent to 16 cb. m. of coal-gas burnt in open-flame burners, or to 4 cb. m. burnt in an incandescent burner, or to 6 litres of petroleum, or to five 200-watt electric lamps. Coal-gas in Germany costs about 17 pf. per cb. m., and petroleum 25 pf. per litre. Hence, the equivalent in lighting power of 1 cb. m. of acetylene is obtained by petroleum for 1 mark 50 pf.; by coal-gas open burner for 2 marks 72 pf.; incandescent burner for 0 mark 68 pf., to which about 10 per cent. must be added for renewals of mantles, &c.; and by electric light for 3 marks 45 pf.

About 30 small towns in Germany are about to be, or are, lighted by means of acetylene. The works at Treptow-a.-d.-T. are typical of these town installations. They were constructed for a daily make of 200 cb. m., or for the simultaneous use of 2,000 flames of 32 candle-power. The generators are of the "carbide into water" type, and the gasholder has a capacity of 50 cb. m. Purification is effected by means of chromic acid dissolved in sulphuric or acetic acid (Ulmann's system). The gas passes from the generators through condensers and a washer with safety seal, to the gasholder, and thence through the purifiers, dryer, meter, and pressure regulator to the distributing system, of which the main pipes are of wrought-iron, 2 to 3 ins. in diameter. The total length of pipes is about five miles.

The insurance companies in Germany do not now demand increased premiums for premises lighted by acetylene, provided certain conditions are complied with, among which are the following:—(1) The gasholder must be provided with a safety valve. (2) The installation must be provided with a purifying apparatus. (3) Generators and gasholders must be isolated by walls of non-inflammable materials. (4) Inflammable substances must not be stored in the apparatus chambers, which must be always well ventilated. (5) Acetylene must not be prepared, stored, or used under a pressure of more than one atmosphere. (6) The piping must be of specified sizes, and the carbide stored and isolated according to regulations.

—J. A. B.

Acetylene Flame. E. L. Nichols. J. Franklin Inst. 1900, **150**, [5], 356—387.

THE author has studied the acetylene flame with a view to utilising it as a standard source of light in photometrical and spectroscopical researches. He concludes that the acetylene must be used soon after generation, as it breaks down with age to such an extent that a sample stored over water for five months was found to contain only 25 per cent. of acetylene, and to give a flame having only 6 per cent. of the brightness of that from newly generated acetylene, though of similar colour. The process by which acetylene is generated from carbide also affects the illuminating power of the gas. Gas generated by the dry process, in which small quantities of water are dropped on large masses of carbide, has on the average only about 80 per cent. of the illuminating power of gas generated by the wet process, in which small masses of carbide are thrown into large quantities of water. The high temperatures which attend the reaction in the dry process appear to produce a mixture of acetylene and other gases instead of merely acetylene. Gas generated by the wet process only was employed in these researches on the acetylene flame.

As acetylene burns with a smoky flame unless mixed with air or a gas less rich in carbon, the flames of mixtures of acetylene and hydrogen were first investigated, but as their candle-power varied greatly with changes in the proportions of the components, and as acetylene was absorbed so rapidly when such a mixture was stored over water that the proportions became uncertain, the flame of a mixture of hydrogen and acetylene was finally deemed unsuitable for photometrical purposes. Certain characteristics of the flame of pure acetylene—*viz.*, its great stability, its great intrinsic brightness, and its white colour—led the author to make further attempts to utilise it in photometry. Photographs of a flat flame viewed edgewise from acetylene under a pressure of more than 2 centimetres of water, showed that it consisted of a layer of heated gas, 0·005 cm. thick, surrounded by a sheath or mantle of highly luminous material. The total thickness from one luminous mantle to the other, was found to be 0·065 cm. The intrinsic brightness was about twelve times that of an ordinary gas flame. This might be attributed either to the number of particles floating in the flame being greater in that proportion, or to the temperature or degree of incandescence being sufficiently higher. If the first were the only or principal cause, the transparency of the flame would be low, and consequently the horizontal distribution of intensity in the case of a flat flame would not be uniform, whereas it was found to be nearly uniform. The great intrinsic brightness of the acetylene flame must consequently be ascribed chiefly to the high incandescence of the carbon, which implies white colour, high temperature, and high radiant efficiency. Spectro-photometric tests showed that the acetylene flame in air is rather whiter than the lime-light, and in colour lies between that and the electric arc light. The acetylene flame in oxygen is whiter than the flame in air, and corresponds almost exactly with the light of an ordinary electric arc lamp. The temperature of the flame in air has been estimated by Le Chatelier at 2,000° C., and by Lewes at 1,517°. The author found, by the use of thermo-couples of various thicknesses, and by plotting curves from the results obtained therewith, that the temperature, which a junction of infinitesimal diameter would have when placed in the hottest region of the flame, would be, for the acetylene flame 1,900°, for an ordinary gas flame 1,780°, and for a candle flame 1,675°. The radiant efficiency of the acetylene flame, determined approximately by Melloni's method, was found to be 10·5 per cent. A comparison of the acetylene flame with other sources of light in the projecting lantern, showed that the light flux from four acetylene jets, placed one behind the other, with a reflector, was five times that from a round-wick petroleum flame with a 5-in. parabolic reflector. The light flux from limelight was four (old limes) to eight (fresh limes) times; that from an alternating current arc, ninety times; and that from direct current arcs, 120 to 200 times the light flux from the petroleum flame. The author concludes that the great intrinsic brightness, stability, steadiness, and great preponderance of rays of the shorter wave lengths render the acetylene flame specially valuable as a reference standard in spectro-photometry.

The flame of acetylene, burnt under a slight blast of air or mixed with oxygen, is useful as a source of high temperatures. Quartz and metals of the platinum group can be readily fused thereby. The temperature of the ordinary acetylene flame, from the luminous mantle outwards, exhibits a very sharp decline, the range extending over more than 1,000° in a distance of 4 or 5 mm. A thermo-junction, having a plane surface set parallel to the median plane of the flame, and moved towards it by means of a micrometer screw, gives a convenient means of observing the melting point of any metal which fuses without considerable oxidation. A tiny length of the metal is looped round the thermo-junction. Manometric flames, produced by burning acetylene within a mantle of pure oxygen, have been used by the author in collaboration with Merritt.

In conclusion, the author states that he has not yet found an acetylene flame the candle-power of which is constant. The most hopeful method of using the flame as a standard in photometry appears to consist in determining the candle-power of a specified area of the flame, and to use that as the source of light. The fluctuations in the radiation from a small area of the flame, were found to be comparable with the fluctuations from the flame of the Hefner lamp. The position of the area used would, however, have to be very carefully specified. The effects of purification of the acetylene, and of the degree of humidity of the air, on the flame have not yet been studied in this connection.

—J. A. B.

Illuminating Gas; Determination of Sulphuretted Hydrogen in ——. A. Müller.

See under XXIII., *page* 73.

Coal-Gas; Determination of Sulphuretted Hydrogen in ——. H. Leicester Greville.

See under XXIII., *page* 73.

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Coal-Gas; New Method for the Volumetric Determination of Carbon Monoxide in ——. A. Smits, H. Raken, and P. C. E. Meerum Terwogt.

See under XXIII., *page* 73.

Gas Liquor; Valuation of ——. F. J. R. Carulla.

See page 23.

PATENTS.

Unconsumed Products of Combustion from Furnaces; Apparatus for Burning the ——. D. W. Stapp, Phillipsburg, Kansas, U.S.A. Eng. Pat. 1791, 1900. Date claimed under Internat. Convent., June 29, 1899.

THE claims are for the combination with an engine, of a receiver located in the smoke arch or chamber, and having its mouth directed towards, and located in advance of, the diaphragm of said smoke arch, and connected to the firebox by means of a conveyor pipe, an air feeder connected to the feeder or air-pipe of the said receiver, a second receiver connected to the firebox or furnace and located in the rear of the diaphragm, the second receiver having its mouth reversely arranged to the first-named receiver, and an air feeder for the second receiver. The first receiver is in the form of an extended bell mouth directed towards the point of flow of the smoke, &c., from the engine firebox, and the air feeders of both receivers have their outer ends arranged so as to create a suction and a forced draught to return to the firebox the matter taken up by the receivers.—C. S.

Artificial Fuel; Manufacture of ——. E. Springborn, Bow, E. Eng. Pat. 24,055, Dec. 2, 1899.

THE process is one for producing fuel from solid or semi-solid carbonaceous substances (*e.g.*, sewage or other refuse matter, earths or rocks of a non-metallic or carbonaceous nature, such as certain clays containing a low percentage of silicate, and also those containing bituminous substances, the silt of rivers or lakes containing vegetable or bituminous matter, and other earths of vegetable origin) by treatment with saccharine matter (a $\frac{1}{4}$ to 1 per cent. aqueous solution of sugar) and inflammable hydrocarbon (*e.g.*, coal tar with 10—15 per cent. of petroleum and 3—5 per cent. of tallow; or 90 per cent. of heavy petroleum and 10 per cent. of tallow), followed by an addition of an alkali carbonate, chloride, or nitrate ($\frac{1}{4}$ to 2 lb. per ton), the product being afterwards pressed into briquettes and dried. With materials poor in carbon an addition of 1—3 per cent. of soot, ground graphite, &c., may be made before the saccharine treatment, or a stronger solution of sugar may be used.

—C. S.

Solid Materials; Method of and Apparatus for Treating ——; *Applicable to the Manufacture of Gas, Coke, and to other Purposes.* P. Naef. Eng. Pats. 23,415, 23,415A, 23,415B, and 23,415C, Nov. 23, 1899.

See under I., *page* 27.

Briquette; Combustible ——. J. Paucheur, Brussels. Eng. Pat. 13,707, July 31, 1900.

A "COMBUSTIBLE briquette made on a foundation of coal by a scientific mixing of about 80 per cent. of coal dust, 17 per cent. of neat petroleum, and 3 per cent. of molasses to bind them."—C. S.

Fire-kindling Substances. H. H. Lake. From E. Jörgensen, Lauget, Norway. Eng. Pat. 15,018, Aug. 22, 1900.

THE substance is "composed of petroleum or other combustible oils, to which is added powdered or finely divided infusorial earth, so as to impart to the whole a pulpy consistency."—C. S.

Artificial Fuel. Dr. Clemens Dörr, Cologne, Germany. Eng. Pat. 15,476, Aug. 30, 1900.

THE claims are for: "A method of utilising carboniferous colliery waste, such as wash-heap waste, separated, *i.e.*, hand-sorted, coal-streaked slate, and all other waste material, the said materials being granulated either when in the condition in which they are dumped at the mine, that is to say, containing non-carboniferous admixtures, such as sand, stone, and the like, or after partial or total removal of the latter, and then being employed as combustibles, either each separately or mixed together, and after having previously been formed into cakes or not, as desired"; and for "the form of the method described in claim 1, in which coal slime, coal dust, small coal, or other waste material of small value are added to the materials mentioned."—C. S.

Chimney Chemical Cleansers. T. Huson, Liverpool. Eng. Pat. 24,375, Dec. 7, 1899.

THE chimney cleansers in use consist of a strongly oxidising salt, such as potassium nitrate, mixed with sulphur or its equivalent, and a volatilisable salt, such as sodium chloride, acting as a diluent. But it is found that sodium chloride, being hygroscopic, is objectionable, and in the present invention it is replaced, preferably, by sodium sulphate, though precipitated calcium carbonate or finely-divided earth or silica may be used. The mixture recommended is composed of potassium nitrate, 56 parts; sodium sulphate, 26 parts; and sulphur, 18 parts; all in fine powder and thoroughly mixed.—E. S.

Gas for Illuminating and Heating Purposes. H. H. Boehndel, London. Eng. Pat. 23,572, Nov. 25, 1899.

Carburetting Air.—The manufacture of a highly absorbent body is claimed, by mixing absorbent materials, such as chalk, lime, powdered pumice stone, peat moss, kieselguhr, and the like, with a substance, such as magnesia or silicate of soda, causing such absorbent materials to hold together in a porous mass, which mixture is, by the addition of water, formed into a paste, which, when divided into small lumps or pieces, is dried and afterwards calcined.

That improvement in the production of combustible gas is claimed, consisting in passing a blast of air through a sealed vessel containing a highly absorbent material impregnated with a suitable hydrocarbon.—R. S.

Gas; Apparatus for Washing and Scrubbing ——. S. Chandler, jun., and J. Chandler, both of Surrey; and Kirkham, Hulett, and Chandler, Ltd., Westminster. Eng. Pat. 24,383, Dec. 7, 1899.

COLUMNS for washing and scrubbing gas are claimed, wherein the plates, which are to be kept in a wet condition, are supported with their lower edges immersed in water, in such a manner that the gas to be treated, and which is admitted above the level of the water, has to pass downwards through the water and to pass upwards between the plates in order to escape, thereby producing a bubbling action, which maintains the plates in a wet condition. In apparatus for washing and scrubbing gas, the combination is further claimed of a casing, a pipe or pipes projecting up through the floor of the casing, a hood covering the pipe or pipes, and having its lower edges dipping into water, and bundles of plates arranged adjacent to the hood in such a manner that the gas, as it escapes from the hood through the water, will rise between the plates.—R. S.

Gas; Apparatus for the Production of ——. A. J. Boult, London. From A. Perrier, Marseilles. Eng. Pat. 25,009, Dec. 16, 1899.

THE apparatus consists of (1) a carburetter, (2) an air-supply device, and (3) a gasholder. In apparatus for the production of gas, an air saturator is claimed, provided with several communicating chambers, arranged one above the other, to which liquid hydrocarbon is supplied from a reservoir, each of the chambers being further divided into several divisions, in order to compel the air, forced in by an air-bell, to take a zigzag or tortuous course through the liquid. In apparatus of the kind described, there is also claimed an air-supply device, consisting of an air-bell in a water receptacle, by the ascent and descent of which, automatically controlled, the air is drawn in and forced out respectively. The gasholder is of the usual form.—R. S.

Fire-Damp, Coal-Gas, Hydrogen, or other Gases; Improved Means for Indicating the Presence in the Atmosphere of ——. G. A. Lyncker and M. F. Mohr, Munich, Germany. Eng. Pat. 2094, Feb. 1, 1900.

A DEVICE is claimed for indicating the presence and accumulation of a gas, the specific gravity of which is not

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above 0·6 (atmospheric air being = 1), such as methane, illuminating gas, hydrogen gas, &c., in which a porous cylinder, closed at the bottom, and made of clay or the like, is closed above gas-tight, by means of a corresponding thin metal foil membrane, which is conductively connected by means of two metal rings with one terminal, a second terminal being connected with a central contact screw screwed into a cross bar of one of the above rings, but insulated from the latter, the said contact screw, with its platinum point, being capable of adjustment above the centre of the membrane, in order that the sensibility of the apparatus may be varied according to the various conditions and kinds of gas.—R. S.

Gas; Enrichment of ——. [*Carburetting Gas.*] F. W. C. Schniewind, New York, U.S.A. Eng. Pat. 10,588, June 9, 1900.

A GAS of high illuminating power is obtained from coke ovens and other sources by drawing off separately the rich and the poor gases produced in a multiple series of ovens, scrubbing the poor gases with oil to eliminate and absorb the benzol contained in the gases, then distilling the oils to recover the absorbed benzol, and mixing the distillate, without further concentration, with the rich gases from the ovens, and finally subjecting the mixed rich gases and benzol distillate to a condensing and washing treatment, in order to remove ammonia and other impurities.—R. S.

Burners for Gas or other Combustible Vapours used in Furnaces. T. Fletcher, A. Neil, and Fletcher, Russell, and Co., Ltd., Warrington. Eng. Pat. 15,501, Aug. 31, 1900.

AN improvement applicable to burners for gas or other combustible vapours used in connection with furnaces, consisting in the combination with such burners of a protecting hollow cone, the larger end or base of which rests against the back of the wire gauze, and the smaller end thereof projects into the furnace. The object of the cone is to protect the wire gauze when the blast is shut off, and to remove the flame from the surface of the gauze.—R. S.

Carburetted Air; Apparatus for the Cold Production of ——, *for Industrial and Domestic Purposes.* F. J. Lothammer, Paris. Eng. Pat. 15,930, Sept. 7, 1900.

AN apparatus is claimed for the production of carburetted air, so contrived as to ensure the formation of a combustible mixture of uniform composition and density throughout. The apparatus comprises an upright cylinder supported by legs, beneath which is a conical receiver, the latter forming the carburetter. The cylinder is divided into three chambers, one above the other, the upper one consisting of the pure air chamber, in which the pressure is regulated by a weighted valve, and from which air flows into the carburetter. The middle compartment forms the carburetted air chamber, and it is connected with the carburetter by means of a large central pipe, and with the "consuming apparatus" by an exit pipe. The lower chamber is the hydrocarbon reservoir, and the lower part of it is connected with the lower part of the carburetter by means of pipes, and its upper part is connected with the upper part of the carburetter by means of a bent tube, which ensures that the level of the liquid in the carburetter shall remain constant.

A carburetter virtually consisting of a conical receiver is also claimed, in which the level is maintained constant, the compressed air which has to be treated, flowing through to the bottom of the receiver (the area at the base being larger than the area at the top) across metal gauze or perforated plates, this air afterwards meeting, in the liquid, other plates of similar construction inclined in all directions. A heated air jacket surrounds the carburetter so as to compensate for the cold produced by the evaporation of the hydrocarbon used for carburetting.—R. S.

Explosive Gaseous Mixture; Device for Automatically Detecting and Indicating the Presence of an ——. J. G. A. Rhodin, Manchester. Eng. Pat. 1122, Jan. 18, 1900.

A DEVICE for automatically detecting and indicating the presence of an explosive gaseous mixture, comprising in its essential features a vessel through which a sample of the gas to be tested is caused to flow, and in which it is exposed to an electric spark. A by-passage from this vessel is kept normally closed by a valve carried by a pivoted tube or arm, which is overbalanced when an explosion in the vessel takes place, and thereby closes an electric circuit.—J. C. R.

Acetylene or other Hydrocarbons; Manufacture of ——, *from Carbide, and By-Products thereof.* G. J. Atkins, Tottenham. Eng. Pat. 22,425, Nov. 9, 1899.

CALCIUM or other carbide is decomposed by admixture with solids containing water or the elements thereof, either in unstable combination or as water of crystallisation. Calcium carbide is stated thus to yield acetylene gradually, together with useful by-products, which vary according to the nature of the solid employed. For instance, the hydrated monocarbonate or monosulphate of an alkali yields an alkaline residue, which with oil or grease may be employed to produce soap; beet, potato, or other starchy matter gives a residue from which solid starch and a solution of the albuminous and gelatinous matters may be obtained. The acetylene formed is stored in ordinary gasholders, which, however, are sealed in solution of silicate of soda to avoid the gradual diffusion of the gas, which occurs when water is used as the sealing liquid.—J. A. B.

Acetylene Gas; Generators for the Production of ——. A. L. Kieny, St. Denis, France. Eng. Pat. 23,432, Nov. 24, 1899.

A COVERED reservoir is divided into two compartments, in one of which is inserted a carbide receptacle to which water is supplied, while the gas thereby evolved passes through water in the lower part of the other compartment, the upper part of which serves to store the gas for the supply of burners, &c. The pressure of gas in this compartment is caused to control the flow of water to the carbide receptacle.—J. A. B.

Acetylene Gas for Street Lamps, Gate Posts, Carriage, and ordinary Illumination; Apparatus for the Production of ——. J. W. Edmundson, Dublin. Eng. Pat. 23, Jan. 1, 1900.

WITHIN a cylinder containing water is a cylindrical bell, with detachable base, containing perforated trays, supporting carbide, traversed by a central pipe through which the generated gas passes to a purifier, comprising a washer and two superposed chambers containing sieves supporting purifying material.—J. A. B.

Acetylene Gas; Apparatus for the Production of ——. C. Meissner, Hornberg, Germany. Eng. Pat. 14,034, Aug. 4, 1900.

CARBIDE, contained in a funnel, drops into water in a generating tank until the pressure of the evolved gas raises a conical hood, which closes the nozzle of the funnel and interrupts the supply of carbide. The funnel is mounted on a cover, with downwardly extended walls sealed in an annular tank containing glycerin.—J. A. B.

Acetylene Gas; Generator for ——. J. Fazan, Apples s/Morges, Switzerland. Eng. Pat. 16,979, Sept. 24, 1900.

THE crown of a bell, floating in a tank of water, supports a perforated cylinder in which is a cylinder containing baskets of carbide and having an orifice near its top, by which water gains access to the carbide. The gas evolved passes through a pipe, with cock, to the bell. Several generating cylinders may be combined with one bell.
—J. A. B.

Acetylene Gas Generating Apparatus. A. E. Adolfsson, Stockholm. Eng. Pat. 17,466, Oct. 2, 1900.

BETWEEN a carbide receptacle and a subjacent tank containing water is a closed vessel in which is operated, according to the movements of the gasholder into which the gas evolved passes, an oscillating vessel which is so constructed that when the opening from the carbide receptacle is open, that into the tank is closed, and *vice*

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versa. An oscillation of the vessel thus conveys a given quantity of carbide into the generating tank.—J. A. B.

Mixtures of Carbide of Calcium which are free from any Danger of Explosion in Generating Gas; Process to Manufacture ——. F. L. Toby and O. S. Borch, both of London. Eng. Pat. 23,874, Nov. 30, 1899.

FIVE to 15 lb. of dried calcium chloride or other hygroscopic salt, and 90 lb. of calcium carbide, are ground together with the addition of a little oil, and to the mixture 2 lb. of tar are added. The whole is mixed, heated to about 120°, and, after cooling and standing for a few days, is compressed into briquettes of suitable size. The briquettes are stated to afford a more uniform generation of gas than calcium carbide alone, and the rapidity of generation may be increased by increasing the proportion of calcium chloride in the mixture. The briquettes are intended for use in generators in which the carbide is in excess of the water.—J. A. B.

Incandescent Gas Lighting; Impts. in connection with Burners used for ——. C. S. Snell, Saltash. Eng. Pat. 24,096, Dec. 4, 1899.

THIS relates to a burner suitable for high-pressure gas, which can automatically adapt itself to low-pressure gas should the pressure be reduced inadvertently or otherwise. At the mouth of the burner is provided a series of gas apertures, collectively large enough to maintain an effective flame within the mantle at ordinary low gas-pressure, but the central hole is of larger bore than the others, and, when closed, leaves sufficient aperture area in the remaining holes to pass enough gas when the latter is at high pressure. A disc, ball, diaphragm, or other convenient form of float valve is arranged below the gas apertures, and is so adjusted that at a certain degree of gas pressure it closes the central exit, leaving the maintenance of the light entirely to the remaining high-pressure apertures. A number of devices for applying this principle are described.—H. B.

Incandescence Bodies suitable for Use with Gas and like Burners. J. H. H. Duncan and The New Sunlight Incandescent Company, Ltd., London. Eng. Pat. 25,359, Dec. 21, 1899.

THERE are claimed mantles of the following composition:—alumina, 48 to 60 per cent.; chromic oxide, 5 to 10 per cent.; and thoria, 42 to 35 per cent. In preparing the mantles, either the usual impregnation process is employed, or solutions of the substances may be mixed with collodion, the mixture being afterwards extruded into threads in the known manner.—H. B.

Lamps; Manufacture of Vacuum Osmium ——. C. Auer von Welsbach, Vienna. Eng. Pat. 7211, April 18, 1900.

"I HAVE found that the presence of traces of oxidising gases, such as water vapour, as well as of reducing dissociable gases or vapours containing a large proportion of carbon, such as, for example, vapour of fatty acids, is in a high degree prejudicial both to the durability as well as to the economy of osmium vacuum lamps. The agents first named are mostly developed from the glass of the bulb; the others come from the india-rubber and from the packings of the mercury pumps." The traces of hydrogen gas which are liberated during use by an osmium filament which has not been too highly heated in the process of manufacture, prevent the action of the oxidising gases on the filament; it is therefore important that the glass of the bulb should contain no reducible oxides capable of oxidising this hydrogen to water vapour. The substance of the invention will be seen from the claims:—(1) For an osmium vacuum lamp, a bulb consisting of glass fusible with difficulty, *e.g.*, potash-soda-glass, containing no oxides, such as oxide of lead, which when heated are reduced by hydrogen. (2) In the process of making lamps of this kind, preventing the presence of deleterious gases by connecting together by soldering, or by molten shellac, those parts of the vacuum-pump which communicate directly with the bulb, and avoiding any kind of fat in the packings of the pump. (3) An osmium lamp constructed in accordance with these two claims.—H. B.

Vapour Burners. A. Lecomte, Paris. Eng. Pat. 10,556, June 9, 1900.

A SPIRIT burner in which a metallic body projects into the flame, conducting heat to the vaporising chamber, a spiral of wire gauze being arranged within the latter to promote the volatilisation of the spirit.—H. B.

Illuminating Power of [Incandescence] Gas Burners; Device for Increasing the ——. W. Theobald, Lee, and G. Theobald, Catford. Eng. Pat. 18,208, Oct. 12, 1900.

THE device consists of a hollow or cup-shaped cap, placed upon the top of the lamp chimney, so that the passage for the draught is considerably lessened. With incandescent mantles the device "is effective especially when the gas is only partly turned on."—H. B.

Hydrocarbon Vapour Burners. A. E. Hartel, Philadelphia. Eng. Pat. 18,474, Oct. 16, 1900.

THIS relates to devices for preventing unvaporised hydrocarbon from passing to the burner from the vaporising chamber, for obviating the transmission of heat to the oil supply, and for effecting the preliminary heating of the vaporising chamber.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Brown-Coal Tar Purification; Chemical Function of Sulphuric Acid in ——, *and its Physical Significance*. R. Pauli. Chem. Zeit. 1900, **24**, [89], 969—970.

THE separation of brown-coal tar into its components (light and heavy oils, and soft and hard paraffin wax) by distillation, is regarded as a physical process, the removal of creosote and resin by alkalis and sulphuric acid being considered chemical operations. In the absence of sufficient resin, the excess of acid attacks the valuable constituents, the term resin as used in this industry, being strictly definable as "loss from tar and oil by the action of sulphuric acid." As sulphurous acid is evolved in the operation, it seems probable than an oxidising action takes place. This was experimentally investigated in the following manner:—100 grms. of tar were placed in a flask on a water-bath, and so arranged that water-vapour could be led in at one end, gaseous products collected at the other by the help of an aspirator in a wash-bottle containing standard iodine solution, and a known amount of acid could be added to the flask when desired. About 3 grms. of concentrated sulphuric acid were so added when the tar had assumed a temperature of 50° C.; the flask was then well shaken for half an hour with the aspirator working freely. The amount of sulphuric acid consumed was estimated by titration, and found to be 1·123 grm. of which 0·81 grm. was represented by sulphurous acid retained in the wash-bottle. The loss of tar and the amount of resin obtained under these conditions were separately determined in a beaker as a more convenient vessel. The difference between 1·123 and 0·81 grm. of H_2SO_4 (0·313 grm.) represents acid spent in forming resin by sulphonation, so that the greater proportion was spent in oxidation. It was also noticed that the total weight of resin was less than the loss of tar by 2—3 per cent. Oxidation by iodine and chlorine was then attempted, only the former agent being found suitable. 8 grms. of iodine caused a tar loss of 8·02 grms., corresponding to the total amount of active oxygen in 3 grms. of H_2SO_4, fatty acids and olefines being attacked as well as aromatic hydrocarbons, and a specially dense and compact resin being obtained. The iodine value of the tar was 40 per cent.

The author experimented with 20 samples of brown-coal tar from different sources, and tabulated the specific gravity before and after addition of 3 per cent. of sulphuric acid, and the weight of resin formed. The specific gravity of the constituents removed (P) was calculated from the formula—

$$\frac{\text{Wt. of raw tar} \times \text{its sp. gr.} - \text{wt. of clean tar} \times \text{its sp. gr.}}{\text{Weight of resin (}i.e.\text{, tar loss)}} = P$$

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This varied from 1·049 to 0·889, the lower limit denoting removal of light constituents owing to excess of acid relative to the amount of heavy constituents. The practical optimum value, he considers, is 0·930, and recommends that any batch of tar or oil should be tested and the proportion of acid adjusted so that the specific gravity of the constituents removed (P), calculated by the above formula, agrees with this value, thus avoiding waste of acid and the conversion of valuable constituents into worthless resin.

—R. L. J.

Metacresol in Mixtures of Cresols; Determination of ——. H. Ditz.

See under XXIII., *page* 73.

PATENT.

Mineral Oils, Liquid; Solidification of ——. H. B. Helbing and F. W. Passmore. Eng. Pat. 23,978.

See under XII., *page* 50.

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigo; Oxidation of ——. G. v. Georgievics and L. Springer. Monatsh. für Chem. **21**, [5], 1900, 413—421.

In order to obtain a discharge pattern on Indigo-dyed goods, the material is printed with an alkali chromate and passed through a bath containing sulphuric and oxalic acid. The chromic acid liberated, oxidises and discharges the Indigo where printed. The oxidation proceeds rapidly in presence of oxalic acid, but very slowly with chromic acid and sulphuric acid alone. The rate at which the oxidation proceeds is proportional to the amount of oxalic acid present, and hence the action is a catalytic one. The oxalic acid can be replaced by citric, tartaric, salicylic, benzoic, succinic, malonic, acetic, or formic acid, glycerin or alcohol, but these substances are much less active.

Oxalic Acid; Oxidation by Permanganate of ——. It is observed, in titrating oxalic acid with permanganate, that the first drops of the latter are only decolorised slowly at the beginning of the operation, but more rapidly subsequently. This is due, according to the authors, to the presence of manganese sulphate, and the decoloration is accelerated from the commencement by adding a trace of this reagent. They assume that the potassium permanganate acts on the manganese sulphate, forming manganese peroxide, and that this, in presence of sulphuric acid, is the oxidising agent. A peroxide could be detected in all stages of the oxidation by the liberation of iodine from potassium iodide, and the yellow coloration with titanium solutions. The peroxide can hardly be hydrogen peroxide, and is probably an organic peroxide, which the authors hope to isolate.

—T. A. L.

Indigo Carmine and Indigotin; Explanation of the Decrease in the Use of ——. W. Zänker. Leipziger Färber- u. Zeugdr.-Zeit. 1900, **49**, [12], 503—504.

Indigo carmine and other forms of sulphonated indigo, *e.g.*, the so-called Indigotin, have been largely displaced in recent years by the coal-tar dyestuffs. The chief advantages of Indigo Carmine depend on its property of level dyeing; even when the colour is unlevel, owing to the initial temperature of the dye-bath being too high, it becomes level on long boiling. The colour is also readily stripped from the fibre should the shade be too full. These advantages are not fully shared by any coal-tar dyestuff, but dark shades dyed with certain coal-tar dyestuffs are considerably faster to light than when Indigo Carmine is employed. This is not the case with pale shades, for not only is it difficult to find a level-dyeing dyestuff giving the same pale shades as Indigo Carmine and exceeding it in fastness, but also the tone of a faded Indigo Carmine colour is not nearly so unpleasant as that, for instance, of a faded Sulphocyanine or Patent Blue colour, the Indigo still showing a pale pure greenish-blue tint, while the coal-tar blue has become an objectionable dull green.

The decrease in the amount of Indigo Extract used in dyeing, which the author considers undeserved, may, however, be to a great extent attributed to the fact that it is so often sent into the market in an impure condition—the result of hasty and incomplete manufacture. Indigo carmine should consist entirely of the sodium salt of indigotin disulphonic acid, but the commercial extracts frequently contain more or less of the monosulphonate and even insoluble unchanged indigo, these impurities being due to imperfect sulphonation. Many of the disadvantages ascribed to the use of Indigo Extract are caused by the presence of these substances, since indigotin monosulphonate is not a good dyestuff for wool, the colours produced by it being pale, dull, and extremely fugitive.

This defect of commercial extracts is now well known to the chemists in several works, and in some cases the indigo is so thoroughly sulphonated that there is danger of falling into the opposite error, and by over-sulphonation destroying the colouring matter or producing an extract yielding colours which rub off very readily. Indigotin trisulphonate does not possess the same useful properties as the disulphonate; in weak solutions the dyestuff is attracted too quickly and in strong solutions too slowly, with the result in the former case of unlevel dyeing, while in the latter matching is rendered very difficult.

It is certain that very great care must be taken in the manufacture of Indigo Extract if this product is ever partly or wholly to regain the position which it formerly occupied.

—R. B. B.

Triphenylmethane; Relation between the Chemical Constitution of Dyestuffs derived from ——, *and the Absorption Spectra of their Aqueous Solutions.* P. Lemoult. Comptes Rend. **131**, [21], 839—842.

When solutions of the various dyestuffs containing 1 gram-molecule per 1,000 litres are compared in layers of equal thickness, all show a band in the red, and most another band towards the violet. The middle of the red band is situated, for all those which contain an atom of tertiary nitrogen in the para position with regard to the central carbon atom in two of the phenyl nuclei, about wave-length 6,860, and for all those which contain such a nitrogen atom in the three nuclei, about wave-length 6,660. These positions seem quite independent of the nature and positions of other substituting groups in the molecule.

—J. T. D.

Triphenylchloromethane; Preparation of ——. M. Gomberg. J. Amer. Chem. Soc. **22**, [11], 752—757.

Carbon tetrachloride (1 part) and benzene (3·5 parts), thoroughly dried, are mixed in a round-bottomed flask, provided with a reflux condenser, and aluminium chloride (1·25 parts) is gradually added. After reaction, the mixture is heated for an hour on the water-bath, thoroughly cooled, and very slowly poured upon ice and water, avoiding all rise of temperature; benzene is also added, to dissolve the triphenylchloromethane. The benzene solution is separated, washed, dried over calcium chloride, and concentrated on the water-bath. On cooling, triphenylchloromethane crystallises out; the crystals are separated and washed with ether. The mother-liquor is concentrated by distillation under diminished pressure, and ether added, when a further portion of triphenylchloromethane separates, and a third portion is obtainable by a repetition of this treatment. The final mother liquors contain triphenylmethane carbinol, but no triphenylmethane. The yield of the chloro-compound is 70—85 per cent. of the theoretical.

The author prepares his aluminium chloride, very conveniently, by acting on aluminium in a combustion tube with a *rapid* stream of chlorine.—J. T. D.

Triphenylcarbinols by Alcohol [Malachite Green]; Etherification of ——. O. Fischer. Ber. **33**, [18], 3356—3357.

Malachite Green base is very readily converted into the corresponding ether by boiling with an alcohol or even by

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allowing the alcoholic solution to stand. The methyl ether is obtained by dissolving Malachite Green base in boiling methyl alcohol, and allowing the concentrated solution to stand. The ether separates in white plates, which easily turn green. The product is very readily soluble in benzene, sparingly soluble in petroleum spirit and in ether. It melts at 151° C. The ethyl ether is always produced when the base is heated with ethyl alcohol to 80°—170° C., and preferably under pressure at 110°—120° C. It forms colourless prisms, melting at 162° C. The benzyl ether is formed by heating the base with 3—4 times its weight of benzyl alcohol for about one hour to 170° C. The melt solidifies to a mass of crystals, and after washing with methyl alcohol the product is crystallised from a mixture of benzene and methyl alcohol, free from acid. It forms silky white needles, softening at 195° and melting at 198° C. The crystals remain colourless in an atmosphere free from acid, but turn green immediately in contact with acids. When treated with dilute sulphuric acid and distilled with steam, benzyl alcohol passes over, whilst the sulphate of the Malachite Green base remains behind.

—T. A. L.

Rosaniline Bases. G. v. Georgievics. Monatsh. für Chem. **21**, [5], 407—412.

The views expressed by the author (Monatsh. **17**, 4) as to the formation of a coloured base from pararosaniline have been controverted by H. Weil (Ber. **29**, 2677; this Journal, 1897, 131). The author, however, considers that they receive fresh support from the work of Hantzsch and Osswald (Ber. **33**, 285; this Journal, 1900, 236), who have shown the existence of *p*-rosaniline ammonium base, and he brings forward some further evidence in support of his view. When a cold magenta solution is treated with a large excess of soda lye, a red amorphous precipitate is obtained, which soon becomes crystalline, and yields quantitatively the carbinol base of rosaniline. When this is shaken with ether the latter remains colourless. If, however, only a very small excess of soda lye be employed, the red precipitate is only converted after some time, and incompletely, into the carbinol base, and on shaking with ether or, preferably, with chloroform about 10 times the quantity of ammonium base (weighed as hydrochloride) as of the carbinol, dissolves with an orange-yellow colour in the solvent. When a pararosaniline solution of known strength is titrated with soda lye, the solution only turns red litmus paper blue when a considerable excess of the latter reagent has been added. This indicates that part of the soda lye is neutralised by the carbinol base, which behaves like an acid towards strong bases. This view is confirmed by the following consideration. The rosaniline carbinol base separates even from very dilute solutions of the filtrate from the red precipitate, and hence the carbinol base, which is insoluble in cold water, must be dissolved by the excess of soda lye, since none of the base crystallises out when the magenta solution is neutralised with ammonia. The author is unable to confirm Weil's statement that rosaniline carbonate solution is decomposed by salt into rosaniline hydrochloride and sodium carbonate, which turns red litmus paper blue (*loc. cit.*). The base obtained by using a small excess of soda lye when freshly precipitated, dissolves completely in ether, but soon loses this property. The soluble portion must consist of the rosaniline ammonium base, although Hantzsch and Osswald doubt the existence in the solid state of such ammonium hydrates. The rosaniline ammonium bases decompose in aqueous solution even more rapidly than in the solid state, and assume the character of salts even in the total absence of carbonic acid. This is due to a combination between the ammonium and carbinol bases and the red colour which the carbinol base gradually assumes, and the coloration on filter paper produced by a solution of Rosaniline in ether is due to the formation of a "rosaniline rosanilate." It is suggested that a similar isomerisation takes place in the case of the bases of Safranine and Methylene Blue. Hantzsch and Osswald point out that the solid so-called free Phenosafranine possesses the conductivity of a salt.

—T. A. L.

Auramine from Tetramethyldiamidodiphenylmethane. J. Walter. Chem. Zeit. 1900, **24**, [94], 1031—1032.

The original method by which Auramine was obtained—heating tetramethyldiamidobenzophenone with sal-ammoniac and zinc chloride—has been entirely superseded by the present process, which, according to the author, is due to him and Sandmeyer. The former had, in fact, deposited a sealed communication in May 1887, which was read in 1895 (this Journal, 1895, 744), and in which the production of Auramine was described, by heating tetramethyldiamidodiphenylmethane with sulphur and subsequently adding sal-ammoniac and zinc chloride. The present process consists in heating tetramethyldiamidodiphenylmethane with sulphur in a current of ammonia gas, and the author lays claim to having devised the plant for this purpose. The melt still gives 80—100 kilos. of commercial Auramine O containing about 8—10 per cent. of dextrin or sugar, and two such charges can be worked through in 24 hours. Excluding the production of the methylene base—from formaldehyde and dimethylaniline—the operation requires eight men by day and two at night, both charges being finished off in the daytime. Further reference is made in the paper to the synthetic production of pararosaniline from diamidodiphenylmethane already mentioned in the abstract quoted above.—T. A. L.

Azo Dyestuffs from β-Naphthol and α-Naphthylamine Sulphonic Acids to Wool; Behaviour of ——. G. v. Georgievics and L. Springer. Chem. Zeit. Rep. 1900, **24**, [94], 352.

Wool dyed with the dyestuffs referred to is not a chemical compound of the dyestuff-acid with the keratin of the wool, although hitherto this has been assumed to be the case. The authors' experiments also show that some relation exists between the solubility and absorption of the dyestuffs. The colour acids are scarcely taken up at all from their aqueous solutions by the wool fibre, and only become so in presence of acetic acid, an increase in this acid producing a heavier shade. In fact, the colour acids are less soluble in dilute acetic acid than in pure water. No relation could be observed between solubility and affinity, but hitherto it has not been possible to determine whether there is not a relation between the strength of a colour acid and its affinity. With regard to the shades obtained, those from the 1·4 acid are the fastest to light, whilst those from the 1·1′, 1·2′, and 1·3′ acids are the most fugitive.—T. A. L.

Azo Dyestuffs from β-Naphthol and α-Naphthylamine Sulphonic Acids. G. v. Georgievics. Chem. Zeit. Rep. 1900, **24**, [94], 351—352.

Of the seven possible dyestuffs having the formula $HO_3S.C_{10}H_6(\alpha)N:N.C_{10}H_6.OH(\beta)$ only Fast Red A from naphthionic acid and β-naphthol has been described. Investigation shows that the position of the sulphonic acid group has an important bearing on the properties of the dyestuffs, and similarities in the naphthylamine sulphonic acids are also present in the dyestuff derivatives of these acids. For instance, the dyestuffs from the acids 1·3′ and 1·2′ ($NH_2:SO_3H$) are almost undistinguishable, whilst the 1·2 and 1·1′ and the 1·4 and 1·4′ derivatives also exhibit a great similarity. In the face of this, Erdmann's statement that the 1·2 naphthylamine sulphonic acid has a conductivity about 2,000 times greater than the peri compound is somewhat strange. The proximity of the sulphonic acid group to the chromophoric azo group in the 1·2 and 1·1′ dyestuffs manifests itself in the yellow shade given by these compounds on wool, all the other dyestuffs giving red shades. On spectroscopical examination, all the dyestuffs transmit red and part of the orange-red almost unchanged, and none of the dyestuffs have any appreciable action on a photographic plate.—T. A. L.

Millon's Reagent. W. Vaubel.
See under XXIII., *page* 71.

Xanthorhamnin and Quercitrin; Sugar Constituents of ——. E. Votocek and V. Fric.
See under XXIV., *page* 76.

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PATENTS.

Indigo Leuco Compounds and other Indigo Products, and Materials for Use therein; Manufacture and Production of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 23,123, Nov. 20, 1899. (Second Edition.)

THE dialkyl esters of phenylglycocoll-*o*-carboxylic acid readily form formyl, carbethoxyl, or benzoyl derivatives, which can be converted into indoxyl compounds, and subsequently into Indigo. The conversion may be effected not only by the action of caustic alkalis, but also by heating, or on standing at the ordinary temperature with dilute alkaline solutions. For this purpose the alkaline earths (except magnesia), the alkali alcoholates, sodium, ammonia, hot sodium carbonate solution, and sulphuric acid of various strengths may be employed. The resulting product is indoxyl or indoxylic acid, or in the presence of alcohol an ester is obtained. With concentrated sulphuric acid, indigo sulphonic acids are obtained. As an example of the method employed, 1 kilo. of phenylglycocoll-*o*-carboxylic acid diethyl ester is heated with 2 kilos. of formic acid (90 per cent.) for two hours to 150° C. After cooling, the solution is filtered, and evaporated *in vacuo*. The residue is then dissolved in ether and extracted with sodium carbonate solution. The formyl compound is obtained by distilling off the ether, and in order to convert it into indoxyl it is boiled with 10 kilos. of a 20 per cent. caustic soda solution out of contact with the air. From this solution, after cooling, the indoxyl may be precipitated, or Indigo may be obtained from it directly. The formyl ester prepared above may be converted into Indigo sulphonic acid by heating it on the water-bath with five times its weight of sulphuric acid, containing 4 per cent. of free sulphuric anhydride. When no further increase in the blue colour formed can be observed, the melt is poured on to ice, and the Indigo sulphonic acid is salted out.—T. A. L.

Indigo Leuco Compounds and other Indigo Products; Impts. in the Manufacture and Production of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 23,123A, Nov. 20, 1899. (Second Edition.)

IN place of the acidyl derivatives mentioned in the foregoing specification the patentees state that the acetyl-derivative of the dialkyl esters of phenylglycocoll-*o*-carboxylic acid can in the same manner be readily converted into indoxyl compounds (which are easily oxidised to Indigo). For instance, 1 kilo. of the acetyl ester is heated with 5 kilos. of a sodium carbonate solution (8 per cent. Na_2CO_3) until all is dissolved. The solution is then diluted, mixed with 2 kilos. of caustic soda lye (20 per cent. NaOH), and air is blown through the solution, when Indigo separates out.—T. A. L.

New Colouring Matters [Black], and of Products for Use therein; The Manufacture and Production of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 25,288, Dec. 20, 1899. (Second Edition.)

By treating dinitrochlorobenzene with *p*-aminophenol in equimolecular proportions in presence of sodium acetate, it yields *p*-hydroxy-*o*-*p*-dinitrodiphenylamine, and the corresponding derivative can be obtained from *p*-aminophenol-*o*-sulphonic acid. The patentees now find that this compound or its sulphonic acid will condense with a further proportion of dinitrochlorobenzene, yielding a phenol ether or sulphonic acid thereof. The condensation can be effected in one operation, and it is unnecessary to isolate the intermediate compound. These new products, on heating with sulphur and sodium sulphide, yield substantive cotton dyestuffs, giving greenish-black shades. On subsequent treatment with sulphuric acid and bichromate they give bluish-black shades. For example, about 19 kilos. of *p*-aminophenol-*o*-sulphonic acid and 5·5 kilos. of calcined soda are dissolved in 140 litres of water, mixed with 10·5 kilos. of calcined soda and 41 kilos. of dinitrochlorobenzene, and cohobated for about three hours, until the latter product has practically disappeared. The product of the reaction separates out on cooling as sodium salt in brilliant light yellow flakes, and may be recrystallised from water or alcohol. For the preparation of a dyestuff, about 40 kilos. of this sodium salt of *p*-dinitrophenoxy-*o*-*p*-dinitrodiphenylamine-*m*-sulphonic acid, 80 kilos. of sulphur, and 200 kilos. of crystallised sodium sulphide are heated together in an iron vessel provided with an agitator to 140° C. When the melt becomes solid at this temperature it is allowed to cool, and the mass is powdered, when it can be employed directly for dyeing. It dissolves readily in water to a bluish-green solution, from which the dyestuff can be precipitated by salt or ammonium chloride, whilst hydrochloric acid yields a yellowish-brown flocculent precipitate. The dyestuff gives greenish-black shades on unmordanted cotton fast to acids, alkalis, and soap. When the dyed fabrics are treated with bichromate and sulphuric acid, bluish-black shades are obtained fast to soap, chlorine, and sulphur. A further series of condensation products is also claimed, resulting in the formation of other nitrated phenol ethers by treating *p*-hydroxy-*o*-*p*-dinitrodiphenylamine with *o*-nitrochlorobenzene-*p*-sulphonic acid or with *p*-nitrochlorobenzene-*o*-sulphonic acid.—T. A. L.

Black Colouring Matter; Manufacture and Production of New ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 890, Jan. 15, 1900. (Second Edition.)

ACCORDING to Eng. Pat. 3828 of 1894 (this Journal, 1895, 147), a process is described for obtaining Naphthazarin or Alizarin Black from 1.1′-dinitronaphthalene. In the present specification the same initial material is employed for the production of a new black dyestuff differing from Naphthazarin. The method consists in treating 1.1′-dinitronaphthalene in concentrated sulphuric acid at a high temperature with sulphuretted hydrogen or with sulphides. A Naphthazarin intermediate product is formed during this operation, which is converted into the new dyestuff. It can be rendered more soluble by treatment with sulphites or bisulphites, and in this condition can be used with a chromium acetate mordant for printing cotton fabrics, giving grey to deep black lakes. The new dyestuff can be produced at a price to replace logwood. About 100 kilos. of 1.1′-dinitronaphthalene are dissolved in 1,000 to 2,000 kilos. of sulphuric acid (96 per cent. H_2SO_4) at 130° C. A current of sulphuretted hydrogen is then passed through the solution until no unaltered dinitronaphthalene remains, which usually takes from 6—8 hours. After cooling, the melt is poured into 500 litres of water, boiled, and filtered. The residue contains some Naphthazarin, which can be removed by means of a solution of alum. The product dyes unmordanted wool violet-black, which becomes deep black on subsequent treatment with a chrome salt. In order to obtain the more soluble bisulphite compound, 200 kilos. of a 25 per cent. paste of the new dyestuff and 75 kilos. of sodium bisulphite solution (40 per cent. $NaHSO_3$) are heated from 4—6 hours at 95° C. The paste so obtained is standardised by adding water. The product is completely soluble in boiling water, and can be used for cotton printing.—T. A. L.

New Azo Colouring Matter [Red], and Lakes therefrom; The Manufacture and Production of ——. B. Willcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 25,511, Dec. 23, 1899. (Second Edition.)

HITHERTO 2.1-naphthylamine sulphonic acid has found no technical application. It has, however, been discovered that when diazotised and combined with β-naphthol it yields a dyestuff which even in the form of its alkali salts is almost insoluble in cold water and very sparingly soluble in hot water. This property renders it a valuable product for the preparation of lakes. For example, a paste containing 1·1 kilo. of the sodium salt in 100 litres of water is mixed with a solution of 1 kilo. of crystallised barium chloride in 10 litres of water. After boiling, 100 kilos. of an aluminium hydroxide paste (containing 2½ per cent. of aluminium hydroxide) are added, and the lake is filtered off, washed, and dried.—T. A. L.

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Azo Colouring Matters [Yellow], and Materials for Use therein; The Manufacture and Production of New ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 1227, Jan. 19, 1900. (Second Edition.)

THE specification relates to the production of a new nitro-*m*-phenylene diamine sulphonic acid by sulphonating and nitrating *m*-dichlorobenzene in one operation. The product so obtained is treated with ammonia under pressure, yielding the new derivative, which, when combined with diazotised Primuline, gives a yellow dyestuff fast to washing, acid, and chlorine. About 1,500 grms. of *m*-dichlorobenzene are stirred into 4,150 grms. of fuming sulphuric acid (23 per cent. free SO_3) at a temperature below 70° C. The melt is then heated for two hours on the boiling water-bath, until a sample dissolves to a clear solution in water. After cooling to the ordinary temperature, a mixture of 2,050 grms. of fuming sulphuric acid (13 per cent. free SO_3) and 725 grms. of nitric acid (94 per cent. HNO_3) is added with constant agitation. The temperature rises to 70°—80° C., and the reaction is completed by heating for about two hours on the water-bath. The melt is then cooled and diluted with 10 litres of water, and the aqueous solution is treated with potassium chloride, which precipitates the potassium salt. About 350 grms. of this salt and 1,200 grms. of ammonia (30 per cent. NH_3) are heated in an autoclave to 150° C. for about six hours. On cooling, long reddish-yellow crystals of the potassium nitro-*m*-phenylene diamine sulphonate separate out. The free acid crystallises in silky yellowish needles. For the preparation of a dyestuff, about 66 grms. of Primuline are dissolved in 2 litres of boiling water. About 7 grms. of sodium nitrite are added, and the solution, when cold, is run into 43 grms. of hydrochloric acid (37 per cent. HCl) and 150 c.c. of water. When the diazotisation is complete, the diazo compound is run into a solution of 25 grms. of the new nitro-*m*-phenylene diamine sulphonic acid in 750 c.c. of water kept alkaline by means of sodium carbonate. The mixture is then heated to 60°—65° C. until a clear solution is obtained, which requires from 4—5 hours. The new dyestuff is ultimately salted out, filter-pressed, and dried. The product so obtained is readily soluble in water, and dyes brilliant yellow shades showing great fastness to washing, acids, and chlorine.—T. A. L.

Colouring Matters; Manufacture and Production of Products Useful in the Manufacture of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 1387, Jan. 22, 1900.

THE action of certain sulphites—preferably bisulphites—on certain aromatic hydroxy and amino compounds, especially those of the naphthalene series, yields characteristic products, apparently ester-like compounds of hydroxyl derivatives with sulphurous acid. These substances, compared with the corresponding free naphthols or other naphthalene derivatives from which they are obtained, are more easily soluble in water. Those of the monohydroxy derivatives do not combine with diazo or tetrazo compounds, whilst the dihydroxy and aminohydroxy derivatives still possess this property, although in a less degree than the dihydroxy naphthalenes and aminonaphthols themselves. Certain of the aminonaphthol esters can be diazotised and employed for the manufacture of azo dyestuffs. The esters in general are tolerably stable to dilute hydrochloric and sulphuric acids. They are, however, hydrolysed by heating with concentrated sulphuric acid, solutions of the fixed alkalis, alkaline earths, and the like, yielding the corresponding hydroxy compounds. By heating with ammonia they are converted into amino derivatives. Hence it is possible, by employing this invention, to pass from hydroxy to amino compounds, and, on the other hand, from certain amino to certain hydroxy derivatives. The patentees, however, disclaim the process described in Eng. Pat. 16,807 of 1899 (this Journal, 1900, 732). The α-naphthol and α-naphthylamine derivatives with a free ortho and meta position, and β-naphthol or β-naphthylamine derivatives with a free *m*-position, are most readily acted upon, and certain rules hold good with regard to the di-derivatives. Of the benzene compounds those most suitable are *m*-derivatives, such as resorcinol, *m*-phenylene diamine, *m*-aminophenol, and the like. For example, in order to obtain the sulphurous acid ester of a naphthol sulphonic acid, 246 grms. of 1.4-naphthol sulphonic acid and 1 kilo. of bisulphite (40 per cent. $NaHSO_3$) are heated on the water-bath for one hour, until a test portion, after acidifying with hydrochloric acid and driving off the sulphurous acid, contains only a small quantity of the initial material. The whole melt is then treated in a similar manner, yielding a solution of the easily soluble sulphurous ester of 1.4-naphthol sulphonic acid. On heating with ammonia it is converted into naphthionic acid. As an example of the conversion of a naphthol into a naphthylamine, 144 grms. of β-naphthol, 116 grms. of ammonium sulphite $[(NH_4)_2SO_3]$, 500 c.c. of water, and 120 grms. of ammonia solution (20 per cent. NH_3) are heated together in a closed vessel, with agitation, to 100°—150° C. until all the β-naphthol has disappeared. The β-naphthylamine, which separates out, is then filtered off, and the mother-liquor is employed for a subsequent operation. For the purpose of obtaining *m*-aminophenol from resorcinol, 110 grms. of resorcinol, 116 grms. of ammonium sulphite, 500 c.c. of water, and 100 grms. of ammonia solution are heated at 100°—125° C. until the resorcinol has practically disappeared. The aminophenol formed is extracted, and purified by shaking its acid and caustic alkaline solution respectively with ether. If in this example the ammonia solution be increased to 250 grms. and the temperature be maintained at 125°—150° C. until the whole of the resorcinol has practically disappeared, the product of the reaction is *m*-phenylene diamine. In this case it is necessary to boil the solution resulting from the reaction with sulphuric acid in slight excess until free from sulphurous acid, and to filter from any insoluble matter. Any aminophenol formed may be removed.

—T. A. L.

Anthraquinone Dyestuffs; Manufacture or Production of New ——. H. E. Newton, London. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 23,637, Nov. 27, 1899.

BY treating mono- or diamino-anthraquinone sulphonic acids or their hydroxy derivatives with benzyl chloride they are converted into benzylated products of great technical value. The new products dye unmordanted wool from acid baths bluer or greener shades than the original materials. For instance, a solution of 10 kilos. of diamino-anthrarufin disulphonic acid (Eng. Pat. 12,011 of 1897; this Journal, 1898, 572) in 500 litres of hot water has slowly added to it, at 80°—90° C., 8 kilos. of benzyl chloride with constant agitation. The temperature is maintained until a sample dissolved in concentrated sulphuric acid and mixed with boric acid no longer exhibits the characteristic absorption spectrum of the boric ether of diamino-anthrarufin disulphonic acid. The new dyestuff is precipitated by cooling and adding concentrated brine. It forms, when dry, a blue powder soluble with a blue colour in water, and is precipitated unchanged by adding hydrochloric acid. It dissolves with a yellow colour in concentrated sulphuric acid, which turns green on adding boric acid. The new dyestuff gives bright blue shades on unmordanted wool from an acid bath, and greenish-blue shades on chrome-mordanted wool.

—T. A. L.

Indazol, and Dyestuffs [Brown] therefrom; Production of Derivatives of ——. R. B. Ransford, Norwood. From L. Cassella and Co., Frankfort-on-the-Maine, Germany. Eng. Pat. 23,657, Nov. 27, 1899.

THE amino-indazol obtained from nitrotoluidine—

$$(CH_3 : NH_2 : NO_2 = 1 : 2 : 4)$$

readily condenses with dinitrochlorobenzene—

$$(NO_2 : NO_2 : Cl = 1 : 3 : 4)$$

yielding a new indazol derivative, which may be used directly or after further nitration, for the production of dyestuffs by heating with sulphur and alkaline sulphides. For example, 13·3 kilos. of amino-indazol, 20·3 kilos. of dinitrochloro-

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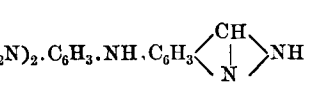
benzene, and 25 kilos. of sodium acetate are boiled together in dilute alcohol for several hours. The alcohol is then distilled off, and the dinitrophenylamino-indazol—



separates as a brown powder. After recrystallisation from alcohol it forms reddish-brown crystals melting at 261° C. In order to convert it into a dyestuff, 15 kilos. of the product are heated with 30 kilos. of sulphur and 75 kilos. of sodium sulphide for several hours to about 130° C. The melt may be used directly for dyeing, and the product gives olive shades on cotton from a bath containing salt and sodium sulphide. A brown dyestuff is formed if the dinitrophenylamino-indazol be treated in sulphuric acid solution with nitro sulphuric acid before heating with sulphur and sodium sulphide.—T. A. L.

Colouring Matters [Brown]; Impts. in the Manufacture of ——. R. B. Ransford, Norwood. From L. Cassella and Co., Frankfort-on-the-Maine, Germany. Eng. Pat. 25,754, Dec. 30, 1899.

On heating the dinitro-oxydiphenylamine obtained from 1.3.4 - dinitrochlorobenzene and 1.4 - aminophenol with caustic alkalis in aqueous solution, it is transformed into a brown dyestuff which differs considerably from the initial material, since this latter, on heating with sulphur and alkaline sulphides, yields Immedial Black, whilst the transformed product when similarly treated glives a characteristic yellowish brown dyestuff. The dinitrophenyoxytolylamine from dinitrochlorobenzene and amino-*o*-cresol behaves in the same way. For instance, 40 kilos. of dinitro-oxydiphenylamine are dissolved in 80 kilos. of caustic soda lye (40° B.) and 240 litres of water, and boiled for 3—4 hours until no more ammonia is evolved. After diluting, the new product is precipitated with hydrochloric acid, and forms, when dry, a black amorphous powder. It dissolves readily in presence of alkalis, and dyes unmordanted cotton intense brown shades. 25 kilos. of the substance, 52 kilos. of sodium sulphide, and 13 kilos. of sulphur, together with a little water, are gradually heated to 160° C. and maintained at this temperature until the melt becomes solid. It can be used directly for dyeing, and dissolves readily in water, giving intense yellowish-brown shades on cotton from a warm bath containing salt. A subsequent chromate treatment turns the shade yellower and increases the fastness.

—T. A. L.

Blue Mordant Dyestuffs of the Anthraquinone Series; Manufacture of ——. O. Imray, London. From The Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 24,954, Dec. 15, 1899.

According to Ger. Pat. 6526 (lapsed), sulphonic acids are obtained by the action of fuming sulphuric acid on dinitroanthraquinone or its reduction products, but these acids are practically valueless. A method is described in Ger. Pat. 75,490 by which they are heated with dilute alkalis under moderate pressure, when they yield blue mordant dyestuffs soluble in water. In the present specification this method is further improved by heating the products of Ger. Pat. 6526 in the form of their lime lakes with aqueous alkalis, with or without the presence of an oxidising agent, such as saltpetre, until they become insoluble in water. Under these conditions the sulphonic acid groups are removed, and the amino groups are replaced by hydroxyl. A mixture of 100 grms. of the product of Ger. Pat. 6526, 50 grms. of lime, 100 grms. of sodium hydroxide, 20 grms. of saltpetre, and 3 litres of water is heated in a closed vessel provided with an agitator for about 20 hours to 180° C., until a sample, when treated with hydrochloric acid, yields an insoluble dyestuff. The whole melt is then boiled with dilute hydrochloric acid, and the hexahydroxyanthraquinones are filtered off. When dissolved in dilute sodium carbonate or alkali, or by washing with sulphuric acid, these products yield pure blue mordant dyestuffs.—T. A. L.

Blue-Violet Dyestuffs; Manufacture of ——. O. Imray, London. From The Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 1761, Jan. 27, 1900.

Dyestuffs of the *o*-tolyldiphenylmethane series are obtained, according to this invention, from dibenzyl-*m*-toluidine. The products formed differ from those obtained from dibenzylaniline in being faster to alkali and bluer in shade. The dyestuffs are obtained either by oxidising the leuco-sulphonic acids of dibenzylamino-*o*-tolyltetramethyl- (or ethyl-) diaminodiphenylmethane, or by sulphonating the basic dyestuffs of the above-mentioned *o*-tolyldiphenylmethane derivatives. The leuco-sulphonic acids may be obtained by condensing tetramethyl- (or ethyl-) diaminodiphenylcarbinol with *m*-toluidine (Ger. Pat. 27,032), benzylating, and then sulphonating with fuming sulphuric acid (25 per cent. SO_3); secondly, by condensing the said diphenylcarbinols with dibenzyl-*m*-toluidine, and then sulphonating; or, thirdly, by condensing the diphenylcarbinols with dibenzyl-*m*-toluidine disulphonic acid (Ger. Pat. 69,654). The basic dyestuffs employed for sulphonation may be obtained by condensing the above-mentioned carbinols with dibenzyl-*m*-toluidine and subsequent oxidation (Ger. Pat. 27,032), or by direct oxidation of the ketone corresponding to the said carbinols with dibenzyl-*m*-toluidine (Ger. Pat. 27,789). *Dibenzyl-m-toluidine* is readily obtained by adding a slight excess of benzylchloride to a hot mixture of *m*-toluidine and a concentrated solution of sodium carbonate. When the reaction is complete, the excess of benzyl chloride is driven off with steam, leaving dibenzyl-*m*-toluidine as a thick oil, which crystallises on cooling. On recrystallisation from alcohol, it melts at 72° C. Its disulphonic acid is formed by treating the base, dissolved in sulphuric acid monohydrate, with fuming sulphuric acid (25 per cent. SO_3). The acid yields salts readily soluble in water, which may be separated and purified in the usual manner. For the production of a dyestuff, the leuco-sulphonic acid of dibenzylamino-*o*-tolyltetramethyldiaminodiphenylmethane, obtained according to one of the methods instanced above, is dissolved in water in the form of its sodium salt. To this solution, made acid, is added, with constant agitation, the calculated quantity of lead peroxide paste. After making alkaline the solution is filtered hot, and the dyestuff is precipitated by adding salt to the filtrate at about 50° C. The product dyes wool bluish-violet shades.—T. A. L.

Indigo into an easily Reducible Form in Paste and in Powder; Process for transforming difficultly Reducible Crystalline ——. T. R. Shillito, London. From J. R. Geigy and Co., Basle, Switzerland. Eng. Pat. 1293, Jan. 20, 1900.

In some of the technical processes for the production of artificial Indigo, the product is obtained in a crystalline condition, which can only be reduced in the vat with difficulty. By dissolving such Indigo in cold concentrated sulphuric acid, it can be precipitated unchanged by adding water at a low temperature, and it is then in such a condition that the addition of a sufficient quantity of hydrosulphite reduces it in a few minutes to Indigo White, the operation being conducted out of contact with air. One kilo. of crystalline Indigo is slowly stirred into 4 kilos. of well-cooled concentrated sulphuric acid. After a short time the green paste is poured on to water and ice. The Indigo is precipitated in an exceedingly fine condition, and, after filtering and washing, may be at once employed for dyeing purposes. It still remains easily reducible after drying and grinding. (See also Eng. Pat. 23,122 of 1899; this Journal, 1900, 1009.)—T. A. L.

Orange-Yellow Dyestuffs belonging to the Acridine Series; Manufacture of ——. C. D. Abel, London. From The Actiengesellschaft für Anilinfabrikation, Berlin, Germany. Eng. Pat. 1820, Jan. 29, 1900.

New orange dyestuffs of the acridine series are obtained by alkylating the naphthacridine derivatives described in Eng. Pat. 16,474 of 1898 (this Journal, 1899, 826). The alkylation can be effected by heating with alkyl haloids or

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with alcohols and mineral acids. For instance, 10 kilos. of aminotolunaphthacridine, 24 kilos. of methyl alcohol, and 12 kilos. of concentrated hydrochloric acid are heated under pressure for several hours at 160°—170° C. After cooling, the excess of alcohol is distilled off, the residue is dissolved in water, and the dyestuff is salted out. It forms an orange powder, very easily soluble in hot water to an orange-yellow solution exhibiting, when dilute, a yellowish-green fluorescence. The solution is precipitated by adding sodium carbonate, caustic alkali lye, or ammonia. This base is scarcely soluble in water or benzene, but dissolves readily in alcohol or ether, and the solutions have a similar yellowish-green fluorescence. The dyestuff gives orange-yellow shades on tannin-mordanted cotton.—T. A. L.

Black Colouring Matter directly Dyeing Cotton; Manufacture of a ——. C. D. Abel, London. From The Actiengesellschaft für Anilinfabrikation, Berlin, Germany. Eng. Pat. 2531, Feb. 8, 1900.

DINITRO-CHLORO-OXYDIPHENYLAMINE, having the formula [1,3,4], $(NO_2)_2 . C_6H_3 . NH . C_6H_3 . (OH) . Cl$, 1.2.4, when heated with sulphur and alkaline sulphides, yields a black cotton dyestuff. For the manufacture of the initial product, 15 kilos. of *o*-amino-*p*-chlorophenol are dissolved in 750 litres of hot water, mixed with 11 kilos. of sodium carbonate and 20·5 kilos. of dinitrochlorobenzene, the whole being then boiled for several hours. On cooling, the condensation product separates in red needles. In order to obtain the dyestuff, 50 kilos. of sodium sulphide, 20 kilos. of sulphur, and 15 litres of water are heated together, and 10 kilos. of the dinitro-chloro-oxydiphenylamine, produced as above, are added at about 80° C. The temperature is then raised and maintained for several hours at 140°–150° C. The heating is then continued at a somewhat higher temperature until the melt is quite dry and may be powdered, or else the mass is dissolved in water and the dyestuff precipitated from the aqueous solution by a mineral acid or by means of a current of air. The product so obtained readily dissolves in a dilute sodium sulphide solution, with an intense bluish-green coloration.—T. A. L.

Extraction; Method or Process of ——. P. Gulden, Leipsic, Germany. Eng. Pat. 16,716, Sept. 19, 1900.

AN improvement in the method of extracting dyeing and tanning materials, fruits, leather, &c., which consists in carrying out the extraction and the evaporation simultaneously and *in vacuo*. The material to be extracted is placed in the digesters, together with a suitable quantity of the liquid solvent to be employed. The mixture is then heated, by means of steam coils or other suitable method, to a temperature not exceeding 60° C. At the same time a vacuum is obtained by means of an air-pump. Thus the surplus liquor is evaporated *in vacuo* after having penetrated the material under treatment, the juices thus obtained being allowed to pass over from one digester to another filled with new material until sufficiently concentrated.—M. C. L.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Yarn and Cloth Testing Machines. G. R. Smith, Ossett, near Leeds. Proc. New England Cotton Manufacturers' Assoc., Washington Meeting, No. 69, Oct. 1900.

THE author has designed four machines which are suitable for testing any textile fibre, either as yarn or cloth. All the machines consist essentially of a beam which is balanced by suitable means before introducing the yarn or cloth to be tested.

The beam is provided with a jaw to fix one end of the yarn or cloth, the other end of the material being attached to another jaw, which is placed at a suitable distance away and connected with an arrangement which is moved by clockwork. When the material under test is stretched by the motion of this clockwork arrangement, the beam is tilted upwards sufficiently to allow water to flow into a graduated cylinder placed at one end of the beam; equilibrium is thus restored, and this action continues until the material breaks.

The amount of water in the cylinder is a measure of the tension to which the material under test has been subjected. —J. E. H.

Impregnation of Fibrous Materials with Substances of Low Melting Point; Process for the ——. J. Rudolf. Leipziger Färber- u. Zeugdr.-Zeit. 1900, **49**, [12], 496.

THE two methods hitherto employed for waterproofing fabrics with paraffin, stearates, or wax are: (1) A hot roller is made to rotate in contact with the solid substance and the fibrous material is then led over this roller; (2) The paraffin, &c. is dissolved in benzene or petroleum spirit and the material steeped in the solution.

According to the new process (Ger. Pat. 1900, 112,943), the substance is emulsified in water by means of a centrifugal machine. Paraffin, ozokerite, vegetable wax, beeswax, and stearine or palmitine and their metallic compounds are the waterproofing substances employed; one of these is melted and revolved in a heated centrifugal machine with boiling water, by which treatment it becomes so finely-divided that it will remain suspended for a long period without separation.

The goods are impregnated with the emulsion and in the drying process which follows the water evaporates, and the emulsified substance melts and penetrates the fabric, thus rendering it waterproof. Only small quantities of the substance are required, and the appearance of the fabric is not affected.—R. B. B.

Cuprammonium Solutions; Preparation of ——. M. Fremery, E. Bronnert, and J. Urban. Amer. Pat. 658,632, Sept. 25, 1900. Chem. Zeit. 1900, **24**, [83], 906.

A MIXTURE of copper and 16 per cent. ammonia solution is treated with air, the temperature being maintained below 5° C.—A. S.

Artificial Leather; Process for the Manufacture of ——. Leipziger Färber- u. Zeugdr.-Zeit.

See under XIV., *page* 52.

PATENTS.

Fibre applicable to all sorts of Weaving and Spinning, and Processes for the Treatment or Separation of Same; Improved ——. G. C. Dymond, Liverpool. From L. Cruz-Pasqual-de-Bonanza, J. Selva-Javaloyes, Diego Quilez-Quilez, M. Gomez-Valdivia, and A. Alonso-Blasco, Elche, Alicante, Spain. Eng. Pat. 16,811, Aug. 18, 1899.

THE fibre from palm limbs is extracted in three ways. (1) The limbs are digested for five hours in boiling water or soda-lye (sp. gr. 1·045) at 90° C., and then passed, when dried, through rollers to squeeze out gummy matters. The fibres are then treated in the usual way to prepare them for spinning, &c. (2) The chemical method consists in first drying the limb, and then digesting it for 48 hours in soda-lye of 8° B. The fibres are now separable, and are washed well with water for 24 hours and then treated with a mixture of equal parts of cocoanut-oil and colophony. They are then treated for four hours in a bath of dilute sulphuric acid of 5° B. (3) The third process consists in first combing or hackling the limb and afterwards digesting in soda-lye.—C. M.

Retting or Steeping Flax; Method of and Apparatus for ——. A. Badoil, Marseille. Eng. Pat. 20,907, Oct. 19 1899. (Foreign Application, April 15, 1899.)

BUNDLES of flax are placed in a series of tanks, which latter are divided into compartments, horizontally and vertically. The horizontal divisions are made by perforated grid-plates. Each division is arranged so that a cage can fit into it. The whole is covered by a non-perforated plate and a lid. The bundles are first digested in a soap solution at 70° to 80° C. for two hours, 8 kilos. of soap to 100 kilos. of stalks is the proportion. The fibres are then removed, passed through fluted rollers and then digested with hydrochloric acid solution (3 litres of acid to 30 litres of water for each 100 kilos. of stalks) at 60° C. for one hour. After draining and

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washing, the stalks are bleached in a solution obtained by mixing 10 kilos. of chloride of lime, and 10 kilos. of sodium carbonate in 1,000 litres of water, this process being carried on at 30° C. for three hours. The flax is afterwards washed well with water, and dried in a hydro-extractor.
—C. M.

Mercerising, Scouring, or Dyeing Yarns; Apparatus for ——. W. Macconel, Netherlee, Renfrewshire. Eng. Pat. 1736, Jan. 27, 1900.

An apparatus consisting of a series of tanks containing the various liquids and an overhead rail. This rail is undulated, and carries on frames the yarn to be treated. As the pulley travels, the yarn dips alternately into the liquids, and is then raised to clear the tank before going on to the next.

The frames are arranged so that the yarn may either be stretched or remain unstretched.—C. M.

Textile Fabrics; Manufacture of ——. E. Marty, Riberac, France. Eng. Pat. 13,084, July 20, 1900.

Fabrics are made by spinning camels' hair, and then weaving alone or weaving with other materials, such as cotton, hemp, &c., according to the quality required. It is claimed that fabrics made with camels' hair resist heat, water, sugar, acids, &c.—C. M.

Impermeable Threads and Fabrics; Production of ——. W. G. Heys, Manchester. From E. Sénéchal de la Grange, Paris. Eng. Pat. 16,332, Sept. 14, 1900.

It is claimed that the following mixture can be made into perfect threads by any process by which artificial silk is made:—100 kilos. of dry nitrated cellulose is mixed with 15 kilos. of indiarubber solution, and 5 kilos. of stannous chloride.—C. M.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, AND BLEACHING.

Stains and Unevenness in Dyed Woollen Tissues; Some Causes of ——. G. Robrecht. Färber-Zeit. 1900, **11**, [22], 349—352.

Stains and cloudy patches in woollen tissues are sometimes caused by imperfect wetting-out of the latter when they have been sent into the dyehouse in the dry state. The tissues should be passed through boiling water to ensure complete saturation before being dyed. Tissues which are received in the dyehouse in the wet state are better not so treated, provided that they have been well washed after milling, as the water is apt to produce stains in them. This is especially the case when pale colours are dyed.

Unevenness in dyeing is often caused by defective construction and defective heating of the dyeing machines. Stains are due to dirty dye vessels and winches, dirty barrows or trucks (used in carrying the pieces to and from the dyehouse), soot from the works' chimneys, rusty iron nails (wooden pegs should be used) in the winches, resin in the wood of new dyeing machines, frothy dye-liquors, scum on the surface of the dyebath (frequently from the dyestuffs), oil drops from overhead shafting, dyestuff-dust blown about the dyehouse by draughts of air (due to faulty arrangement of the dyehouse), presence in the tissue of oxalic acid left after removing iron stains, drops from the roof or overhead beams (the last is a prolific source of stains).

In removing stains, not only the stained part, but the tissue for some distance about it, should be treated. The reagent, for instance, soap, must also be thoroughly removed before dyeing or redyeing.—E. B.

Aniline Black, over-dyed with Basic Dyestuffs; The Bronzing of ——. F. A. Roesler and H. Hackl. Färber-Zeit. 1900, **11**, [22], 357—358.

The bronze-like appearance of Aniline Black, which has been printed upon cotton tissues and dyed over or "topped" with basic dyestuffs, is principally due to the colour-lakes being superficially deposited upon the printed parts, but is partly due to the nature of the Aniline Black and of the dyestuff employed. The defect is strongly shown with Magenta, Methyl Violet, Crystal Violet, Victoria Blue, and Brilliant Green, less so with Methylene Blue, New Methylene Blue, Capri Blue, Nile Blue, Safranine, and Methylene Violet 3 R A extra. To prevent it to some extent, the following method of dyeing is recommended:—Mordant the printed tissue with an acetic acid solution of tannic acid, fix with tartar emetic, thoroughly rinse to remove the imperfectly fixed mordant, dye for some time in the cold with the basic dyestuff, next raise the temperature to 38° C., and maintain this temperature till the bath is exhausted, then add acetic acid and carry the temperature to the boiling point. The tissue is afterwards well washed and dried. Dyeing at the ordinary temperature has the effect of causing the dyestuff chiefly to become fixed upon the unprinted parts of the tissue. The object of the addition of acetic acid, and of the boiling of the dyebath, is to remove the loosely fixed colour-lake.—E. B.

Unions with Diamine Dyestuffs; Dyeing of ——. W. E. Fearnsides. J. Soc. Dyers and Colourists, **16**, [12], 258—263.

For drabs, fawns, &c., Diamine Catechin B is an ideal dyestuff, being fast to light, stoving and hot-pressing; in conjunction with Diamine Fast Yellow B and Diaminogene B, varied shades are obtained, which are level and fast to light.

In the dyeing of light shades, it is important to keep on the light side of the pattern, since, if the shade be too dark, it is very difficult to strip the wool, which indeed can only be done effectively by means of potassium permanganate and sodium bisulphite.

Again, in dyeing shoddy unions which have been stripped with potassium bichromate and sulphuric acid, it is best to neutralise the goods thoroughly with alkali previous to dyeing, otherwise uneven results will be obtained.

Dress goods and crépons containing mercerised cotton, are dyed with less sodium sulphate than usual, the material being entered into the dye-bath at or near the boil, and the boiling continued during the whole of the dyeing process in order to cover the wool. (The ordinary process consists in dyeing for a considerable time below the boil.) In this connection, avoid dyestuffs which have a greater affinity for cotton than wool. In the case of dark shades, the mercerised cotton has a tendency to dry up "bronzy," but this appearance can be removed by running the goods for 15 minutes in a fresh hot bath containing sodium sulphate. In all cases, the addition of a small amount of acetic acid in washing is recommended.

Two-coloured ("shot") effects upon crépons are obtained by dyeing the wool with acid dyestuffs, washing and dyeing the cotton in a cold concentrated bath containing sodium sulphate and carbonate and substantive dyestuffs; Diamine Black R M W, Diamine Black B H, Diamine Sky Blue, Diamine Fast Yellow A, and Diamine Orange D, are largely used in this connection.

However, where the cotton is to be dyed black, the following process is employed:—Dye the cotton with Diamine Black B H at 100° F. (if higher temperature, the wool will be stained), diazotise and develop with phenylene diamine, and finally dye the wool in acid bath.

Quite recently a new method of dyeing, by a combination of the dyeing and milling process, has been adopted, chiefly for the production of black. A full black is obtained by adding 1—1½ per cent. of Milling Black B to the soap solution and milling for at least 60 minutes; the wool, which is only slightly but uniformly tinted, is dyed in acid bath with 2—5 per cent. sulphuric acid, and the boiling is reduced to a minimum in order to diminish the bleeding effect of the cotton.

The addition of sodium sulphate in the milling yields a more intense black, but this advantage is more than counter-balanced by the increased scouring which is necessary to remove the soap in the presence of a salt, and which consequently diminishes the intensity of the black. In all cases, scouring must not be done at a temperature above hand-warmth nor for too long a time.

Generally, most substantive dyestuffs can be applied in the manner described, only they are not fast enough to acids

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to withstand cross-dyeing. However, for mixtures in which the wool has been dyed either in the loose state or as yarn, the cotton is advantageously stained or even dyed to shade, by adding the dyestuff to the soap solution in the milling process; moreover, this procedure is more economical than the older process of dyeing the cotton cold in the washing machine.—J. E. H.

Linen Dyeing; Some Notes on ——. Textile Colorist, **22**, [262], 291—292.

In dyeing with the basic colours, if full shades be required, it is necessary to mordant the linen before dyeing, by steeping it in a solution of tannic acid, varying in strength from 1 lb. for pale shades to 3 lb. for deep shades, allowing the linen to remain in this mordanting solution from 6 to 12 hours, according to the depth of shade required.

When dyeing bright colours, the best tannic acid should be employed; for dark shades, sumach may be used with advantage. After mordanting, the tannin is fixed on the linen fibre by steeping the goods for half an hour in a solution of tartar emetic, the amount employed being equal in weight to that of the tannin used. If only pale shades are required, it is not necessary to mordant the linen before dyeing. The dyeing is best effected by working the goods for 20 minutes in a cold solution of the dyestuff, then gradually raising the temperature to a boil, and finally working the goods for half an hour at this temperature. The goods are then washed in water and dried.

The Rosaniline Blues require the addition of 5—8 lb. of alum to each 100 galls. of the dye-bath, in order to thoroughly fix the dye on the linen fibre, and the temperature of the dye-bath should not exceed 180° F. or the colour is liable to be injured; it is recommended to allow the linen to remain in the bath until the latter has cooled down to 100° F. before removing the goods.

In dyeing with the direct cotton dyes, the most economical results are obtained by making the dye bath as strong as possible, and dyeing at a boil; about 10—20 lb. of Glauber's salt or common salt are added to the dye-bath for each 100 lb. of linen to be dyed. The dye-bath is seldom exhausted of colour; it is therefore economical to retain it for future use, adding from two-fourths to three-fourths of the original amount of dyestuff used for each succeeding lot of goods to be dyed. Some of the direct dyestuffs may be treated with chromium chloride, chromium fluoride, chromium sulphate, potassium bichromate, or copper sulphate, in order to increase the fastness of the colour to washing and light, and in some cases to increase the depth of shade; the quantities recommended are 7—9 oz. for medium shades and 2—3 lb. for deep shades.

Many of the direct dyes may be diazotised and developed after dyeing by treatment in a cold solution of sodium nitrite and hydrochloric acid for 15—20 minutes, using 1—3 lb. of sodium nitrite according to the depth of shade required, together with three times this amount of acid; the goods are now transferred for 15—20 minutes to the developing bath, which contains β-naphthol, resorcinol, phenylene-diamine or some other developer.

The "Sulphyl dyestuffs" are useful for dyeing linen. Among these are the Immedial Blacks, Blues, and Browns, &c., &c. In using these colours the linen is dyed in a very strong dye-bath at a boiling temperature, keeping the goods underneath the surface of the liquor during the dyeing. The dye-bath may be used over again by strengthening it with 50—70 per cent. of the original quantity of the dyestuff used. After dyeing, the excess of liquor is squeezed out of the goods and returned to the dye-bath, the linen being then well washed and treated with a solution of potassium bichromate or copper sulphate in order to develop and fix the colour on the fibre.—M. C. L.

Lactic Acid in Calico Printing; Some Applications of ——. F. Oswald. Bull. Soc. Ind. Mulhouse, Sept.—Oct. 1900, 343—346.

Of the two isomeric modifications of lactic acid, only the α-hydroxypropionic acid is of interest to the calico printer. Its chief value depends on the fact that a solution of considerable strength, *viz.*, 16° B. can be prepared containing the lactates of aluminium, tin, and calcium, whereas it is not possible to prepare any other solution suitable for use in printing containing these three metals in combination with the same acid. The solution is made from 600 grms. of aluminium sulphate, 300 grms. of stannous chloride, 100 grms. of quicklime, and 1,000 grms. of lactic acid, these ingredients are heated together until dissolved, and yield about three litres of solution at 16° B. The printing colour is prepared with starch thickening, olive oil, Alizarin, and the above solution of lactates, or the last may be replaced by aluminium and calcium acetates, stannic oxide, and lactic acid. The colours are considerably brighter than when no lactic acid or lactate is used, and good results are also obtained with Alizarin Orange, Alizarin Bordeaux, &c.

The author's experiments point to the possibility of dyeing a Turkey-Red with only two paddings, the probable sequence of operations being as follows:—Pad with Alizarin and Turkey-Red oil with or without the addition of ammonia, dry, pad in solution of mixed lactates, dry, and steam.

Chromium lactate also possesses features of interest and is best prepared by dissolving chromic oxide in lactic acid. When this is used in printing with Alizarins, the shades are brighter than those obtained with the acetate or nitro-acetate.

Lactic acid is useful in printing basic colours with tannin and tartar emetic, and especially in conjunction with Indulines.

Stannous lactate owing to its reducing properties can serve as a discharge for direct colours. If basic colours are added, coloured discharges are produced, but for a white discharge, stannous chloride is added to the thickened lactic acid. In either case printing of the discharge must be followed by steaming.

Finally, lactic acid may be employed in preparing a thickening to replace "acid starch thickening." For this purpose the starch is heated with water, and while still hot, the lactic acid is added and the mixture cooled.—R. B. B.

Irisamine in Calico-Printing; Application of ——. W. Hofacker. Färber-Zeit. **11**, [21], 337.

Irisamine G (Cassella) is a new dyestuff of the Rhodamine series, and yields brilliant rose shades.

In addition to the usual mode of application with tannic acid and antimony, it may be fixed by means of a salt of chromium oxide (Cr_2O_3), in which case the shades are quite as fast to light and washing, and, if possible, more brilliant, than those obtained with tannic acid.

The fixation with chromium should be especially serviceable for the production of brilliant rose shades in combination with steam colours. The quantity of chromium acetate (18° B.) employed, must not exceed 50—75 c.c. per litre of printing colour.—J. E. H.

Colouring Matters [Blacks on Cotton] on the Fibre; Method for the Detection of Certain ——. Leipziger Färber- u. Zeugdr.-Zeit. 1900, **49**, [12], 487.

To determine whether black cotton has been dyed with the sulphur dyestuffs (Vidal, Immedial, Katigen, Sulphogen colours, &c.), the fibre is boiled with a solution of stannous chloride in hydrochloric acid. A strip of paper moistened with lead acetate solution is held in the steam from the boiling solution, and is coloured brown or black if sulphur colours be present.

Aniline Black is identified by treating the cotton for a short time with cold hydrochloric acid, when fibre and solution both become green. Aniline Black dyed by the one bath process, is distinguished from an oxidation black by the green colour of the ash in the former case, due to the presence of a large amount of chromic oxide; the one bath black also rubs off much more readily than the oxidation black.

In order to ascertain if Direct Blacks have been used in combination with Aniline Black, the cotton is boiled for some time together with white cotton in water containing a little soda; if Direct Blacks are present, the white cotton is stained. Should the dyed cotton bleed very strongly, and the reactions for Aniline and Sulphur Blacks be not given, the colour has been produced by means of direct dyestuffs alone.

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Logwood may be detected by the red colour of solution and fibre when the latter is boiled with dilute sulphuric acid: on neutralising with soda, the red changes to a yellow. By repeated extraction with sulphuric acid, the logwood may be completely removed, and the fibre then tested for the presence of other colouring matters.

If tannic acid has been employed in conjunction with iron, the ash will contain a considerable amount of ferric oxide, and if this is the case, the presence or absence of logwood should also be determined.

Basic colours which are employed for topping or "blooming" blacks on cotton, may be extracted by cold concentrated alcohol, to which a few drops of hydrochloric acid have been added.—R. B. B.

Leather; Dyeing, Staining, and Finishing of ——. M. C. Lamb. Leather Trades' Rev. **33**, [764], 871.

Continental Methods of Dyeing: The Two-Tray Method.—The skins to be dyed are divided into packs—say, for example, four packs. A strong solution of the dyestuff to be used is prepared, a quantity being dissolved sufficient to dye all the skins. This stock liquor is conveniently made up into four times as many pints of dye-liquor as there are packs to be dyed—in this case 16 pints. Two dye-trays are provided similar to English dye-trays, but not so deep, and three separate dye liquors are prepared with hot water, each sufficient to take one pack of skins, the skins being paired flesh to flesh. One of the liquors should contain one pint of the strong stock solution, the second two pints of the same, and the third one quarter of the solution that remains. These liquors may be termed respectively 1, or weak liquor; 2, or medium liquor; and 3, or strong liquor. The first liquor is poured into one of the trays, and a pack of skins worked in it, these being turned, just as is customary in the English tray method. The second, or medium liquor, is placed in the second tray, and the pack of skins is removed from the weak liquor and worked in the medium. By the passing of the pack of skins through the weak liquor, this becomes exhausted of its dye, and may be thrown away, and into the empty tray the strong liquor is poured, and in this strong liquor, the dyeing of the pack of skins is completed.

These two remaining liquors now form the weak and medium liquor for the next pack. The pack of skins is successively passed through the first, and then on to the second, the spent liquor is thrown away, and a fresh liquor is prepared with one-third of the remaining stock solution, poured into the empty tray, and in this strong liquor, the second pack goes through its final working. These two liquors now form the weak and medium liquor for the third pack. To finish this third pack of skins, one-half of the remaining stock liquor is used; and for the finishing of the fourth pack, the remaining stock liquor is put into the bath.

The temperature of the several baths should be between 45° and 50° C., and the packs should be worked in each bath from 5 to 10 minutes.

By the above process each pack of skins goes through three separate baths, commencing with a weak bath, when the skins are naturally greedy for the dye, and finishing with a strong hot liquor, which may be much stronger than the bath used in the ordinary English tray method. This finishing liquor produces a fullness and evenness of shade unobtainable by the English process, and the method is extremely economical in the use of dyestuffs.

The Dip Method.—A wooden vat or tray, 3 ft. in length, $1\frac{1}{2}$ ft. in width, and 1 ft. deep, is tilted up lengthwise at an angle of about 45°, so that the dye liquor in the tray runs to its lower end. The skins to be dyed are paired, and are dyed pair by pair. About half the quantity of the concentrated dye solution usually required to dye a pair of skins is placed in the tray, together with hot water enough to make $1\frac{1}{2}$ gall. The skins are worked up and down five or six times, being lifted out of the liquor each time. The remainder of the concentrated dye solution is now added, and the process repeated until the requisite depth of shade is acquired.

By this process only one pair of skins is dyed at a time, consequently, out of a pack of about four dozen skins at least half a dozen shades can be sorted out.

This method, usually adopted on the Continent, even ignoring its other disadvantages, is quite unsuitable for this country on account of the great amount of labour required for it, and the quantity of dyestuff wasted.

—J. G. P.

PATENTS.

Sulphur Dyestuffs; Method of Dyeing with ——. O. Imray, London. From The Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main. Eng. Pat. 24,455, Dec. 8, 1899.

In this patent the application of the sulphur dyestuffs is described, after the manner employed in the hydrosulphite indigo vat, by first transforming them by means of hydrosulphites into their leuco derivatives, then dyeing with them in this form, and finally developing the colour by oxidation. The method of carrying out the process is exactly the same as with indigo, and indigo may be used in combination with the sulphur colours in this way. Other indigo vats, *e.g.*, the lime and copperas vat, do not give similar useful results. The oxidation may be brought about either by exposure to air or by treatment with metallic salts or other oxidising agents.

Among the most suitable dyestuffs for this vat-dyeing process are Immedial Blue C, Immedial Black G, and V extra, Katigen Blue, Vidal Black, Clayton Fast Black D, and the dyestuffs obtained according to Eng. Pat. 24,538, of 1898 (this Journal, 1899, 1012).—R. B. B.

Dyeing or Printing with Azo Colouring Matters; Process for the Production of Grounds on Cotton in ——. T. R. Shillito, London. From J. R. Geigy and Co., Basle, Switzerland. Eng. Pat. 25,618, Dec. 28, 1899.

In the production of grounds for azo-colours, *e.g.*, Paranitraniline Red, on the cotton fibre by means of phenols, naphthols, and their derivatives, a rosin soap, made from rosin and alkali, is added to the padding solution instead of Turkey-red oil, olive oil, or any of the additions hitherto employed. Or, the rosin soap may be separately applied previous to the application of the grounding solution.

—R. B. B.

Discharging Indigo-dyed Silk Goods; Impts. in ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen a/Rhein, Germany. Eng. Pat. 2689, Feb. 10, 1900.

The Indigo-dyed silk goods are first discharged in the usual or any suitable manner, *e.g.*, with bichromate followed by sulphuric and oxalic acids, and subsequently submitted to the bleaching action of reducing or oxidising agents, such as sulphurous acid, in the gaseous or liquid condition, or as bisulphite, hydrogen peroxide, or other bleaching agent.

—R. B. B.

Dyeing, Bleaching, and other Liquids and Gases, through the Materia contained therein; Sliver Cans or Receptacles to Permit of the Circulation of ——. H. Honegger, Duisburg a/Rhein, Germany. Eng. Pat. 7214, April 18, 1900.

Cans for the reception of slivers during the bleaching and dyeing processes, &c. are furnished with a removable perforated cover, a perforated false bottom, and a solid real bottom with a hollow seating. This seating fits on a projecting hollow pin attached to the false bottom of the vessel containing the dye or other liquor, and the liquor is made to circulate through the slivers from below, returning to the outer vessel through the perforated lid of the sliver cans.

For the purpose of making the can in a smaller and more convenient form, it may be composed of two parts, the upper of which is a removable extension of the lower or actual can, and serves as a guiding arrangement when the slivers are laid on the drawing frame, as well as when they are compressed by the movable cover.—R. B. B.


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VII.—ACIDS, ALKALIS, AND SALTS.

Potassium Chlorate; Electrolytic ——. A. Brochet. Ind. Electrochim. 1900, **4**, 41—43. Through Science Abstr. **3**, [11], 893.

CONTINUING previous investigations the author now concludes that in cold and only slightly alkaline or acid solutions of potassium chloride, the only primary electrolytic product is hypochlorite, the reduction of which can be prevented by adding bichromate as proposed by Müller, some of this hypochlorite is then oxidised to chlorate in a manner not yet ascertained, but probably in part through the agency of bichromate, as there seems to be no electrolysis of water. In hot alkaline solutions the conversion into chlorate is more rapid, but not complete. The question of the direct formation of chlorate in more strongly alkaline solutions remains undecided, but the author agrees with Oettel.—W. G. M.

Chlorates; Decomposition of ——. *Part III. Calcium Chlorate and Silver Chlorate.* W. H. Sodeau. Proc. Chem. Soc. **16**, [229], 209.

WHEN calcium chlorate is decomposed slowly, about 0·6 per cent. of its total chlorine is evolved, whether the pressure be 760 mm. or 4 mm., but the proportion exceeds 2 per cent. when the decomposition under atmospheric pressure is rendered violent. As the proportion of free chlorine is independent of the pressure of the gaseous products, the calcium chloride in the residue is not produced by the action of chlorine upon oxide first formed.

When silver chlorate is heated to about 350° C. it explodes with a yellow flash, about 7 per cent. of its chlorine accompanying the oxygen. When slowly decomposed, the influence of pressure is even greater than in the case of lead chlorate. At atmospheric pressure, only 0·2 per cent. of its chlorine remains free, but 22·6 per cent. is obtained at $2\frac{1}{2}$ mm. pressure, and more than 36 per cent. should be obtained if the action between chlorine and silver oxide could be completely eliminated.

It is concluded that oxygen and chlorine are produced during the slow decomposition of either chlorate by two simultaneous independent reactions represented by the equations $2M(ClO_3)_2 = 2MCl_2 + 6O_2$ and $2M(ClO_3)_2 = 2MO + 2Cl_2 + 5O_2$ (where M = Ca or Ag_2). With calcium chlorate the "chloride" decomposition proceeds at about 180 times the rate of the "oxide" decomposition, whilst with silver chlorate the ratio is less than 1·8 : 1.

The probability of the "oxide" decomposition being endothermic suggests an explanation of the increase of chlorine in rapid decomposition at high temperature.

Silver chlorate differs from the chlorates of potasssium, barium, and calcium in its highly explosive nature and in the occurrence of an extremely strong secondary action between chlorine and the oxide, but resembles the chlorates of potassium, barium, calcium and lead, in that no free chlorine is produced by displacement from the chloride.

Iron Nitride. G. J. Fowler.

See under XXIV., *page* 77.

Electro-Chemical Industry in France. L. Guillet.

See under XI. A., *page* 48.

Sulphuric and Nitric Acid; Early Manufacture of ——. Oscar Guttmann.

See page 5.

PATENTS.

Acetic Acid of High Percentage and on a Large Scale, by means of Fractional Distillation; Process and Apparatus for the Production of ——. E. Edwards, London. From The Krauschwitzer Thonwaarenfabrik für Chemische Industrie (vormals Ludwig Rohrmann) Company, Krauschwitz, Germany. Eng. Pat. 25,297, Dec. 20, 1899.

THE acetic acid vapour coming from the generating vessel is condensed in a long and capacious horizontal cooler, whence the acid is led to three storing tanks, from any one of which it may flow through suitable valved pipes, by gravity, into a stone chamber of cubical form, lined externally with lead, heated by a steam coil, and provided at the top with a pipe leading to a stoneware condensing arrangement, whence the acid flows into a tank below. In connection with this there are two more stone retorts, each successively smaller than the preceding one, and similarly provided with condensing and storing adjuncts. The crude acetic acid received from the cooler into one of the storage tanks is of about 70 per cent. strength, and contains sulphurous acid; it is allowed to rest for 24 hours, when it is run into the first and largest of the stone retorts, till the retort is two-thirds full. The acid is then carefully heated, and the sulphurous acid which comes off first is allowed to escape. The weak acetic acid of the early part of the distillation is collected separately; apart from this, the first third of the distillate is of 56 per cent., the second of 70 per cent., and the last third of 85 per cent. strength. The first third condensed, is sold as 56 per cent. acid, whilst the other portions are oxidised by addition of 2 per cent. of sodium chromate, and, after rectifying, an acid is obtained of 90 per cent., which is oxidised by potassium permanganate, pure glacial acid being ultimately obtained, besides acid of intermediate strength.—E. S.

Sulphuric Acid by the Catalytic Process; Manufacture of ——. E. Raynaud, Spy, Belgium, and L. Pierron, Jette Saint Pierre, Belgium. Eng. Pat. 16,254, Sept. 12, 1900. (Under Internat. Convent.)

IN case the temperature be kept uniform, at which combination of sulphurous acid with oxygen is effected by catalytic bodies, the gases are first brought into contact with such bodies containing but a small proportion of platinum (say about 5 per cent.), and next with bodies containing about 40 per cent. of platinum, and finally with such as contain about 10 per cent. A portion of the gaseous mixture while rich is thus "first converted by the substance of slight richness, and, as it becomes impoverished, it is subjected to the action of substances of greater richness which complete the conversion." The final contact with the poorer bodies causes the re-formation of any sulphuric acid first formed, which may, through excessive action, have become decomposed. Or catalytic bodies of uniform richness may be used, by such regulation of the temperature in the successive parts reached by the gases, that the reaction may begin at about 300° C., advancing to 500°, and then declining to about 400°, the variation of temperature acting similarly to the variation in the first example of the richness in platinum of the catalytic bodies employed. Hydrogen sulphide may, after purification, replace sulphurous acid in the process.—E. S.

Sulphurous Acid; Process for the Purification of ——. E. Raynaud and L. Pierron, both of Belgium. Eng. Pat. 16,253, Sept. 12, 1900. (Under Internat. Convent.)

CRUDE sulphurous acid gas is passed through one or more towers charged with porous material, such as Kieselguhr, by which it is absorbed. The material is then heated by a suitable device, whereby the gas is said to be liberated in a pure state. Several towers or columns may be arranged to form a circuit, so that those in which the porous material is saturated may be cut off temporarily, and the gas set free.—E. S.

Hydrates of the Peroxides of Lime, Baryta, Magnesia, and the like; Manufacture of ——. G. F. Jaubert, Paris, France. Eng. Pat. 17,460, Oct. 2, 1900.

TO obtain calcium peroxide hydrate, 78 parts of sodium peroxide is intimately mixed with 74 parts of dry hydrated lime, and the mixture is strongly compressed into cylinders of 500 grms. each. Such a cylinder is immersed in 5 litres of water with 1 kilo. of ice, in an enamelled iron vat, which is itself cooled. The temperature is kept below 10° C. After an hour or two, the cylinder is disintegrated, and the calcium peroxide may be separated by filtration, washed, and dried, first at ordinary temperature in a closed vessel,

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and lastly at 100° C. or above. The filtrate consists of caustic soda solution. Barium peroxide and magnesium peroxide, and the like, may be similarly obtained.—E. S.

Peroxide of Sodium, either alone or with the addition of other Salts; Preparing Compressed ——. G. F. Jaubert, Paris, France. Eng. Pat. 17,461, Oct. 2, 1900.

SODIUM peroxide is compressed in a steel pastille mould formed of a cylinder closed at one end and into which a punch is forced, giving a pressure of 7,000 kilos. on a surface of about 25 sq. cm., the cylinder being charged with 500 grms. of the powder. Such compressed peroxide is stated to have great advantages in use over the uncompressed peroxide, especially in respect to liability to explosive decomposition in presence of water, and dangers of fire. For some purposes, it is preferred to compress an intimate mixture of the peroxide with potassium bisulphate, for which latter the sodium salt, or oxalic or tartaric acid may be substituted.—E. S.

Solid Hydrosulphites; Manufacture and Production of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 901, Jan. 15, 1900.

FIRST example: zinc dust is added to a sodium bisulphate solution of stated density, and the solution, after filtering, is heated to 50°—60° C., and sodium chloride is stirred in; on cooling, solid sodium hydrosulphite separates in crystals. Second example: a strong, hot solution of zinc hydrosulphite is treated with sodium chloride to obtain crystals of a "new zinc-sodium double salt." If solid zinc chloride be dissolved in the zinc hydrosulphite solution, zinc hydrosulphite is obtained as a solid salt. Magnesium hydrosulphite solution, treated with sodium chloride, yields a magnesium-sodium hydrosulphite. Third example: sodium hydrosulphite solution, in which zinc chloride is dissolved, gives a precipitate, separable by filtration, of a "new zinc-sodium double salt." Fourth example: solid calcium chloride, or magnesium chloride, is dissolved in zinc hydrosulphite solution to obtain the zinc-calcium or the zinc-magnesium double salt. Fifth example: the paste from the filter or cake from the filter-press, obtained by the process described in the first example, is washed with acetone or alcohol or the like, until water is removed, and is then dried, preferably *in vacuo*. The same washing process is generally applicable. Reference is made to Eng. Pat. 19,762, 1899 (this Journal, 1900, 900).—E. S.

Alkaline-Earth Silicides, and a Combination of Silicon and Hydrogen, and Process for their Manufacture. B. J. B. Mills, London. From The International Chemical Company, New Jersey, U.S.A. Eng. Pat. 14,124, Aug. 7, 1900.

ALKALINE earth silicides are formed by reducing a compound containing the alkaline earth metal combined with oxygen and mixed with silica by heating with carbon in an electric furnace. A compound of silicon and hydrogen combined in equal molecular proportions, is made by reducing a mixture containing the alkaline earth metal and the siliceous material by heating with carbon in an electric furnace, and treating the resulting silicide with dilute acid. This yellow, crystalline, non-explosive compound is insoluble in water and in acids, and is decomposed by caustic alkaline solutions. Chemical compounds are claimed consisting of silicon combined with an alkaline earth metal in the proportions represented by the formula RSi_2, R indicating the alkaline earth metal; and of silicon combined with barium in the proportion represented by the formula $BaSi_2$, these compounds being white, or bluish white substances of metallic appearance, having a crystalline fracture, and oxidising slowly in the air to silicon dioxide and an alkaline earth metal oxide, or to silicon dioxide and barium oxide and are decomposed by pure water, with the formation of the alkaline earth metal hydrate, silica, and free hydrogen or of barium hydrate, silica, and free hydrogen respectively.
—G. H. R.

VIII.—GLASS, POTTERY, ENAMELS.

Pottery Glazes; Solubility of Certain Lead Glasses or Frits used in the Preparation of ——. W. Jackson and E. M. Rich. Paper read before the Manchester Lit. and Phil. Soc. Chem. Trade J. 1900, **27**, [702], 331.

THE authors carried out experiments to determine what factors, apart from chemical composition, affect the amount of lead oxide dissolved on treating lead frits with dilute hydrochloric acid. The results show that the solubility is increased in a very marked manner by increase of fineness, the solubility of the same frit, reduced to different degrees of fineness, varying from 1 to 15 per cent. of the material used. After the action of the acid has proceeded for a short time, the whole of the soluble lead appears to have been extracted. It was found, however, that this was not due to the absolute insolubility of the remainder, but to the formation of an insoluble layer on the surfaces exposed to the action of the acid, which protects the enclosed particles from further action. When this layer was removed by chemical or physical means, it was found possible to extract more lead oxide from the frit, and by continually removing this insoluble layer, practically the whole of the lead oxide could be extracted.—A. S.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Timber; Preservation of ——. O. Chanute. Eng. and Mining J. 1900, **70**, [21], 606.

THE more important of the new methods for the preservation of timber are as follows:—

The Creo-Resinate Process.—In this process it is proposed to use creosote and resin, together with a small percentage of formaldehyde.

The Water-Creosote Process.—An emulsion of creosote and water is forced into the wood.

The Hasselman Process.—The wood is boiled in a solution of the sulphates of copper and iron with alumina and kainite.

The Allardyce Process.—The wood is treated first with a solution of chloride of zinc and then with tar oil.

The Naphthenic Acid Process.—This consists in "injecting into the wood a solution of a copper salt of naphthenic acid, the naphthenic acid being obtained from Russian petroleum.

The author recommends the adoption in the United States of the following three features of European practice:—

(1) The careful testing, chemically, of the antiseptics to be injected.

(2) The uniform injection of the wood with stated and liberal quantities of the antiseptics.

(3) The adequate seasoning of the wood before treatment. This is stated to be essential, if good results are to be obtained; otherwise the antiseptic will not be uniformly distributed, and some portions of the wood will decay before others.

The author concludes from his experience that if "the ties (wood) are injected with reasonable uniformity, and with the equivalent of $\frac{1}{2}$ lb. of dry zinc chloride to the cubic foot, as is done in Germany, "Burnettizing" makes them last 10 to 12 years in the track, with ordinary exposure; while perhaps half that quantity will produce the same result in the more arid regions of the United States; that the zinc-tannin process will impart to them a life of 12 to 14 years, and the zinc-creosote process may extend this to 14 or 16 years."—A. S.

Mortars [Cement]; Injurious Action of Saline Liquids on ——. Deval. Bull. Soc. d'Encouragement, 1900, **6**, [11], 669.

TABLETS, 2 mm. in thickness, cut from briquettes made from pure Portland cement, were immersed in water for periods of seven days, three months, and six months respectively, after which they were placed in solutions of

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magnesium sulphate and calcium sulphate, and the time noted of the first appearance of disintegration and their final destruction. The results obtained, confirm the observations of Vicat, *viz.*, that old mortars better withstand the action of sea-water than freshly made ones.—H. H. B. S.

Portland Cement; Manufacture of ——, *from Blast-Furnace Slag by the Forell Process.* C. Steffens. Chem. Zeit. Rep. 1900, **24**, 359.

This process has been working satisfactorily for several years in the Lollar Portland Cement Works. The raw materials, consisting of wet granulated slag and hard limestone, are broken, mixed, and passed through a drying chamber heated by the hot gases from the kiln. The dried mixture is finely ground, and is then mechanically conveyed to the revolving kiln, which is a special feature of the process. The clinker, on leaving the kiln, is white hot, and only loosely balled together. The usual operations of making into balls and drying are entirely dispensed with. The total consumption of coal amounts to from 18 to 20 per cent. of the clinker produced. The cement is of good quality, and the process is expected to be put in operation at other works when the prejudice at present existing against slag cements has disappeared.—H. H. B. S.

X.—METALLURGY.

Iron and Steel Production; Direct ——. C. Otto. Chem. Zeit. 1900, **24**, 1033—1034.

Blast-furnace practice in America has shown that the coal consumption in the Leadville furnaces is higher than in those of Pueblo, which are at an elevation 5,000 ft. lower. This is due to the lower atmospheric pressure at the higher level. By working under pressure several advantages would be gained, and notably an economy in time. Although a good ore mixed with carbon is readily reduced in the earlier stages of the reduction, six hours is necessary to complete the reaction. But by invoking the assistance of mechanical energy the time may be shortened. By thermal calculations it is shown that if the reduction be effected at a pressure of one atmosphere above the normal, the time of reduction may be reduced by one-half, the external heat applied being, of course, increased in correspondence with the reduction in the time, and the ore being sufficiently finely crushed to allow of the reaction being completed in the shorter period. By doubling the difference of temperature between the inside and the outside of the reduction vessel, the time of reduction may be again reduced by one-half. Such a pressure-furnace (working at + 1 atmosphere pressure) has been tried by Bessemer. Cast steel has been made experimentally in a similar way by a Westphalian works. 1·5 kilo. of scrap-steel with 5 kilos. of ore and 1·25 kilo. of wood-charcoal dust were placed (in a crucible) first in an ordinary wind furnace, and then in a special blast furnace, with the result that 4·575 kilos. of cast steel were produced, containing, per cent., 0·46 C., 0·07 Si, 0·07 Mn, and 0·014 S.—W. G. M.

Soft Steel and Wrought Iron; Influence of Copper in Retarding Corrosion of ——. F. H. Williams. Proc. Eng. Soc. Western Pennsylvania, **16**, Sept. 1900, 231—232.

Three pieces of soft Bessemer steel containing 0·078, 0·145, and 0·263 per cent. of copper, and one piece without copper, were dipped simultaneously into water and hung up to dry many times a day for a month, and were then cleaned from corrosion, and the loss in weight determined. Whilst the loss in the steel was 1·85 per cent., the losses in the copper steels were respectively 0·89, 0·75, and 0·74 per cent. only. Similarly, whilst a soft steel lost 1·65 per cent., and three samples of wrought iron lost 0·76, 0·80, and 0·87 per cent., a wrought-iron containing 0·393 per cent. of copper lost only 0·53 per cent. Consequently copper not only reduces the corrosion of soft steel to within that of wrought-iron, but reduces the corrosive susceptibility of the latter metal as well.—A. W.

Iron and Alloys of Iron; Effect of Temperature on Magnetic Properties of ——. R. L. Wills. Phil. Mag. 1900, **50**, 1—37; through Science Abstr. **3**, [11], 879.

Ewing has divided the process of magnetising magnetic metals into three stages: (1) where there is low permeability and almost no retentiveness; (2) where the magnetisation curve rises rapidly and permeability is high; and (3) where permeability decreases and the saturation point is approached. Heat causes the transition from stage to stage to occur under a lower magnetising force, and the author now reports the effect of temperature on the permeability for low magnetising force. Rings of iron and of Fe—W, Fe—Al, and Fe—Ni, and of a steel containing Cr and Mn, non-magnetic when unannealed, but magnetic after annealing, were wound with the magnetising coils, and the induction was measured ballistically on reversing the magnetising current. By raising the temperature gradually under constant magnetising force, permeability-temperature curves were obtained for different values of the magnetising force. These are now published, together with μ-H curves for constant temperatures up to 800° C.

—W. G. M.

Gold Ores at Cripple Creek, Colorado; Sampling and Milling of ——. S. F. Hazlehurst. Eng. and Mining J. 1900, **70**, [19], 545.

There are five samplers now in active operation in the Cripple Creek district, whilst another one will be ready about the beginning of 1901. The sampler of the National Gold Extraction Company has a capacity of about 200 tons a day. The ore is first passed through a Blake crusher, 9 by 15 ins.; then through a set of rolls, 14 by 24 ins.; after which it is screened through a $\frac{1}{4}$-in. mesh, and passed into a "Yezin cut-out," by which it is reduced to $\frac{1}{25}$ of its bulk. It is then "coned" and quartered, passed through an Engelbach grinder, and dried over steam pipes. The method of sampling employed by the other companies is essentially the same as the foregoing, but the Rio Grande Sampling Company can deal with 400 tons, the Eagle Ore Sampling Company with 450 tons, and the Taylor and Brunton and Cripple Creek Sampling and Ore Companies with 600 tons a day. In the milling establishment of the Colorado Ore Reduction Company there are a cylindrical drier of the White-Howell pattern, a system of fine-crushing rolls consisting of three sets of Davis rolls, 14 by 27 ins., with six sets of revolving screens, and a Ropp roaster. The ore is crushed to $\frac{1}{2}$-in. mesh, dried, reduced to a No. 24 mesh in the fine-crushing apparatus, and then roasted. The roasted ore is treated either by the cyanide process or by chlorination, according to its character. For the cyanide process, there are four tanks of 50 tons capacity each, two of 65 tons each, and two of 150 tons each; all the tanks are provided with filter bottoms. After the ore-pulp has remained a sufficient time in contact with the cyanide solution, the latter is drawn off, the pulp is washed with water, and the residual tailings are sluiced over a system of riffles, in order to obtain as complete an extraction as possible. The gold is recovered from the cyanide solution by precipitation with zinc, and is worked up in the usual manner.

For the chlorination process, there are three barrels, two of 10 tons capacity each, and one of five tons; they are lined with sheet lead, and are provided with filter bottoms of hard wood and lead, and with covers which can be screwed on; they are mounted on trunnions. The roasted ore-pulp is introduced, together with the requisite quantities of bleaching powder, sulphuric acid, and water, into the barrels, and the latter are set in motion. After a sufficient time, the chloride of gold solution is drawn off, the pulp washed with water, and the gold precipitated from the solution by sulphuretted hydrogen. The solution is allowed to settle, and any slime which may be held in suspension is recovered by passing the supernatant liquid through a filter press. The sulphide of gold is roasted in a muffle until free from sulphur, and is then melted and cast into bars.

The Economic Gold Extraction Company's mill has a capacity of 300 tons a day, and comprises six rolls, 16 by 36 ins., each of which is fed from a 5-ton hopper; inclined screens; seven roasters of the Argall type; and an "economic ore cooler," of which the following is a brief

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description:—"It is a shell, 18 ft. in length by 6 ft. in diameter, a continuous channel 360 ft. long being made inside by pieces 2 by 4 ins., riveted to the shell, 12 ins. apart. It is raised at the far end, where it is furnished with discharge spouts; the cylinder revolves under water, which is constantly cooled by a sprayer." The capacity of the cooler is about 60 tons in 24 hours, and the temperature is reduced from 1,600° F. to 150° or 200° F.

The ore is crushed by the rolls, and, after passing over the screens, has become reduced to from No. 16 to 20 mesh. The crushed ore is roasted, cooled, and then treated by chlorination in the usual manner. The mill tailings are subjected to further treatment on Wilfley tables.—A. S.

Telluride Gold Ores of Cripple Creek, Colo., and Kalgoorlie, West Australia. T. A. Rickard. Eng. and Mining J. 1900, **70**, [21], 611.

In the Cripple Creek district, Colorado, the lodes partake of the composition of the prevailing rocks, which is mainly andesitic breccia, lying upon granite, with bodies of phonolite, trachytic phonolite, nepheline basalt, &c., penetrating both the granite and the breccia. At Kalgoorlie the prevailing rock is schistose, and the lodes are generally bands more highly schistose than the encasing rock, and impregnated to a notable degree with disseminated pyrites and secondary calcite.

The ores from Cripple Creek and Kalgoorlie present appreciable differences in chemical composition. The Cripple Creek ore contains a high proportion of alumina, ranging from 15 per cent. in the granitic ores to 25 per cent. in those occurring with phonolite and allied rocks; a trace of magnesia; up to 4 per cent. of lime; from 55 to 70 per cent. of silica, the amount being highest in the granitic ores; and from 1·5 to 2 per cent. of sulphur. The Kalgoorlie ore contains from 2 to 12 per cent. of alumina; from 5 to 15 per cent. of secondary carbonates of lime and magnesia; from 45 to 60 per cent. of silica; 1—2·5 per cent. of titanic acid; and from 4 to 8 per cent. of sulphur. In both ores the percentage of iron is a little higher than that of sulphur, but in about the same ratio.

The Kalgoorlie ore is the better from the smelters' standpoint, being less silicious and containing a much smaller percentage of alumina. The Cripple Creek ore can only be smelted satisfactorily when mixed with other ores, so as not to impair the fusibility of the slag.

The Cripple Creek ore can be satisfactorily treated by either the cyanide or chlorination process. The Kalgoorlie ore is not suitable for chlorination, on account of its high percentage of lime and magnesia, but is very amenable to cyanidation.

The Kalgoorlie ore yields the finest specimens of the telluride of gold, calaverite; samples analysed had a specific gravity of 9·377, and contained nearly 42 per cent. of gold, with less than 1 per cent. of silver. In the Cripple Creek ore, the calaverite is generally finely disseminated, and somewhat obscured by the presence of sylvanite; it has a specific gravity of 9, and contains 38—40 per cent. of gold, and about 3 per cent. of silver.—A. S.

Gold Ores at Mount Morgan, Queensland; Chlorination of ——. E. W. Nardin. Proc. Inst. Civil Eng. **142**, [4].

The lower-grade ore, containing about 11 dwt. of gold per ton, is treated with a solution of chlorine gas in water, and the gold precipitated with charcoal. The plant at the new West Works, which is capable of treating 100,000 tons of ore annually, consists of 16 vats, each of 100 tons capacity, four chlorine stills, one set of four towers in which the gas is absorbed by trickling water, four closed-in storage tanks for the chlorine solution, four similar gold-liquor storage tanks, 12 charcoal filters, three vacuum and three force pumps. The chlorinating vats have each a false bottom of wood, upon which are layers of gravel and sand of decreasing size. The finely ground ore is thrown in on the top of this, and the chlorine solution run in above and withdrawn below by the aid of a vacuum of about 5 lb. per square inch. The escaping liquors from each vat are tested until they contain plenty of free chlorine, when washing water is run through.

The parts of the plant are built at different levels, to avoid pumping as much as possible. The stills are made of flags, 5 ins. thick, jointed with india-rubber, like ordinary chlorine stills for the making of bleaching powder. The joints of all the pipes carrying chlorine gas or solution are also "grouted" with tar and fireclay, &c. The gold-liquor pipes, pumps, &c., are made of the usual cast-lead, hardened with a small percentage of antimony. The filtering vats have a wooden false bottom covered with cheese cloth, on which is put about 2 ft. of finely crushed charcoal, which is afterwards burnt and the ash smelted. The sulphuric acid for making the chlorine is manufactured at the Company's works from imported sulphur. The cost for chlorine alone amounts to a trifle over 5½*d.* per lb., and the total cost for chlorinating and precipitating is about 4*s.* 4½*d.* per ton of low-grade ore, with an extraction of 92·06 per cent., leaving 22 grains in the residue.

The treatment of the richer ore, of an average of about 4 oz. of gold per ton, at the top works, is exactly the same, after the ore has been roasted to get rid of the 11 per cent. of sulphur which it contains. The extraction in this case is 95 per cent., leaving about 4 dwt. 6 grains in the residue. The chlorinating period, however, is much longer, with a consumption of 11·47 lb. of chlorine per ton of ore, as compared with 2·51 lb. for the low-grade material.—A. W.

Platinum; New Method of Separation of the Metals accompanying ——. E. Leidié. Comptes Rend. **131**, [22], 888—891.

1. *Elimination of Foreign Metals.*—The residues from the extraction of platinum and iridium are roasted in the air, reduced in hydrogen, washed with hydrochloric acid, and again reduced in hydrogen. They are then mixed with twice their weight of common salt, and heated to redness in a stream of chlorine, any volatile products being collected. These products and the residue are extracted with water, and the process is repeated with the insoluble portion. The aqueous solution is allowed to stand for a day, filtered from any insoluble chlorides, heated to 100° C., and a slight excess of sodium nitrite added, when any iron falls as ferric hydroxide, and any gold as metal. On now adding sodium carbonate, all the other metals are precipitated, while the platinum, palladium, iridium, rhodium, and ruthenium remain in solution as sodio-nitrites, the osmium as sodium chloro-osmite. The liquid is heated to boiling, and filtered.

2. *Separation of the Platinum Metals.*—(*a*) Excess of sodium hydroxide is added, and a stream of chlorine passed through the liquid contained in a distilling apparatus entirely of glass, at first in the cold, afterwards at 50°—60° C. The distillate of perosmic and per-ruthenic anhydrides is received in dilute alcohol, which reduces the anhydrides to the metallic state. The two metals are separated by the method of Deville and Debray. (*b*) The alkaline liquid is now saturated whilst hot with hydrochloric acid, enough sodium nitrite added to convert the chlorides again into the double nitrites, and ammonium chloride added to saturation. Iridium and rhodium are precipitated as ammonio-nitrites. These are dissolved in hot hydrochloric acid, the solution evaporated and treated with water, and the solution saturated with ammonium chloride; the rhodium remains dissolved, while ammonium chloro-iridate is precipitated. This is collected, dried, and heated to 450° C. with sodium chloride; the sodium chloro-iridate formed is soluble in water, and is thus separated from any double rhodium salt it may have contained. The solution is precipitated with ammoniume hloride as ammonium chloro-iridate, which gives the metal as reduction in hydrogen. The rhodium salt from which the iridium has been separated is concentrated to crystallisation; the crystals are redissolved, transformed into sodio-nitrite, then into ammonio-nitrite, which is precipitated (any iridium present remaining in the solution, provided that it be not saturated with sal-ammoniac); this precipitate is converted into double chloride, which is then reduced by hydrogen. (*c*) The liquid from which the rhodium and iridium have been precipitated is evaporated to dryness, the residue heated with hydrochloric acid, dried, and calcined. From the residue, the alkali

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salts are dissolved out by water, and the remaining metals dissolved in aqua regia; the excess of acid is evaporated, the residue dissolved in water, and a reducing gas (preferably nitric oxide) passed through. On now saturating with ammonium chloride, ammonium chloroplatinate falls, which is collected, recrystallised, and reduced in hydrogen. To the mother-liquor, mercuric cyanide is added, when palladious cyanide is precipitated. This is decomposed by heat, the palladium dissolved in nitric acid, and converted into ammonium chloro-palladite, which is reduced in hydrogen at a red heat, and the metal cooled in carbon dioxide.—J. T. D.

Calcium Carbide and Silicon Carbide as Reducing Agents for Metallic Oxides, Salts, and Earths. B. Neumann. Chem. Zeit. 1900, **24**, 1013—1014.

Moissan, Warren, and Frölich have, at different times, described the use of calcium carbide as a reducing agent for metallic oxides. This reduction takes place in accordance with the equation $3M'_2O + CaC_2 = CaO + 3M'_2 + 2CO$, where M' is a monovalent metal; it is readily effected, but leaves the reduced metal mixed with lime, which is only fluxed with difficulty. The author uses salts, and preferably haloid salts, a certain (sufficient) amount of oxide being added to allow of the removal of carbon as carbon monoxide, according to the general equation—

$$2M'_2O + 2M'Cl + CaC_2 = 3M'_2 + CaCl_2 + 2CO.$$

By this means, using salt or NaCl + KCl as a flux, and heating the whole mixture in a crucible, Ag, Cu, Ni, and Pb are readily reduced and recovered in quantity; Sn and Zn are for the most part volatilised; Fe, Cr, and Mn do not yield a regulus of metal. Alloys also, such as bronze, brass, and German silver, can be produced from mixed chlorides. In all these reductions carefully dehydrated chlorides should be employed. If NaCl be substituted for part of the metal chloride, sodium is reduced, but is distilled off, an attempt to prepare a lead-sodium alloy having proved unsuccessful.

Sulphates are also reduced ($M'_2SO_4 + 2M'_2O + CaC_2 = 3M'_2 + CaSO_4 + 2CO$), but fluorspar or other flux is required for the $CaSO_4$ produced. Ni and Pb were thus reduced, but Fe, Cr, and Mn gave no regulus. Mixtures of $CuSO_4$ and SnO_2, and $ZnSO_4$ and CuO, gave bad results. Sulphates mixed with CaC_2, without the addition of oxide, yielded sulphides (as, for example, Cu_2S).

Carbonates behaved, in the main, like sulphates, white-lead ores and malachite giving good results. Roasted *erubescite* gave a black copper, owing to the iron present; roasted PbS + ZnS gave a brittle crystalline mixture of zinc and lead. Tinstone and raw calamine each gave a low yield of metal. Mixtures of tinstone and copper ores produced an inferior ferruginous alloy; copper ore, with calamine was, however, more satisfactory. Molybdenum glance gave minute grains of metal. Spathic iron ores, hæmatite, and garnierite were not reduced.

Other carbides, such as silicon carbide, gave similar results, soda being added in this case to flux the silica produced. Even, however, with calcium carbide at its present low price (other carbides are excluded by their cost), the process is not likely to find an application on a large scale. The use of oxides and chlorides alone need be considered; but chlorides require an expensive dehydrating process, whilst oxides from roasted ores are usually too impure. Hence, for the ordinary metals, reduction by carbon is cheaper, whilst for the more valuable metals the method of reduction with the aid of aluminium (requiring as it does no extraneous heat) is preferable. Frölich has stated that about $\frac{1}{10}$—$\frac{1}{4}$ ton of CaC_2 is required to reduce 1 ton of Cu; but, according to the author's figures, 342 kilos. of the pure carbide—much more, therefore, of the commercial carbide—would be used per 1,000 kilos. of copper.—W. G. M.

Uranium and Vanadium Ores; Analysis of ——. O. P. Fritchie.

See under XXIII., *page* 70.

Ferrochrome; Determination of Carbon in ——. A. A. Blair.

See under XXIII., *page* 70.

PATENTS.

Iron and Steel Wire, Rods, and the like Articles; Forming a Protective Coating on ——. O. G. Moseley, Manchester. Eng. Pat. 24,496, Dec. 9, 1899.

The coating is produced by enclosing the article within a tube or chamber, heating it by a current of electricity passing through it, and surrounding it with a "barffing" agent, which may be the usual hot producer-gas of the Bower-Barff process, or preferably the hot products of combustion of gas or oil mixed with, and injected into the chamber by dry steam under pressure, in such a manner that little or no air is drawn in at the same time.

An apparatus is claimed for this purpose illustrated for the treatment of wire. It consists of a tube closed at both ends except for small central holes to allow the wire to be drawn through from one drum on to another. Close to the entering end is a side tube connected with the dry steam injector, the latter being conveniently arranged between the fuel burners, which are under a small hood, so that the injection of the steam draws in with it the hot products of combustion direct from the flames and without any appreciable quantity of air. An exit is provided for them near the other end of the barffing tube. At the ends of the tube are electric terminals, which are attached to the wire so that the portion travelling through the barffing agent in the tube can be heated.—A. W.

Tool Steel; Making of ——. R. W. James, London. From The Bethlehem Steel Co., South Bethlehem, Pa., U.S.A. Eng. Pat. 10,738, June 12, 1900.

A metal-cutting tool is formed of air-hardening tool steel containing not less than one-half per cent. of chromium and not less than one per cent. of tungsten or molybdenum, or a mixture of these substances, the said tool or its cutting portion being heated prior to use to a temperature of not less than 1,725° F., in order to make it capable of efficient use and adapted to retain its efficiency at high temperatures. The thermal treatment may be varied, and a separate claim is made for each variation in the method of producing the metal of this composition as follows: heating to a temperature of or over 1,725° F.; to a temperature of or over 1,850° F.; and, after heating to 1,725° or over, to the following fluctuations,—cooling rapidly to below 1,550°; cooling the tool and reheating to above 450° and below 1,350°; cooling and reheating to above 700° and below 1,240°; cooling to a temperature not over 1,240°, and afterwards maintaining for several minutes between 1,240° and 450°; cooling to below 1,550° and maintaining for several minutes between 1,350° and 450°; cooling to below 1,550° and maintaining for several minutes between 1,240° and 700°; and, lastly, coating the portion of the tool to be treated, with fusible slag previous to heating to 1,725° F. or over until the slag is melted.

In addition to the 10 claims three others are made: one for a similar steel-cutting tool containing not less than 1 per cent. of chromium and not less than 4 per cent. of tungsten or its equivalent, heated to 1,725°; another for the method of producing the same; and the third for a similar metal tool containing not less than 3 per cent. of chromium and not less than 6 per cent. of tungsten or its equivalent, heated to 1725° F.—A. W.

Moulding Material for Use in Casting Steel. E. Sarg, Malstatt-Burbach, Prussia. Eng. Pat. 18,120, Oct. 11, 1900.

In place of the fire-clay in the usual moulding material which necessitates a long drying and burning process before use, coal-slate is added to the silver sand and coke, and the mixture air-dried at a moderate temperature, the innermost parts not necessarily being dried. A convenient mixture consists of three parts of silver sand, six parts of coal-slate (black-batt or bituminous shale), and one half part of coke.—A. W.

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Lead from Zinc; an Improved Process for Separating ——, when both Metals exist together in Solution as Nitrates, Chlorides, or partly as Nitrates and partly as Chlorides. G. E. Davis and A. R. Davis, both of Manchester. Eng. Pat. 253, Jan. 4, 1900.

ZINC oxide is added to the solution of the mixed lead and zinc salts, and carbonic acid gas is passed through, whereby lead carbonate is precipitated, zinc replacing lead in the solution. It is preferred to conduct the process in two stages; in the first stage less than the theoretical quantity of zinc oxide is used, mixed with the lead precipitate of a previous second stage operation; in the second stage an excess of zinc oxide is used.—E. S.

Ores [Lead, Zinc, Silver, &c.]; Treatment of Complex and Refractory ——. F. Ellershausen, London. Eng. Pat. 483, Jan. 8, 1900.

THE raw ores are smelted in a blast furnace or cupola, with plenty of lime, so as to leave very little zinc in the slag, and the fumes generated at the throat of the furnace are drawn off by means of a fan or exhauster which rapidly mixes them with water, so as to obtain them in chemical and mechanical combination. The water absorbs the sulphur dioxide, which in turn dissolves part of the zinc, leaving an insoluble portion containing sulphides of lead and zinc with varying proportions of zinc sulphide and oxide. The whole is conveyed to settling tanks, the clear liquor, when cooled, is used again in the fan, and the deposited material is treated with boiling crude caustic liquor, which decomposes the lead compounds, forming a deposit of metallic lead, containing the volatilised silver, whilst the insoluble zinc compounds suspended in the liquid soda are recovered by removing and diluting with water, and afterwards suitably treated. The soluble zinc in the fan water, when sufficiently concentrated, is recovered by treating it with the alkali solution remaining after the deposition of the metallic lead.

A claim is made for the apparatus for this process constructed in accordance with a diagrammatic illustration. The inlet opening of the fan is in connection with the throat of the furnace, and the outlet connected to a pipe leading to a trough or launder, contained in a closed chamber, and running to the settling tanks. Water is supplied through an opening in the top of the fan casing on to the revolving blades. If the mixing be incomplete with one fan, the fumes are drawn through and washed in a second one. This is done by nearly closing a valve in the exit pipe, so that the water can pass along, but without the fumes, which are withdrawn through a side pipe between the first fan and the valve, to the inlet of the second fan, and so on, the exit tube leading to the same launder.—A. W.

Sulphide Ores [Lead, Zinc, Gold, &c.]; Treatment of certain Mixed ——, for the Recovery of their Valuable Constituents. G. E. Davis and A. R. Davis, both of Manchester. Eng. Pat. 710, Jan. 11, 1900.

THE treatment is a combination of operations in which the mixed sulphide ores are attacked by dilute nitric acid, eliminating impurities from the resulting solution of nitrates of zinc, lead, iron, &c., by the addition of a regulated quantity of zinc oxide with agitation and heat to remove the iron, &c., separating the lead from the purified solution by a further regulated quantity of zinc oxide and then passing through it carbonic acid gas, evaporating the residual solution of zinc nitrate to a suitable strength, specific gravity of about 1·5, and furnacing the same for the production of zinc oxide and gaseous nitrogen compounds, and the recovery of the latter as nitric acid, together with the nitrous fumes from the original operation of the nitric acid on the ore. The ore residue containing silica, sulphur, and sulphate of lead, together with gold and silver, may be treated in any convenient manner.

A separate claim is made for the use of the nitrate of zinc solution for diluting the nitric acid to be used for attacking the ore, so as to obtain a stronger ultimate solution of the same for evaporation.—A. W.

Zinc Ores; Treatment of Complex ——. G. de Bechi, Paris, and The General Metal Reduction Company, Ltd., London. Eng. Pat. 985, Jan. 16, 1900.

ZINC-BEARING sulphide ores are mixed and roasted with 15 to 30 per cent. of silica, silicious sand or other silicious matter, whereby the zinc is rendered more completely soluble in acids than when the ore is roasted by itself, and consequently the residue, after leaching, is in a condition more suitable for further metallurgical treatment (this Journal, 1899, 1026).—A. W.

Aluminium Alloys. L. G. Baudelot, Arques-la-Bataille, France. Eng. Pat. 873, Jan. 15, 1900.

THE claims are for the addition of cobalt to alloys of aluminium with copper, German silver, or other analogous metals, with the production of the alloys, aluminium-copper-cobalt and aluminium-German silver-cobalt, and a method for obtaining the same as follows:—A rich alloy, of copper or German silver, 800 parts by weight, with cobalt 200 parts, and aluminium 3,000 parts, is first prepared, and 200 parts of it are added to 800 parts of molten pure aluminium at a bright red heat to obtain the final alloy. —A. W.

Aluminium with other Metals; Manufacture of Composite Articles of Cast ——. L. G. Baudelot, Arques-la-Bataille, France. Eng. Pat. 874, Jan. 15, 1900.

THE cast aluminium is attached to cores or strengthening pieces of other metals, such as steel, &c., by covering or coating the said cores or pieces with an alloy or a metal, such as tin, brazing metal or the like, which will enable the aluminium to afterwards adhere to the same. In the case of steel the metal is first coated with brazing metal and then with tin to prepare it for the aluminium.—A. W.

Aluminium; Process of Soldering ——. J. Novel, Geneva. Eng. Pat. 8518, May 8, 1900.

IN soldering aluminium to itself or to other metals, the parts are first tinned in conjunction with a flux consisting of a mixture of stearic acid, oleic acid and resin, or stearic acid with oleic acid or resin, in suitable proportions, and are then soldered in the ordinary way, using a soldering flux composed of the same materials.—A. W.

Crucibles and Crucible Furnaces. A. Reynolds, Sheffield. Eng. Pat. 1004, Jan. 16, 1900.

THE crucible is built up on a supporting plate or frame having a large free air space below, and consists of a thick bed of refractory material with a circular sunken recess on its upper surface into which the wall of the crucible, consisting of a tube of refractory material open at both ends, is placed and packed with fire-clay. The bed is perforated with a large conical hole which is filled by a plug of refractory material, held up in its place from underneath by a plate secured by bolts and cotters. The upper truncated surface of the plug, forming the central part of the bottom of the crucible, is partly hollowed out so as to slope to the centre, from whence a vertical tapping hole runs right through the middle of the plug to the air space underneath. The tapping hole is closed at its lower end by a small plug of refractory material supported on a swinging plate held up by a cotter. A number of crucibles may be built on the same hearth, each one with a separate tapping hole accessible from the air space below, the object being to tap the contents without removing or disturbing the crucible, which can then be made of larger size.—A. W.

Metallic Alloys; Production of Nickel Coloured and Silver Coloured ——. M. Ekker, Erzsebetfalva, and J. Krajcsics, Budapest, both in Hungary. Eng. Pat. 17,390, Oct. 1, 1900.

TO produce nickel-coloured alloys, the following materials are placed in layers in the smelting pot in the order given, commencing at the bottom with 3,750 parts by weight of old copper, then 20 of phosphor bronze, 7,000 of nickel, 80 of pulverised magnesium, a further 3,750 parts of old copper, 20 of aluminium, 8,000 of zinc, 150 of cadmium, 20 of zinc ash, and, finally, 7,500 parts of old copper on the top. The

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whole is then melted, stirred, mixed with about 20 parts by weight of sal-ammoniac powder, and the alloy cast in moulds.

Similarly, for the silver-coloured alloys, the following materials are arranged in layers in the same order and melted and mixed with 10 parts of sal-ammoniac powder, *viz.*, 6,000 parts by weight of nickel, 20,000 of copper, 4,000 of zinc, 100 of pulverised magnesium, 300 of cadmium, 20 of zinc ash, and 10 of aluminium.

Compositions for the manufacture of alloys according to these formulæ are specially claimed.—A. W.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Electro-Chemical Industry in France. L. Guillet. Génie Civ. 1900, **37**, 146—149, 172—173, 186—190, 219—220, 229—231, 254—256. Through Science Abstr. **3**, [11], 894—895.

This is a review of the whole chemical industry of France. With regard to the electro-chemical portion of the papers, caustic soda is produced in works at Lamothe and Montiers, by two companies using respectively the Griesheim and Outhenin-Chalandre processes respectively, the annual output at Lamothe being 2,500 tons. Alkalis and bleaching powder are made by the Société Fives-Lille at Bozel, in Savoy, where 8,000 h.p. is available. At St. Michel, the Société d'Électro-chimie manufactures potassium permanganate, ammonium persulphate (made from the sulphate, and used in bleaching and photography) chlorates and perchlorates; the last two compounds are also made by Berges, Corbin, and Co., at Chedde (Savoy), the two companies producing 3,000 out of the 3,850 tons of chlorate made in France. Ammonium perchlorate is now being made for use in the manufacture of mining explosives; and the electro-thermal reduction of phosphorus is about to be used for the first time in France. Eight factories, situated respectively at Sechilienne, Epierre, St. Michel, Giffre, N.D. de Briançon, Bellegarde, Froges, and St. Beron, manufacture calcium carbide, but though they have, in all, 14,400 h.p. available, it is not all used for the purpose.

—W. G. M.

Electric Furnace [*Calcium Carbide*]; *Development of the* ——. M. Keller. Paper read before the International Congress of Electricity, Paris. Eng. and Mining J. 1900, **70**, [19], 549.

The author divides electric furnaces, designed for the manufacture of calcium carbide, into three classes:—(1) Arc furnaces, based on the Moissan and Siemens type. (2) Resistance furnaces, based on the Héroult type. (3) Incandescence furnaces, based on the Cowles type (see this Journal, 1889, 678). Arc furnaces may be further subdivided into three classes:—(*a*) furnaces with both electrodes movable; (*b*) furnaces with one electrode fixed, forming usually the floor or hearth; (*c*) multiple arc furnaces, in which the floor of the furnace generally acts as the common secondary electrode for the arcs, which form between it and the three or more primary electrodes fixed around it; polyphase currents are mostly used with these furnaces.

Arc furnaces are not suitable for the manufacture of carbide, because of the loss of energy occasioned by the temperature of the arc being considerably above that required; and loss of material owing to the finer particles of the charge being carried away by the "blowing" of the furnace.

In resistance furnaces the temperature attained is directly related to the sectional area of the electrodes. For the production of carbide, an E.M.F. of 20—25 volts is sufficient, but "heavier" currents are required than with arc furnaces, and conductors of larger sectional area must therefore be provided.

The incandescence type of furnace permits the utilisation, within a limited area, of the greatest amount of energy, and avoids the most serious defect of the second type, namely, that the currents must always traverse the whole depth of the layer of materials already fused.

Electric furnaces may also be classified according to the kind of current employed. Furnaces heated by means of alternating currents have recently been widely adopted, because the dynamos yielding monophase or polyphase currents are better adapted to stand the resistance variations incidental to electric furnace operations. Furnaces employing monophase currents are best arranged in series, but with arc-heating, it is better to connect the furnaces in parallel. In the furnace designed by Bertolus in 1897, triphase current was used, and three carbon electrodes were connected to the three terminals of the dynamo, whilst the hearth of the furnace itself provided the common return electrode. In later forms the three different phases of the current have been utilised in separate furnaces, and these, therefore, each operate as though worked with monophase current.

The carbon for the electrodes is subjected to special treatment in order to increase its conductivity. For furnaces in which vertical electrodes are used, the latter are generally formed square or rectangular in section, whilst for other types of furnace, cylindrical carbons are mostly used.

With arc furnaces the E.M.F. required, varies considerably, and depends upon the conductivity of the gases which are emitted from the heated substances. For the production of calcium carbide, an E.M.F. of 50—60 volts is required; for corundum, 50 volts; and for the production of iron by the electro-thermal method, 20 volts. In resistance furnaces, a lower E.M.F. is generally sufficient. With incandescence furnaces practically any E.M.F. up to 80 or 100 volts can be used, for the resistance increases with the increase of the length of the bed of materials through which the current has to pass, and this may be varied at will.

According to recent estimates the total energy employed in electric furnace operations is 230,000 h.p., of which total, 185,000 h.p. are used in the production of calcium carbide, 27,000 h.p. for aluminium, 11,000 h.p. for copper, and 2,000 h.p. for carborundum. It is stated that in the latest form of the Gin and Leleux furnace, it is possible to obtain 6·20 kilos. of carbide per kilowatt day of 24 hours, or, in other words, a thermal efficiency of 75 per cent.—A. S.

Sulphuric Acid Solution; Electrolytic Reduction of Substances Reducible with Difficulty in ——. J. Tafel. Zeits. Phys. Chem. 1900, **34**, 187—228. Through Science Abstr. **3**, [11], 893—894.

The author seeks for a general method for the preparation of organic compounds by electrolytic reduction, and has experimented with caffeine. This substance can only be reduced in sulphuric acid solution when the cathode is of a material (lead or mercury) showing a high cathode-potential. The surface of the cathode should be coated electrolytically with spongy lead to prevent the disturbances in reduction due to the contamination of the cathode by traces of foreign metals. Reduction is slightly hastened by a rise of temperature. Within certain limits the current-yield is nearly proportional to the current. For equal strengths of solution and equal current concentration per litre of liquid at the cathode, the current density is without any great influence on the reaction, but the reduction increases slightly as the current density diminishes. With equal strength of solution and current concentration, and with the same relation between cathode-area and volume of cathode liquid, the reaction is the same for all sizes of apparatus of similar construction.—W. G. M.

Sulphuric Acid containing Iron; Electrolysis of Dilute ——. [*Effect of Iron in Sulphuric Acid for Secondary Batteries.*] K. Elbs. Zeits. für Elektrochem. 1900, **7**, [19], 261—262.

Two similar gas (H-O) voltameters with bright platinum electrodes were placed in series. In one voltameter pure sulphuric acid (sp. gr. 1·175) was employed, whilst small

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quantities of iron were added to the acid in the other. The results are given in the following table:—

Amount of Iron in Acid.	Current Density.	Loss of H-O Gas.
Per Cent.	Per Sq. Dm.	Per Cent.
1	2·230	48·3
	0·920	64·3
	0·228	97·4
0·1	6·4	3·0
	4·9	3·6
	2·27	7·2
	1·123	11·9
	0·366	24·1
	0·355	25·1
0·01	2·217	1·7
	1·150	1·9
	0·360	6·3

If formed lead plates are substituted for the bright platinum electrodes the values are scarcely altered. The bad results which would be obtained if the sulphuric acid in secondary batteries contained iron are obvious from the above table. Not only iron and manganese, but all metals which have a changing valency produce the same effect. It is now usual to specify that the acid for secondary batteries shall be free from iron. The question arises as to how far this must be complied with, especially if it be remembered that iron gives very pronounced reactions, and that traces are easily detected.

The author considers that if the amount of iron present in the acid be less than 0·01 per cent. it will practically have no injurious effect. In order to ascertain whether the amount of iron lies below this limit he employs the following rapid tests. About 10—15 c.c. of the acid are supersaturated with aqueous ammonia. If no turbidity, due to ferric hydroxide, be produced after standing a few minutes, the acid contains at most only 0·008 per cent. of iron. Acid containing 0·005 per cent. of iron is immediately coloured blue on adding potassium ferrocyanide, or red on adding potassium thiocyanate.

If therefore an acid shows the presence of iron when tested with potassium ferrocyanide or potassium thiocyanate, but not when tested with ammonia, it may safely be used for secondary batteries.—J. S.

Manganous Salts at the Anode; Behaviour of ——. K. Elbs. Zeits. für Elektrochem. 1900, **7**, [19], 260—261.

The products obtained at the anode during the electrolysis of manganous salts may contain manganic salts, *Braunstein*, or permanganic acid, according to the nature and quantity of the acid employed, and to other conditions of experiment. The term "*Braunstein*" is employed as a collective name to denote all brown precipitates, consisting of hydroxides or other derivatives of manganese peroxide.

For the exclusive production of permanganic acid the conditions are:—The manganous salt of a strong acid in very dilute solution, a large excess of the acid, and a temperature not exceeding 80° C. Several difficulties occur in the case of manganous sulphate. Although the conditions of experiment are varied within wide limits, manganic sulphate, braunstein, and permanganic acid or two of these products are usually formed. Manganic sulphate and permanganic acid both produce a deep violet-red coloration, which, however, can be distinguished by the absorption spectrum. Manganic sulphate absorbs the yellow and green portion of the spectrum uniformly, whilst permanganic acid at sufficient dilution shows the five well-known absorption bands.—J. S.

Potassium Chlorate; Electrolytic ——. A. Brochet.

See under VII., *page* 42.

Ampère-Manometer. G. Bredig.

See under XXIII., *page* 69.

PATENTS.

Gases Generated in Electrolytic Apparatus; Improved Means for Carrying off the ——. W. Bein, Berlin, Germany. Eng. Pat. 24,058, Dec. 2, 1899.

The electrolytic apparatus described is an improvement on that claimed for in Eng. Pat. 21,838, 1894 (this Journal, 509, 1895), and provides means for leading off the gases generated at the lower electrode without disturbing by ebullition the layer formation of the cell. The electrodes are substantially horizontally arranged at the top and bottom of the electrolytic cell in so far as a layer of the electrolyte is provided between the electrodes, which is to be kept undisturbed and serves as a diaphragm. Each lower electrode is covered with a frame or box provided with a slanting cover of osmotic pervious material, and having recesses at its side to enable the liquid to enter the frame, the latter causing the gases generated at the lower electrode to escape beyond the impervious partition to a compartment from which they are drawn off.—G. H. R.

Electrical Accumulators; Method of Producing Electrodes for ——. C. Luckow, jun., Cologne, Germany. Eng. Pat. 24,960, Dec. 15, 1899.

The claim is for a method of rendering metals capable of storing electricity by subjecting them in shapes suitable for electrodes to the electrolysis of aqueous solutions of the alkali and alkaline earth hydroxides, such solutions being strongly diluted, so that a very high degree of electrolytic dissociation of the dissolved constituents takes place.

—J. C. R.

Electrolytic Apparatus. W. Barnes, Massachusetts, U.S.A. Eng. Pat. 1457, Jan. 23, 1900.

The apparatus comprises an hermetically sealed electrolysing cell containing a diaphragm, which divides it into two compartments, the one containing an anode, and the other the cathode, and both electrically connected with an electrical generator. An hermetically sealed feed regulator connected by pipe to the cell, is actuated by the level of the liquid in the latter, and there are conduit connections from it to the cell, and also between it and the intermediate feed reservoir, which has an inlet, whilst the main feed reservoir has an outlet which discharges into the inlet without being in contact with it. There is a vacuum-creating device for, and operatively connected with, at least one compartment, comprising a conduit which is both a vacuum and a gas-escape conduit. A vacuum chamber on a lower level than the cell is connected with at least one compartment of it, and with the feed reservoir, between which and the vacuum chamber is a testing device with a conduit to the feed regulator. Various modifications are described and illustrated.—G. H. R.

Electrodes for use in Electro-chemical Processes. O. Lanckner, London. From A. Vogelsang, Dresden. Eng. Pat. 14,104, Aug. 7, 1900.

Relates to the construction of electrodes of platinum foil, or other metal which is not acted upon by the electrolyte. The examples shown are intended for the production of bleaching liquors from common salt solutions.—J. C. R.

Electrolytic Meters. A. Wright and The Mutual Electric Trust, Ltd., both of Brighton. Eng. Pats. 23,315 and 23,316, Nov. 22, 1900.

These inventions relate to methods of measuring electric current by means of electrolytic meters. According to the specifications the meter may be placed in a circuit forming a shunt or by-pass to the main current. This, it appears, has hitherto not been practicable, on account of the polarisation in the electrolytic cell. By the present arrangements these drawbacks are overcome by means of an extraneous source of electricity, like a primary or secondary battery, or thermopile, placed in circuit with, and opposed to the electrolytic cell.—J. C. R.

E

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(*B.*)—ELECTRO-METALLURGY.

Iron and Nickel; Electro-Deposition of ——, *from a Solution of the Sulphates.* F. W. Küster. Zeits. für Elektrochem. 1900, **7**, [19], 257—259.

REFERENCE is made to the experiments of Tœpffer (this Journal, 1900, 156), who found that the alloy obtained on electrolysing the mixed sulphates of iron and nickel, was relatively richer in iron the lower the current density used. Exterpolation of the curves showed that for zero current density, iron free from nickel should be deposited.

This result was quite unexpected, since nickel is a nobler metal than iron, the decomposition point of nickel solutions being about 0·1 volt lower than that of iron solutions.

The author has, by a novel method, re-determined the potentials necessary for the liberation of iron and nickel from solutions of their sulphates, and confirms the fact that nickel is deposited at about 0·1 volt lower than iron. As a possible explanation of the anomaly he suggests that, although nickel is deposited first, the ratio :— *liberated* H_2 | *deposited* Ni, may for a given E.M.F. be greater than the ratio :— *liberated* H_2 | *deposited* Fe.—J. S.

Metals; Electrolytic Cleansing of ——. J. Reyval. Écl. Électr. 1900, **24**, 91—92. Through Science Abstr. **3**, [11], 897.

IN the process patented by the Vereinigte Elektricitäts Aktien Gesellschaft of Vienna (French Pat. 292,333 of 1899) an alkali-metal salt is used as electrolyte; the metal to be cleansed forms one electrode (aluminium or zinc would be made cathodes, but iron, copper, or copper alloys would be anodes), and carbon, or a metal not attackable by the solution, or by the ions present, forms the other electrode. With Al or Zn the aluminate or zincate formed at the cathode diffuses through the solution until, meeting the free acid from the anode, hydroxide is deposited. Similarly, iron or copper salts, formed at the anode in cleansing these metals, are ultimately precipitated by the alkaline solution flowing from the insoluble cathode. Thus, the electrolyte is always regenerated, and the dissolved metal is deposited as a hydroxide, which may be recovered. To cleanse steel sheets for galvanising, they are, as anodes, opposed to thicker sheets of iron as cathodes, in a solution of sodium sulphate. In this process, which is said to be rapid and economical, an E.M.F. of from 4 to 8 volts suffices to produce a current density of 140 ampères per square metre [13 ampères per square foot].—W. G. M.

PATENT.

Electro-Deposition of Metals upon Iron and Steel. H. M. Punnett, and H. M. Punnett, jun., Birmingham. Eng. Pat. 24,668, Dec. 12, 1899.

(1) THE articles to be coated are suspended through the medium of a permanent magnet or magnets, so arranged within the electrical circuit as to constitute a return-current conductor; and (2) the same, but with the said magnets energised by a separate current.—J. C. R.

XII.—FATS, OILS, AND SOAP.

Wax; Acid and Saponification Values of ——. *Modification of Hübl's Method of Determining them.* O. Eichhorn.

See under XXIII., *page* 74.

PATENTS.

Mineral Oils, Liquid; Solidification of ——. H. B. Helbing and F. W. Passmore, London. Eng. Pat. 23,978, Dec. 1, 1899.

PETROLEUM is converted into a solid mass by mixing it with a concentrated aqueous solution of a salt of caseïn, preferably the sodium salt, in the proportion of, say, 20 parts of caseïn dissolved in 100 parts of decinormal caustic soda solution to 1,000 parts of petroleum. The emulsion is poured into moulds and allowed to stand, when it gradually thickens.—D. B.

Mineral Oils, Liquid; Solidification of ——. H. B. Helbing and F. W. Passmore, London. Eng. Pat. 23,979, Dec. 1, 1899.

To every 1,000 parts of the freshly-made emulsion, prepared in accordance with the method described in the previous specification, there is then added 10 parts of ordinary commercial 40 per cent. formaldehyde solution. The product is at once poured into moulds and left to harden. The relative proportions of the ingredients may vary according to the particular kind of product which it is desired to obtain.—D. B.

Oil from Dirty Waste; Extracting ——. J. Heywood, Clayton, Manchester. Eng. Pat. 25,228, Dec. 20, 1899.

THE oily waste is placed in a closed receiver between two perforated plates, where it is extracted with a stream of carbon bisulphide, made to travel in an upward direction by means of a pump. From the outlet of the receiver the liquid passes to a steam-heated still, the oil remaining, and the solvent travelling through a condenser to a storage well, into which the pump suction dips. From the lowest point of the condensing coil an escape pipe conducts any vapours and gases beneath the level of water in a small tank, whence they pass away through a vertical shaft provided with a descending current of water. At the end of each extraction, steam is admitted to the base of the receiver, which drives into the condenser all the remaining solvent. The oils recovered are drawn off from the still at proper intervals.
—F. H. L.

Oil-yielding Seeds; Process for Treating ——. [*Linoleum, &c. Manufacture.*] M. Bärwinkel, Hamburg. Eng. Pat. 11,860, June 30, 1900.

IN this process, oil-cake or crushed oleaginous seeds are mixed with metallic oxides, such as manganese peroxide, lead monoxide, zinc oxide, or the like, or else with sulphur or metallic sulphides, such as those of antimony or lead. The product is then brought into a revolving drum, heated to a temperature ranging between 80° and 168° C. for several hours, and submitted to the action of oxidising gases, such as air or oxygen. In the case of linseed, 9 parts thereof may be mixed with 1 part of sulphur, and treated as above; and the result is a homogeneous substance, closely resembling linoleum, and capable of being rolled into sheets. Cork or similar filling materials may be added if desired; but by this process the natural solid matter of the seeds remains in the "linoleum." The claims are for the employment either of the oxides or sulphides, or of oxidising gases, or for both together.
—F. H. L.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*B.*)—RESINS, VARNISHES.

Exudation Resins. M. Bamberger and E. Vischner. Monatsh. für Chem. **21**, 564—570.

LARICIRESINOL (chiefly the isomeride of m. pt. 95° C.; see this Journal, 1899, 1134) was subjected to destructive distillation. From 427 grms. there were collected 257 grms. of distillate, consisting of a watery layer (about 80 grms.) and an oily layer; while uncondensable gases, containing carbon dioxide and hydrocarbons, were also formed, and a hard, bright charcoal remained in the retort. The watery layer was slightly acid, and from it there was separated, after neutralisation, an aldehyde, but in quantity too small for further examination. The oily layer partly solidified, and by filtration there was separated from it a crystalline substance, which, after repeated solution and crystallisation from alcohol, proved to be pyroguaiacin, $C_{12}H_{10}.OCH_3.OH$. The alcoholic mother-liquors yielded a second crystalline substance, but not in quantity sufficient for identification. The oil was distilled under 33—35 mm. pressure, and chiefly yielded two fractions, one at 90°—

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110° C., principally guaiacol, the other at 200°—230° C., containing much pyroguaiacin, and a second substance, probably a methoxy-derivative of pyrogallol. About 40 grms. of guaiacol and about 25 grms. of pyroguaiacin were obtained.—J. T. D.

Resins of the Conifers; Recent Researches on ——. A. Tschirch. J. Pharm. Chim., 6th ser. **12**, [9], 409—413.

THE author divides the resins into three groups:—(1) *Tannol resins*, which contain esters of resin alcohols, resino-tannols, which afford reactions analogous to those of tannins. These resino-tannols form benzoic or cinnamic esters. (2) *Resene resins*, which contain no tannol esters, but consist mainly of resenes, a group of bodies which are indifferent to alkalis and to other reagents. (3) *Terpino-resins*, or acid resins, analogous to resinolic acid.

Tannol Resins.—This group comprises the benzoresins, containing esters of benzoic or cinnamic acid, such as benzoin, Peru and Tolu balsams, acaroid resin, dragon's blood, resin of aloes, and storax, and the umbelliferous gum resins, ammoniacum, galbanum, sagapenum, asafetida, and umbelliferous opopanax.

Resene Resins include the burseraceous oleoresins, myrrh, olibanum, burseraceous opopanax, Mecca balsam, elemi, bdellium, tacamahaca, mastic, dipterocarpous dammar, Doona resin, and Manilla copal.

Terpenoresins.—This group includes coniferous resins, the resin of *Polypus officinalis*, and the resins of the Cæsalpinæ, copaiba balsam, and Zanzibar copal.

Method of Examination.—The resinous product is dissolved in ether, and agitated successively with (1) a 1 per cent. solution of ammonium carbonate; (2) a 1 per cent. solution of sodium carbonate; (3) solutions of potassium hydrate, 0·1 per cent. and 1 per cent.

Resinolic acids are dissolved by these solutions; resenes remain in the ether, with any essential oil present, which may be subsequently removed by steam distillation. All coniferous resins, except amber, contain no esters, but consist solely of resinolic acids, resenes, and essential oil. The majority of these acids are amorphous, and are removed by the sodium carbonate solvent; only a few are soluble in the solution of ammonium carbonate. The former may be separated by crystallisation, or by precipitation with lead acetate. The following are the constituents of the chief coniferous oleoresins examined:—

Venice Turpentine.—Laricinolic acid, $C_{20}H_{30}O_2$; *α*- and *β*-larinolic acids, $C_{18}H_{26}O_2$; and laricoresene.

Strasburg Turpentine.—Abienic acid, $C_{13}H_{20}O_2$, soluble in ammonium carbonate; abietolic acid, $C_{20}H_{28}O_2$; *α*- and *β*-abietinolic acids, $C_{16}H_{24}O_2$; and abietoresene, $C_{19}H_{30}O$.

Canada Balsam.—Canadinic acid, $C_{19}H_{34}O_2$, soluble in ammonium carbonate solution; canadolic acid, $C_{19}H_{30}O_2$; *α*- and *β*-canadinolic acids, $C_{19}H_{30}O_2$; and canadoresene, $C_{21}H_{40}O$.

Jura Turpentine.—Picea-pimarinic acid, $C_{13}H_{20}O_2$, soluble in ammonium carbonate; picea-pimaric acid, $C_{20}H_{30}O_2$; *α*- and *β*-picea-pimarolic acids, $C_{25}H_{44}O_2$; and juroresene, $C_{21}H_{36}O$.

Bordeaux Turpentine.—Pimaric acid [pimarinic?], $C_{14}H_{22}O_2$, soluble in ammonium carbonate; pimaric acid, $C_{20}H_{30}O_2$; *α*- and *β*-pimarolic acids, $C_{18}H_{26}O_2$; and bordoresene.

Sandarac.—Sandaracolic acid, $C_{45}H_{66}O_7$ or $C_{13}H_{20}O_2$; callitrolic acid, $C_{65}H_{84}O_8$ or $C_{15}H_{20}O_2$.

Amber.—Succino-abietic acid, $C_{80}H_{120}O_5$ or $C_{32}H_{48}O_2$; and succinsilvinic acid, $C_{24}H_{36}O_2$.

The following constituents, noted by others, have been confirmed by the author:—

American Colophony.—Abietic acid, $C_{19}H_{28}O_2$.

Galipot.—Pimaric acid, $C_{20}H_{30}O_2$.

Comparison of these figures shows several homologous formulæ. Thus, pimaric acid is the homologue of abietic acid, laricinolic acid of larinolic acid, pimaric acid of pimarolic acid. The acids of Canada balsam only differ in the number of their hydrogen atoms; pimaric, picea-pimaric, and laricinolic acids have a common formula. The author does not accept the theory that resins are formed by the oxidation of terpenes. Having allowed oil of turpentine to resinify in the air, only traces of resinolic acids were found to have been formed. The products of oxidation were chiefly resenes. The formation of the resenes of the terpenoresin, or terpinoresenes in this manner seems, therefore, possible. Resinolic acids do not appear to be derived from terpenes, but to possess some bonds in common with them. On submitting abietic acid to dry-distillation with zinc dust, naphthalene and methylnaphthalene are among the products obtained; naphthalene is also among the bodies obtained on heating colophony. If, however, colophony be distilled with slaked lime, no naphtbalene results, but terpenes are formed, and if pimaric acid be heated with hydriodic acid and phosphorus, terpenes are also produced. These results establish the fact that the coniferous resins contain both a naphthalene group and a terpene nucleus.

A peculiar hydrocarbon, fichtelite, which possesses this structure, is already known; it seems probable that pimaric and abietic acids may be derivatives of this body.—J. O. B.

(*C.*)—INDIA-RUBBER, &c.

India-Rubber from Different Species of Sapium. Pharm. J. 1900, **65**, [1585], 511.

R. THOMSON has recently exhibited some leaves of a species of sapium from the United States of Colombia, and stated that the plant yielded a very valuable india-rubber. Hemsley, in the "Icones Plantarum," pl. 2647, gives a description of *Sapium verum*, from which the best, or "Colombian Virgen," rubber is obtained. Another species, *S. jenmani*, Hemsl., is described in the same work, pl. 2649. According to Thomson, it yields an abundance of rubber of inferior quality. The leaves of *S. verum* are elliptic, oblong, leathery, with many lateral veins, and are rounded at both base and apex. The leaves of *S. jenmani* are thinner and narrower, and the apex is acuminate with an obtuse point.—A. S.

Balata and Gutta-Percha; Purification of ——. Arends. Chem. Zeit. 1900, **24**, [83], 897.

THE author has carried out experiments to ascertain the suitability of balata as a substitute for gutta-percha, and also as to the use of the cheaper carbon tetrachloride in place of chloroform for the purification of the two substances. The following method for the purification of balata is given:—Commercial balata is cut into small pieces, boiled with acidulated water, washed, and dried. The dry substance is dissolved in a mixture of equal parts of petroleum spirit and carbon tetrachloride, the liquid allowed to settle, the clear portion decanted, and, after the addition of some water, the solvent distilled off. The residual purified balata is freed from any traces of the solvent still present, then well beaten and rolled out. Gutta-percha can be purified in a similar manner, except that the purified product frequently requires to be bleached, if a white preparation be desired.

The author considers that balata can satisfactorily replace gutta-percha in the preparation of traumaticin, gutta-percha-plaster mulls, &c. He also draws attention to the various directions in which carbon tetrachloride can be applied in analytical practice.—A. S.

PATENTS.

Gutta-Percha; Manufacture of ——. Siemens Bros. and Co., Ltd., Westminster, and W. Dieselhorst, Old Charlton, Kent. Eng. Pat. 25,494, Dec. 23, 1899.

IT has hitherto been found somewhat difficult to dry gutta-percha after the preliminary washing without the use of so elevated a temperature that the material is liable to be injured. To overcome this inconvenience, the gutta-percha is masticated at a more moderate temperature in a vessel where a partial vacuum is maintained by means of a pump, the vapours passing first through a surface condenser. In order to prevent any accidental contamination of the gutta-percha with the lubricating oil of the masticator-shaft bearings, each shaft, between its stuffing box and the masticator proper, passes through a catch vessel, and has a circumferential groove cut upon it. By this device the oil escaping from the gland collects in the catch pit, for it cannot pass the groove; while any gutta-percha working its

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way along the shaft also falls into the pit, and cannot be drawn back into the apparatus by the vacuum.—F. H. L.

India-Rubber and Gutta-Percha; Process for Producing a Substitute for ——. E. Zühl, Berlin. Eng. Pat. 18,536, Oct. 17, 1900.

To imitate gutta-percha (A) 2 kilos. of paraffin, 6 kilos. of pitch, and 2·5 kilos. of Chinese wood-oil are melted and mixed together. 1·1 kilo. of sulphur chloride and afterwards 100 grms. of powdered sulphur are next added, and the whole is heated for an hour to 160° C. (B) 2 kilos. of pitch and 1 kilo. of wood-oil are heated together under cover for eight hours at 280°, then vulcanised with 150 grms. of sulphur chloride as above. The material obtained resembles india-rubber in respect of durability and insulating power, but is less elastic, and is weak under torsion. To obviate these defects, (C) 100 grms. of india-rubber are dissolved in 300 grms. of molten naphthalene at the lowest possible temperature, and incorporated with 400 grms. of wood-oil and 700 grms. of pitch, asphalt, or the like; the naphthalene is volatilised by a current of steam, and the residue is vulcanised as before. (D) 1 kilo. of A is dissolved in 3 kilos. of naphthalene, mixed with 100 grms. of india-rubber in the same quantity of solvent, and the naphthalene removed with steam.—F. H. L.

XIV.—TANNING, LEATHER, GLUE, SIZE.

Raw and Tanned Hides; Use of Spirit in the Removal of Fat from ——. A. Wünsch. Ledermarkt, 1900, [75]; through Zeits. Spiritusind. 1900, **23**, [47], 429.

Raw hides always contain a large proportion of fat, which ought to be removed before tanning, since the mordanting and tanning liquors penetrate better, and are more easily removed afterwards, if the fat be previously extracted. When benzene is used alone for this purpose with wet or dry hides, the penetration is less uniform and the removal of fat is less complete than when a mixture of alcohol and benzene is employed. In this case, not only is fat recovered which would otherwise be saponified by the alkaline depilatory, but the leather also is softer and more valuable.

The soaked hides, after having been pressed and allowed to drip, are placed in a wooden drum, which is mounted in a somewhat larger stationary cylinder, which can be hermetically closed, and in which, by means of tooth gearing, the inside of the cylinder may be made to rotate. When the interior is filled with a pack of hides, the cylinder is closed and the drum rotated. At first, dilute alcohol is brought into contact with the skins. This liquor, by suitable pipes, is then drawn off and replaced by a mixture of benzene and strong alcohol, which may be further strengthened with more benzene if required. After treatment the mixture is run off, and the hides rinsed with a little alcohol.

The cylinder is now opened, and the hides, deprived of fat, are taken out, and replaced by a fresh pack to be treated. The apparatus is fitted with the necessary feeding pipes from the alcohol and benzene reservoirs, as also waste pipes and pressure valves. The benzene, alcohol, and fat can be recovered from the solutions, the former being used in subsequent packs.—J. F. B.

Brown Shoe Calf; Manufacture of ——. Leather Trades Rev. **33**, [764], 869.

Treatment of Fresh Market Calf.—The skins are thoroughly soaked in two or three changes of clean water, and are then limed, after which they are unhaired and fleshed, and may be run through a washing tumbler in soft water for about an hour. After leaving the washing tumbler, they are then put into a weak puer at a temperature of about 35° C., and are then passed on to a strong puer. When sufficiently reduced, they are scudded and then drenched, the object of the drench being to remove all traces of lime salts, to clean the skin, and to open it up into proper condition to receive the tan. They are then ready to be tanned in a weak gambier liquor of about 5° Bk. [Barkometer].

In starting new liquors, one pint of acetic acid should be added to the paddle for every five dozen medium calf skins, the object of this acid being to keep the fibres open.

The skins are kept in motion in the paddle till coloured off, and are then put on a horse to drip overnight. They are then placed in a similar liquor of 10° Bk., and the process repeated until a strength of 20° or 25° Bk. is reached, when the goods should be thoroughly struck through. They are now introduced into a fresh paddle containing a gambier liquor of 25° Bk., to which about 2 galls. of good oakwood extract have been added; and the process of tanning continued until, by the addition of oakwood extract, the strength registers 35° Bk. The time taken depends upon the substance of the skin. After tanning, the skins should be laid in pile to drain, and then oiled with best Newfoundland cod oil, laid in pile for a day, and then hung in the sheds to dry.

Splitting, Shaving, Sumaching, &c.—The tanned skins are wet back, sammied until in condition for shaving, or, if stout enough, split with a band-knife splitting machine, the splits being used for waxing linings, &c. After shaving, they are soaked in water, brushed over on the grain with a soap solution (made up of 2 lb. of soft soap and 3 galls. of hot water), then rinsed in a tub of hot water, soured in sulphuric acid, and afterwards sumached. The sumaching may be done in a drum taking $2\frac{1}{2}$—3 buckets of sumach with 7—8 pails of water, at a temperature of 50° C. The skins are run in this for about three hours, washed up in warm water, allowed to drain, and then dried to fix the tannin.

Dyeing and Finishing.—The skins are now wetted back, put into a paddle and dyed, the dyeing generally being done with acid dyestuffs. Suitable shades of brown can be procured from Cuba and Indian Yellow R and Fast Brown R, toned down with blue or green. A little sulphuric acid is added to the dye-bath to develop the shade. After dyeing, the skins are washed up, struck out on the grain side, strained on boards, and dried. When dry, they are removed from the boards, flamed to pattern, set out on flesh and grain, and hung up in a warm room or shed until thoroughly dry; they are then stuffed, the first stuffing being made by boiling two medium sized cow-heels for three hours in water, to which are added $\frac{1}{2}$ lb. of Irish moss, 1 pint of linseed oil, $\frac{1}{4}$ lb. of Castile soap; when cool the liquid is strained through calico. This should make from 3 to $3\frac{1}{2}$ galls. The stuffing is put on with a flannel cloth, rubbed well in, and smoothed with the hand. The goods are hung up, and afterwards receive a second coat, consisting of the same solution diluted to half strength with water. The skins are finished by perching with a moon knife, after which they receive another coat of stuffing in the dry state, are hung up, brushed up with a stiff brush or brushing machine, and finished by rolling with a plain roller.—J. G. P.

Artificial Leather; Process for the Manufacture of ——. Leipziger Färber- u. Zeugdr.-Zeit. 1900, **49**, [12], 497.

Equal parts of grey wool and Italian hemp are felted together, and the sheets of felt thus obtained are washed and dried and then impregnated with a specially prepared mixture. This mixture contains boiled linseed oil, colophony, turpentine, glycerin, and vegetable wax, these ingredients being heated together on the water-bath with the addition of ammonia, until a homogeneous mass results; a solution of gum and a casein solution containing sodium bichromate are then added, also an antiseptic, and mineral colours according to the shade required. The mixture is heated until it is viscous, and is employed in this condition for impregnating the felt, after which treatment the material is dried at the ordinary temperature, steeped in a solution of aluminium acetate, and finally dried by pressure between heated rollers. The product is stated to be especially suitable for the manufacture of boot soles.—R. B. B.

Leather; The Dyeing, Staining, and Finishing of ——. M. C. Lamb.

See under VI., *page* 41.

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PATENTS.

Leather; Improved Process and Composition for Tawing Skins in the Manufacture of ——. G. W. Adler, Philadelphia, U.S.A. Eng. Pat. 24,680, Dec. 12, 1899.

THE skins are first treated with a solution of aluminium sulphate and sodium chloride; after which they are subjected to treatment with sodium thiosulphate if a fine grain be required; the goods are now revolved for one hour in the drum, in a solution made by dissolving 6 lb. of chrome alum, 3 lb. of sodium sulphate, 3 lb. of sodium chloride, and ½ lb. of potassium or sodium acetate in 3—6 gallons of water; these quantities being sufficient for 100 lb. of skins prepared for tanning.

It is claimed that by this method it is possible to produce a material which possesses the qualities of a chrome-tanned leather together with the characteristics of an alum-tawed skin.—M. C. L.

Extraction [Tanning or Dyeing Materials, &c.]; Method or Process of ——. P. Gulden. Eng. Pat. 16,716, Sept. 19, 1900.

See under IV., *page* 38.

Hides and Fibrous Materials; Apparatus for Treating ——. J. F. Lester, Atalanta, U.S.A. Eng. Pat. 17,480, Oct. 2, 1900.

THE claim of this invention is that the tanning or cleaning may be accomplished without removing the material under treatment from the chamber in which it is placed. For the apparatus used for such treatment, the combination is claimed of "a suitable chamber for containing the material, one or more independently-controlled fluid tanks, a supply pipe for creating a pressure within the chamber, a valve regulating the supply of fluid to the pump, and a valve-controlled discharge-pipe."—M. C. L.

XV.—MANURES, Etc.

Thomas Slag; Detection of Mineral Phosphate in ——. N. von Lorenz.

See under XXIII., *page* 69.

XVI.—SUGAR, STARCH, GUM, Etc.

Beetroot Juice; Krause's Method for Determining the Purity of ——. H. Claassen. Bull. de l'Assoc. des Chim. de Suer. et de Dist. 1900, **18**, [4], 250—251. From Centralbl. Zuckerind. 1900, [41], 809.

THE hydrometer used by Krause is graduated in two ways, one giving the actual degree Brix of the digestion juice, the other, that of the original juice of the beetroot. The calculation has been established as follows:—Since 104·2 grms. of pulp contain 4·2 grms. of marc, the dilution of the juice is 100 grms. to 400 c.c. If the beetroot juice be 11° Brix, the diffusion juice is 2·715. The polarisation found, relates not to 25 grms. of beetroot juice, but to 26·048 grms. of pulp. Krause calculates thus:—2·715 × 26·048 ÷ 25 = 2·8288° Brix, which corresponds to 11° Brix of the original beetroot juice. The figure 11 of the Brix scale is therefore placed opposite the figure 2·8288 of the Brix scale of digestion juice.

The author, however, pronounces strongly against the use of too fine a pulp, for it is difficult to weigh exactly, and gives trouble from froth.

It remains to be determined if the duration of the digestion has an influence on the result, if the solid constituents of beetroot marc may not gradually dissolve, and thus influence the readings of the hydrometer, and if there is inversion of sugar. Further, it remains to be proved that digestion without acetate of lead gives the same polarisation as the ordinary method with acetate of lead. These various points should be definitely fixed before the new method is allowed to make its way into practice.—L. J. de W.

Diffusion Juice by the Separation Process; Purification of ——. A. V. Bull. de l'Assoc. des Chim. de Suer. et de Dist. 1900, **18**, [4], 252. From Die deutsche Zuckerind. 1900, [29], 1166.

IN a preceding number of the same journal, Szyfer has drawn attention to the purification of raw juice by the process elaborated by Steffen for desaccharifying molasses. In laboratory tests a sucrate was obtained of 96·70 purity, leaving 0·65 of sugar in the waste liquors. On the large scale, after evaporating the juice obtained by decomposing the sucrate with carbonic acid, a syrup of purity 96 was obtained. In another case, on treating a diffusion juice of purity 88·30, a syrup was obtained of purity 96·61, and saline quotient 53·13; the exhaustion of the beetroots had been pushed to the extreme, and the scums of the decomposition of the sucrate still contained 1·90 per cent. of sugar.

In criticising Szyfer's experiments, the author states that the separation of sugar as saccharate is difficult in solutions containing more than 7 per cent. of sugar. The idea of applying the separation process to diffusion juice has already been entertained by Stammer, but the cost, considering the considerable quantity of lime necessary, prohibited its application industrially. Desaccharifying molasses by separation is practised in factories where the tri-saccharate is used in place of lime in defecating diffusion juice at the first saturation, so that there is no longer an excessive consumption of lime. The conditions for properly carrying out the separation have been indicated by Steffen in his patents and still hold good.

Szyfer thinks that only 7 to 8 of lime should be used per 100 of beetroots, but this quantity would be too small for roots containing 14 to 16 per cent. of sugar, for hitherto it has been considered that 80 of lime per 100 of sugar is necessary to give a satisfactory result in separation. In any case 8 per cent. is already three times the amount actually required. The cost of manufacture would be considerably increased, and the present plant insufficient.—L. J. de W.

Sugar Liquors; Influence of Alkalinity on ——. Zscheye. Bull. de l'Assoc. des Chim. de Suer. et de Dist. 1900, **18**, [4], 254. From Die deutsche Zuckerind. 1900, [30], 1194.

THE principal cause of the grey colour of sugars is the solubility of salts of iron in sucro-calcic solutions. It is advisable to saturate at the second carbonating to about 0·03 of alkalinity, calculated as lime, so as to decompose all the sucro-calcic compounds formed during defecation, and to precipitate the iron salts which have entered into solution. It must also be noted that the organic acids set free by sulphurous acid, likewise dissolve the iron in the juice, and the presence of small quantities of invert sugar may have the same effect. In any case a certain alkalinity must be maintained at every stage. These observations have been confirmed by Strandes. In a new factory no sulphurous acid is used, but the lime is allowed time to act on the juice, and by boiling and agitation, the defecation is effected under conditions favourable to a full purification. The sugars obtained are always of a fine yellow colour.

—L. J. de W.

Third-Jet Sugar and Molasses; Composition of the Insoluble Matter of ——. H. Pellet. Bull. de l'Assoc. des Chim. de Suer. et de Dist. 1900, **18**, [4], 193—194.

WHEN molasses and solutions of certain sugars of low quality are examined, they are found not to be absolutely clear, but the turbidity persists and does not collect rapidly at the bottom of the vessel. This insoluble matter was collected by filtration and analysed.

Third jet sugar gave 0·264 grm. of insoluble matter per 100 grms. of sugar. After ignition there remained 0·130 grm., or about 50 per cent. of organic matter as loss.

Molasses gave a total residue of 0·0467 grm. per 100 grms. of sugar, containing 42 per cent. of organic matter.

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The mineral residues gave the following results :—

——	3rd Jet Sugar.	Molasses.
Silica soluble in alkalis	74·7	97·9
Sand	5·7	Nil.
Alumina and peroxide of iron..	7·6	0·6
Lime	9·1	1·5
Sulphuric acid.....	2·6	Traces.
Copper	Traces	..
Various (phosphoric acid, nil)..	0·3	..
	100·0	100·0

It appears that these insoluble substances, apart from organic matter, consist of silica soluble in alkalis, which is found in the products as gelatinous silica. The composition will evidently vary with the method of working adopted in the sugar factories, and the study of these deposits may serve to explain many obscure facts in manufacture.—L. J. de W.

Sugar; Action of Ozone in the Manufacture of ——. Herzog. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1900, **18**, [4], 252—254. From Die deutsche Zuckerind. 1900 [30], 1197.

From an examination of recent publications on the action of ozone on sugar and beetroot and factory juice, the following conclusions are drawn, *viz.*:—that the subject requires a more thorough study before it can be proved that there is no danger of destruction of sugar; that the influence of ozone on beetroot juice appears to be directed to the destruction of those constituents which give it its characteristic odour and taste; and that there has been no proof of an increase in the quotient of purity or of a strong decolorisation by the action of ozone alone.—L. J. de W.

Beetroot Diffusion Juice; Warm Diffusion and Warming ——. M. Melichar. Zeits. Zuckerind. Böhmen, 1900, **25**, [1], 8—15.

In criticising Claassen's views on diffusion, the author divides the heat into the useful portion which is carried by the diffusion juice, and the lost heat which is left in the spent pulp and waste waters.

With the high price of fuel at the present time, it is desirable to consider whether diffusion shall be carried out in the old costly way as hitherto, or the so-called hot diffusion shall be adopted, in which the highest diffusion temperature is given to the first diffuser which is filled with fresh chips.

With regard to the proposal to heat cooled diffusion juice with open spent steam from the quadruple effect, it is pointed out that there exist heaters with high transmission coefficient, which are capable of readily heating the juice without dilution; moreover, diluted juice necessitates an increase of surface of evaporation in addition to the direct disadvantage.—L. J. de W.

Diffusion Juice and Massecuites; Organic Acids Extracted by Ether from ——. K. Andrlik, K. Urban, and V. Stanek. Zeits. Zuckerind. in Böhmen, 1900, **25**, [2], 83—89.

In diffusion juices organic acids extractible by ether vary greatly in quantity; their acidity ranged from 24·5 to 39·4 c.c. of normal alkali per 100 grms. of sugar, mean 29·1 c.c. The above figures, however, are not to be considered as limits. Of this acidity, oxalic acid accounts for from 7·6 to 15·3 c.c., mean 10·77 c.c., of normal alkali. Acids volatile with steam were only present in small quantities, equivalent to from 1·4 to 3·3 c.c., mean 1·9 c.c., of normal alkali per 100 grms. of sugar. Only a portion of the organic acids gets through into the massecuite, numbers corresponding to from 6·1 to 14·2 c.c., mean 9·3 c.c., of normal alkali were obtained. Including the oxalic acid, 68 per cent., or about two-thirds, of the organic acids are removed by the saturation processes; excluding the oxalic acid, of which only very small traces remain after saturation, 49·3 per cent., or about one half, of the other acids are removed.

The quantity of organic acids extractible with ether, varies with the season; the mean difference between the organic acids of the massecuites of two seasons corresponded to 3·8 c.c. of normal alkali per 100 grms. of sugar. Apparently the quantity of organic acids extractible with ether increases during the boiling of the syrups; the increase observed up to the final molasses, corresponded on an average to 0·52 c.c. of normal alkali per 1 per cent. of ash. The quantity of volatile acids increases during saturation and evaporation up to the first massecuite; this increase amounted to 51 per cent. of the volatile acids originally present in the diffusion juice.—J. F. B.

Filtration [Sugar] through Animal Charcoal. F. Stolle. Zeits. Ver. deutsch. Zucker-Ind. 1900, **50**, [537], 872—883.

An attempt is made to determine the quantity of the constituents of revivified char which are dissolved by varied treatment in the filter. Revivified char was preferred, since the employment of new char for refined liquor is exceptional. 35 kilos. of the char are put into a malleable iron filter, 6 ft. long, and washed with water at 30°, 50°, and 80°—90° C. for two days, samples being taken every few hours, the water having a head of 6 ft., and being run at the rate of 1 litre in 7 minutes. In each case both water and char are analysed. Previous to each experiment the char, after fermentation, is treated with caustic soda, then with the calculated quantity of hydrochloric acid, and with frequently renewed boiling water until the washing water is neutral. It is then passed through a Klusemann washing machine, dried thoroughly, and carefully burned at a temperature of 500° to 550° C., and finally packed in the filter for the experimental washing.

With water at 30° C., 28 hours elapse before the water is free from calcium and sodium sulphates; sodium chloride and carbonate show for some time afterwards. Calcium carbonate begins to appear when the sulphate is absent. Calcium sulphide could not be detected; iron, only in the first sample.

With water at 50° C., sodium sulphate disappears after 8 hours washing, calcium sulphate after 12 hours, sodium carbonate after 17 hours, and sodium chloride after 22 hours. Calcium carbonate begins to show at the eighth hour and before the sulphate is absent. Ammonia, even after 12 hours, can be quantitatively determined, and traces of iron show throughout.

When water at 80°—90° C. is used, calcium sulphate, sodium chloride, and sodium sulphate disappear after 8 hours, and sodium carbonate after 12 hours. The solution of calcium carbonate begins after 4 hours, while the sulphate is still present. Iron is present in traces throughout, and ammonia in measureable quantities for 12 hours.

When steam was passed through, the condensed water showed the same percentage of calcium sulphate throughout the experiment, but calcium carbonate was not dissolved. The following table shows the composition of the char :—

Temperature of Water.	A.	B.	30°	50°	80°—90°	Steam.
Carbon	8·140	6·138	7·086	7·032	7·150	6·984
Sand and clay .	0·308	0·466	0·519	0·330	0·234	0·416
Calcium carbonate.	10·28	7·187	6·590	6·590	6·570	7·100
Calcium sulphate.	0·0717	0·058	0·009	0·016	0·0105	0·0433
Calcium sulphide.	0·132	0·040	0·0014	0·0783	0·121	0·0634
Nitrogen (Kjeldahl).	1·044	0·549	0·5236	0·6003	0·678	0·686

Column A. is new char before use. B. the revivified char after being frequently used; this was the char taken for the experiments.—L. J. de W.

Beet-Molasses; Presence of Lactic Acid in ——. A. Schöne and B. Tollens. Zeits. Vereins deutsch. Zucker-Ind. 1900, [538], 980—981.

Since lactic acid is formed by the action of lime or strontia on aqueous solutions of cane sugar at 100°—125° C., the

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probability exists that the acid will be present in beet-molasses, and this supposition the authors confirm. Of 13 samples of molasses examined, eight contained lactic acid in such a quantity that it could be separated and converted into zinc lactate, identified by analysis; in the others, the acid was detected qualitatively. The authors conclude, therefore, that lactic acid is a constant constituent of beet-molasses —H. T. P.

Cane Sugar; Action of Strontia upon Solutions at 125°—128° C., of ——. A. Schöne and B. Tollens. Zeits. Vereins deutsch. Zucker-Ind. 1900, [538], 978—979.

THE authors have carefully examined the changes occurring when a saccharose solution is heated with strontia, under pressure at 125°—128° C., and find, that although small proportions of lactic acid and other decomposition products are formed, no trace of raffinose is produced. The same result has already been shown to obtain when cane sugar solutions are heated to 100° C. with lime or strontia.. It is concluded, therefore, that the raffinose present in beet-molasses, pre-exists in and is wholly derived from the beet, and is not formed during the manufacturing process.
—H. T. P.

PATENTS.

Sugar; Method and Apparatus for Refining ——. J. Robin-Langlois, Paris. Eng. Pat. 23,134, Nov. 20, 1899.

THIS invention consists of devices for quickly refining sugars by taking them in the raw and crystallised state and then washing, turbining, drying, and grinding, for the purpose of agglomeration into a pasty mass. The claims are for apparatus for carrying out the different processes.
—J. L. B.

Saccharine and other Crystallisable Liquids; Concentration and Crystallisation of ——. Process and Apparatus for ——. J. McNeil and C. McNeil, Govan, Lanarkshire. Eng. Pat. 23,598, Nov. 27, 1899.

THE crystallisation of saccharine and other crystallisable solutions is carried out in a series of vessels all working under diminished atmospheric pressure and heated by exhaust or low pressure steam. The first vessel works intermittently by drawing in charge after charge of the liquid to be treated, bringing each to a hot saturated condition, then forming the grain and dropping it into a vessel placed underneath. From this receiver the mass is drawn up to the second vessel in the series and some syrup or thick juice is run in to increase the size of the grain. The mass then passes into the third vessel where more syrup is added, this process being continued throughout the series.
—J. L. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Glycogen in Yeast; Appearance and Disappearance of ——. R. Meissner. Centralbl. Bakteriol. (II. Abth.), 1900, **6**, 517; through Woch. für Brau. 1900, **17**, [45], 669—670.

WORTMANN observed in certain cases of fermentation of wine musts that the carbonic acid evolved, was in excess of the amount calculated from the sugar consumed. This was noticed especially in the later stages when the fermentation was of protracted duration. He attributed it to the consumption by respiration of the reserve materials of the yeast: glycogen and fat. In 1895, Will studied the formation of glycogen in the yeast cell under favourable nutrition and its disappearance during auto-fermentation. Laurent found that the glycogen might amount to 32·58 per cent. of the dry substance of the yeast. Lindner has observed the formation of glycogen at the expense of other dead cells. The author finds that the dilute solution of iodine often only gives a yellow coloration, and recommends a solution containing 20 parts of potassium iodide and 7 parts of iodine in 100 of water; this gives a sharp and rapid coloration. The reaction was obtainable in the case of yeast from must cultures 22 hours old, even with daughter cells having a diameter one-fifth of that of the mother cells; younger buds only showed a yellow coloration. Some races only gave the brown reaction after some time; others showed it immediately after the first yellow coloration. The author confirms the observation of Will and Lindner that the distribution of glycogen is very irregular. During the secondary fermentation, glycogen was still detected after some time, both in quiescent and fermenting cells. In wine fermentation the quantity of glycogen is greatest at the end of the primary fermentation, after which it gradually decreases. Whilst still a fair amount of sugar is unfermented a number of the cells pass into the quiescent stage and lose some of their glycogen; this change is recognised by the granular structure of the cell contents and the shrinkage of the cells; the quiescent cells are less resistant to iodine, and give the glycogen reaction at once. The rate of disappearance of glycogen varies with different races; some cells containing glycogen are found even in starved deposits. It does not do to wait for the disappearance of all the glycogen before separating the yeast from the wine. The production and consumption of glycogen in the cells may proceed simultaneously. The author regards the glycogen as a "transitory" reserve material which secures a constant supply of sugar for the yeast, and aids it in its struggle for existence.—J. F. B.

Zymase from Sterilised Yeast. E. Buchner. Ber. 1900, **33**, [17], 3307—3310.

THE author has amplified his previous observations on the preparation of active zymase extracts from yeast previously dried and sterilised. Bottom-fermentation beer yeasts were carefully dried at a pressure of 30 mm., at temperatures ranging from 35° to 100° C. The dried yeasts were then subjected to the action of dry heat in a current of hydrogen for a considerable time, namely, for from 8 to 10 hours, at temperatures ranging from 95° to 110° C. To meet possible objections, all the preparations were then tested for sterility by careful observation of their behaviour in beer wort for three weeks. All the preparations having been proved sterile, they were then extracted by trituration with a 10 per cent. solution of glycerin in water, with the aid of sand and kieselguhr. After pressing, extracts were obtained which were still active to an extent varying from one quarter to one half of the activity of the extracts prepared from the fresh yeast. Thus a considerable quantity of active zymase was recovered in spite of the high temperature and the loss of zymase attendant on the manipulations and imperfect solubility in the dry state. To the author's mind, the above results conclusively dispose of the theory advanced to explain the fermentative activity of his extracts by the presence of living protoplasmic residues.—J. F. B.

"Zymase, Buchner's"; Remarks on the Paper by Macfadyen, Morris, and Rowland on ——. E. Buchner. Ber. 1900, **33**, [17], 3311—3315.

THE author considers that several points in the paper by Macfadyen, Morris, and Rowland (this Journal, 1900, 1127), dealing with the preparation and properties of expressed extracts from English top-fermentation beer yeasts, are open to criticism. In the first place, the bibliography of the English authors is not quite complete, no notice being taken of Lange's work on top-fermentation distillery yeasts (this Journal, 1898, 779), amongst others. Certain apparent discrepancies are found in regard to the relative effect of the extracts on different sugars. In some cases glucose is fermented twice as strongly as maltose, and in other cases the relations are exactly reversed; the only difference in the extracts producing these results lies in the age of the yeast before extracting. Again, in regard to the action of antiseptics, discrepancies of a similar nature are noticed; in some cases toluene has a greater retarding effect than thymol; in others, thymol is more inhibitive than toluene. Buchner comments on the general weakness of the fermentative power of the extracts prepared by the English authors; very few samples were as active as Buchner's extracts, whilst many possessed less than half the normal activity. It is also pointed out that with concentrations of sugar below 20 per cent., such as were largely used by the English authors, the mere addition of thymol is not sufficient

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to suppress the activity of micro-organisms. Top-fermentation yeasts are always more or less impure, and with such low concentrations of sugar, the authors' results are vitiated in the absence of proof of the sterility of their liquids. Finally, Buchner refers to one of his former papers (this Journal, 1899, 778) on the question of the so-called "auto-fermentation" of the extracts. In that case he had determined the "auto-fermentation" in extracts of Munich yeast, and he now gives results of experiments with Berlin yeast. The quantity of gas evolved by the latter without addition of sugar is somewhat higher than in the case of the Munich extracts, probably owing to a higher content of glycogen, but it never exceeds 10 per cent. of the total quantity of gas evolved when sugar is added. The very large quantities of gas evolved by the extracts from the English yeasts without sugar may be due to glycogen, or very probably to the activity of bacteria.—J. F. B.

"Zymase; Buchner's ——"; Enzyme Theory versus Plasma Theory. Windisch. Woch. für Brau. 1900, **17**, [46], 681—682.

CONTRIBUTING to the discussion on the paper of Macfadyen, Morris, and Rowland (this Journal, 1900, 1127), the author first remarks on the extreme difficulty at first experienced in preparing active yeast extracts. The very erratic results might be explained by assuming that zymase is not secreted and stored up in large quantities, but is only formed when there is work for it, that is, under the stimulative influence of the presence of sugar. When the yeast is removed from the fermenting liquid, the small quantity of zymase would be rapidly digested, and no more would be formed. Bottom-fermentation yeasts are always fully immersed in the saccharine medium, and are kept at low temperatures. Top-fermentation yeasts are exposed to the air, and, owing to their position at the surface of the liquid, they are not in constant contact with saccharine wort; moreover, at the high temperatures employed in English breweries, they are far more susceptible to the action of the proteolytic enzyme. The author quotes numerous instances in nature where the secretion of an enzyme is determined by excitement due to the presence of the particular substance which it attacks, *e.g.*, the animal digestive enzymes, &c. Lange's work showed that the extracts from top-fermentation distillery yeasts were less active than those from bottom-fermentation brewery yeasts, and also contained less nitrogen. How far the weaker activity of the extracts from top-fermentation yeast depends on the particular conditions of growth outlined above remains to be investigated.—J. F. B.

Aspergillus Niger; The Proteolase of ——. II. G. Malfitano. Ann. de l'Inst. Pasteur, 1900, **14**, 60; through Woch. für Brau. 1900, **17**, [46], 690.

THE enzyme has the character of a proteolytic diastase, very similar to papaïn and the proteolytic enzyme of malt. It acts upon gelatin, nucleoproteins, globulins, and albuminates, but it only attacks albumin if the latter has undergone a previous decomposition, since it cannot dissolve coagulated albumin. The particular reaction of the medium most favourable to its activity is that of neutrality towards Methyl Orange, that is, acidity due to acid phosphates.

—J. F. B.

Fermentation Vats [Distillery]; Tar Coating for ——. G. Heinzelmann. Zeits. Spiritusind. 1900, **23**, [48], 438. (Compare also this Journal, 1900, 839 and 761.)

FURTHER evidence is now to hand that the tarring of the vats inside can be effected without any damage to the course of fermentation, and to the use of the more solid matter of the spent wash as fodder. A good way of applying the tar, so as to avoid any subsequent ill effects, is to use it boiling. At the end of the season, when the vats have dried, a coat of boiling coal-tar is given; it is allowed to remain a fortnight before applying a second coat. In this way sufficient time is afforded before the next season for the coating of tar to become perfectly hard and harmless. Tar should certainly never be applied shortly before the vats are required for use. The removal and oxidation of the objectionable volatile constituents of the tar are considerably facilitated by its application whilst boiling; the boiling tar also penetrates the wood more readily.

The main object in tarring the vats is to dispense with the trouble of having to lime them every time after emptying, and it is sufficient to wash them with warm water, finishing up with a thorough brushing. But this latter operation is sometimes omitted by the workmen, and, since it is absolutely essential, it is best to sprinkle the tarred vats with lime, and then insist on its being brushed off. The use of lime is an additional safeguard, as growths of moulds can occur even on tarred surfaces. Moreover, the use of lime destroys the organisms which have lodged on the copper cooling worms, and which are not removable by the hose alone.—J. F. B.

Potato Spirit from the Mashing Space; High Yields of ——. Schirmann. Zeits. Spiritusind. 1900, **23**, [48], 438.

THE author complains of the large number of fraudulent processes purporting to give higher yields of spirit per cent. of the mashing capacity. Whilst not denying that yields of 12 per cent. and more can be obtained with good materials and up-to-date plant, he holds that those people who state that high yields should be the rule and not the exception, do so out of ignorance.

In obtaining a high yield, the first question that arises is whether it is obtained economically, and without a great waste of starch. Whilst frequently obtaining a yield of 12 per cent. from his mashing space with good potatoes, the author also very often has the greatest trouble in getting 9·5 per cent. with potatoes poor in starch.

It is more important to utilise the whole of the raw material efficiently than to obtain high yields at a loss. Concentrated mashes are frequently difficult to attenuate down to the lowest gravity (less than 1° Balling is often demanded), on account of certain properties and constituents of some kinds of potatoes.—J. F. B.

Fermentation Gases; Utilisation in the United States of ——. H. Medinger. Woch. für Brau. 1900, **17**, 701—702.

IN the Milwaukee breweries the methods of Schlitz and Pabst are in use. Fermentation is carried out in the settling tank (capacity, 320 hectolitres) and in fermenting vats (capacity, 110—120 hectolitres). The vats are provided with two openings, one carrying a pipe for conducting the gas to a receiver, and the other for introducing the yeast and other manipulations; sometimes an observation glass is also provided.

The wort is made from malt, with maize or rice adjuncts; it comes from the brewing house into a collecting tank; it then passes through the coolers into the settling tank. Here it is pitched with yeast and aërated four times in 36—48 hours for five minutes with filtered air. The further fermentation is conducted in the fermenting vats, in which the wort is cooled, sometimes as low as 1·5° C., and remains 10—14 days without aëration. The gas is collected from both the settling tank and the fermenting vats. The covers of the vats are kept saturated with water to prevent shrinkage of the wood. In some New England breweries the gas is freed from bad-smelling impurities and pumped into the Lager vats under pressure, whereby, it is said, the ripening of the beer is considerably hastened.

Wittemann, of New York, has introduced a process which is said to work very well: the gas flows at a pressure of about $\frac{1}{2}$ lb. per sq. in. into a carbonic acid factory, where it is treated by a special process and compressed. In a Californian brewery the gas is used without purification for gassing the beer, but the latter has not a good flavour. The collection of the gases of fermentation is especially advantageous to those breweries which cask their beer under pressure before bottling. The cost of the American method is not great; in one case known to the author, the

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alteration cost 525*l.*, and was borne by the carbonic acid factory, the cost of the gas to the brewery being reduced to one-twentieth.—J. F. B.

Melitriose [Raffinose]; Is a Special Enzyme required for the Hydrolysis, by Micro-organisms of ——? A. Bau. Woch. für Brau. 1900, **17**, [47], 698.

In their paper on certain species of Amylomyces (this Journal, 1900, 1128), Sitnikoff and Rommel suggest that, since glucose is fermented but raffinose is not hydrolysed by some of the species, this sugar may require the presence of a special enzyme for its hydrolysis. The author points out that those species which did not hydrolyse raffinose also had no effect upon cane sugar. He lays great stress on the close analogy between the nature of the attachment of the fructose group to the melibiose residue in raffinose and that of the fructose and glucose groups in cane sugar. Both sugars are non-reducing, and both are very easily split up by weak acids into reducing sugars; and, since Fischer proposed the formula $C_6H_{11}O_5—O—C_6H_{11}O_5$ for cane sugar, the author thinks that a similar argument will apply for the connection of fructose to melibiose to form raffinose, *i.e.*, $C_6H_{11}O_5—O—C_{12}H_{21}O_{10}$. The author grants that the anhydride linkage between the glucose and galactose groups of melibiose is of quite a different nature; melibiose is only split by strong acids (mineral acids and oxalic), and requires the presence of a special enzyme, melibiase, for its hydrolysis before fermentation. But he holds that the ordinary cane-sugar enzyme, invertase, is sufficient for the resolution of the simple —O— connection, and that, whenever invertase is present, raffinose [melitriose] is split up into fructose and melibiose.—J. F. B.

Invertin or Invertase in Grapes; Presence of ——. V. Martinand. Comptes Rend. **131**, [20], 808—810.

The must of grapes, made after careful cleansing and sterilising of their outer surface, was found to contain invertase, which was identified by the temperature of its maximum activity, and by the influence of acetic acid on that activity. Unit quantity (that capable of inverting 0·2 grm. of sucrose in an hour, at 56° C., in presence of 1 per cent. of acetic acid) was contained in from $\frac{1}{10}$ to $\frac{1}{5}$ c.c. of the must of various grapes. The same amount was found in the extract from 2·5 grms. of fresh vine leaves. The amount in the grape is more than enough to invert all the sugar it contains. When the invertase in the must is destroyed by heat, the wine formed from it contains practically no invertase, while that made from the fresh must contains it in considerable quantity. Invertase in wine, then, comes as a rule from that in the must, not from the fermenting yeast. This diastase does not oxidise so readily as some others, for it is contained in considerable amount in the must made from currants which have been allowed to take up again their natural water by soaking, while the oxidising diastase contained in the fruit is oxidised and destroyed in the drying process. Invertase disappears altogether, however, in the oxidising disease of "*casse*," as well as in the microbian diseases known as "*tourne*" and "*pousse*."—J. T. D.

American Wines; Composition of ——. W. D. Bigelow. U.S. Dept. Agric. 1900, Bulletin No. 59.

This bulletin contains tables giving the results of analyses of 845 samples of American wines of known origin from the various wine-producing States. The largest number of analyses relate to the wines of California, the material from the other States being as yet rather meagre. For purposes of comparison, the reports of the German "Weinstatistik Commission" are quoted on the subject of European wines.

Alcohol.—The American wines generally contain a higher percentage of alcohol than the European; this is especially the case with the wines produced in the warmer parts of California. Fermentation does not yield more than 14·5 grms. of alcohol per 100 c.c.

Glycerin.—Unfortunately many of the analyses of American wines do not include determinations of the glycerin; the results obtained ranged from 0·163 to 1·083 grm. per 100 c.c. The German authorities quote limits from 0·4 to 1·0 grm. per 100 c.c., with extreme cases of 0·2 and 1·39 in rare instances. The glycerin content of American wines, so far as has been determined, is lower than that of European wines.

Glycerin to Alcohol Ratio.—This ratio is considered of great importance in judging the purity of wine. The later German statistics put this ratio at from 6 to 14 parts of glycerin per 100 of alcohol. The glycerin-alcohol ratio of American wines of known purity often falls below the minimum limit of 6 per cent.

Sugar-free Extract.—This is got by subtracting the sugar, —0·1 grm., and, in the case of plastered wines, the potassium sulphate, —0·1 grm., from the grms. of total extract per 100 c.c. According to the later opinions, the minimum limit should be 1·6 grm. per 100 c.c. for white wines and 1·8 for red wines in Europe. For Californian wines, Curtis puts the average extract at 2·90 for red wines and 2·0 for white (six months old), or 2·65 for red and 1·75 for white (two or three years old). He regards with suspicion a red wine lying outside the limits 2·4—3·25 and a white wine outside 1·5—2·4 grms. of sugar-free extract per 100 c.c.

Ash.—The German commission puts the limits of ash between 0·44 and 0·11 grm. per 100 c.c., regarding with suspicion anything less than 0·14 or more than 0·35. The American wines answer to this specification, and the same standards may be applied. Curtis gives the average ash contents of American wines as 0·28 grm. per 100 c.c. for red and 0·21 for white wines.

Extract to Alcohol Ratio.—This ratio is used as a test for the fortification of wine by added alcohol or its dilution with water. This ratio is not included in the tables for American wines in this bulletin.

Total Acid.—The acidity of European wines lies between 0·4 and 1·5 grm. per 100 c.c., calculated as tartaric. The acidity may vary during ageing. The acidity of Californian wines (six months old) averages 0·525 grm. per 100 c.c. for red and 0·570 for white; less than 0·450 is suspicious.

Volatile Acid.—The high volatile acidity of American wines is undoubtedly largely due to imperfections in the methods of fermentation. But it is very probable that with equal perfection, the volatile acids of American wines would still be higher than in European wines. For Californian wines up to three years old, Curtis proposes a volatile acidity of 0·14 per cent., as against the German maximum of 0·12 per cent. There has been a great improvement as regards volatile acids in American wines in recent years.

Reducing Sugar.—Imperfect fermentation also accounts for a high percentage of reducing sugar; for this reason American dry wines often exceed the 0·1 grm. per 100 c.c. which is regarded as the standard for European wines.

Plastering is of rare occurrence in American wines.

The remainder of the bulletin contains full descriptions of the analytical methods employed and the tests for the detection of various preservatives.—J. F. B.

"Saccharin" in Wine and Beer in the Absence of Salicylic Acid; Detection of ——. F. Wirthle.

See under XXIII., *page* 72.

Yeast from Grain Distilleries; Classification as a Foodstuff and Examination of ——. S. Rohn.

See under XVIII. A., *page* 58.

Methyl Alcohol in Mixtures; Detection of ——. S. P. Mulliken and H. Scudder.

See under XXIII., *page* 71.

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XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Meat Extracts; The Food Value of ——. L. Fürst. Chem. Zeit. 1900, **24**, 994—995.

After reviewing the various statements made by Bremer, König, Bömer, and others, concerning the true nutritive constituents of meat extracts, the author comes to the conclusion, already generally accepted, that the proportion of albumoses, peptones, and albumins in the extracts is too small to give any food value to the same.

The amount of extract usually taken is too small to have any but a stimulative effect.—W. P. S.

Yeast from Grain Distilleries; Classification as a Foodstuff and Examination of ——. S. Rohn. Zeits. Unters. Nahr. und Genussmittel, 1900, **3**, [11], 756—763.

By a recent enactment, pressed yeast for bakers' use has been brought under the foodstuff laws in Germany. It must be the pure product of the fermentation of grain, and must not be mixed with potato flour nor with beer yeast.

Detection of Potato Flour.—For small quantities, up to 2 per cent., the best means of detection and estimation is the microscope. With higher proportions, the granules cannot be counted with sufficient accuracy to give reliable results. One or two per cent. of potato flour does not necessarily indicate wilful adulteration, as the yeast may become contaminated to this extent by using the presses, vessels, and pipes for other purposes. There is as yet no really good method for the quantitative estimation of starch in yeast; the author suggests that an iodine colorimetric method or a saccharification method might be worked out successfully.

Detection of Beer Yeast.—An expert has no difficulty in distinguishing grain-fermentation yeast from beer yeast when both are pure, either by taste or by the small black specks of hop resins present in the latter. But to determine the composition of mixtures is a very difficult matter, especially when the proportion of beer yeast is less than 25—30 per cent. The only chemical test is the behaviour towards raffinose (Bau, this Journal, 1898, 937). Beer yeasts of the bottom-fermentation type ferment this sugar completely, whilst the top-fermentation distillery yeasts convert it into melibiose. By this test the detection of less than 20 per cent. of beer yeast could only be effected by very careful comparative fermentations; moreover, the author has often met with distillery yeasts which ferment raffinose completely but slowly. Microscopic examination is useless for the detection of beer yeast in distillery yeast, owing to the numerous variations of both kinds.

Detection of Molasses Yeast.—The detection of yeast derived from molasses fermentation, when mixed with that of grain fermentation, is practically impossible. Even experts are unable to distinguish with certainty between the two kinds in the unmixed state. Since the number of pressed yeast factories working molasses is very small, the Government must resort to official supervision if it desires to control the sale of this kind of yeast.

Testing the Fermentative or Working Power of Yeast.—There is no absolute measure of the fermentative power of yeast; the most general method of testing is that of Hayduck and Meissl. The tests vary in different factories and have only a relative value, depending entirely on the conditions of manufacture and employment.

The yeasts of highest fermentative power are not always those most suitable for bakery purposes, and official tests are hardly called for.

The annual production of pressed yeast in Germany is 21 million kilos. from 954 distilleries.—J. F. B.

Oranges; Artificial Colouring of ——. Pum and Micko. Zeits. Unters. Nahr. und Genussmittel, 1900, **3**, [11], 729—735.

The authors contradict a statement made by Hotter of Graz, that "blood" oranges are often made artificially by injecting colouring matters under the skins of ordinary yellow oranges.

Extensive experimental trials showed that in no case could any staining of the orange be effected with natural or artificial dyestuffs which could possibly deceive the simplest purchaser after the orange was peeled.—J. F. B.

Tea; Theine in ——. J. Kochs. Rev. Cult. Colon. **7**, 494. Pharm. J. 1900, **65**, [1586], 537.

The author has determined the percentage of theine in several varieties of Chinese tea The samples were all pure, and had preserved their aroma owing to the packages having been hermetically sealed. The results of the analyses were:—Souchong, 2·83; Flower Pekoe, 4·36; Scented Tea, 3·08; Pouchong, 3·44; Congou, 3·83; and Oolong, 3·66 per cent. of theine. A Brazilian tea, Chà Morumby, contained 3·11 per cent. of theine. The market value of a sample of tea and its suitability for use depend not only upon composition, but also upon the appearance, aroma, and taste of both leaf and infusion. Tea from Assam, Ceylon, and Java is better packed, and consequently has more aroma than that from China and Japan. According to W. Krohn, formerly German Consul at Futschau, only the Chinese, scented Orange Pekoe tea is artificially flavoured. The author states that this tea is of excellent quality, and that the flavouring is in no wise an attempt to adulterate the article.—A. S.

Maize in Wheaten Flour; Detection of ——. G. Embrey. *See under* XXIII., *page* 72.

Maize in Wheaten Flour; Detection of ——. E. J. Bevan. *See under* XXIII., *page* 72.

Dulcine (Phenetol-Carbamide) in Foods and Beverages; Detection of ——. *See under* XXIII., *page* 72.

PATENTS.

Foodstuffs; Process and Apparatus for Preserving ——. J. J. Möller, Flensburg, Germany. Eng. Pat. 24,801, Dec. 13, 1899.

The apparatus for preserving foodstuffs or for disinfecting any articles consists of an inner vessel fitting loosely in an outer containing vessel. On the upper periphery of the outer vessel, two troughs or grooves are made, corresponding with two projecting flanges on the periphery of the lid, in such a manner that a double "liquid seal" is produced. The inner trough, which is in communication with the interior of the vessel, is filled with a readily volatile antiseptic, whilst the outer groove is filled with oil to prevent evaporation of the antiseptic into the air. A further receptacle also containing the antiseptic is suspended inside the vessel by a flange or lips from the top. In this way the vapours of the antiseptic come into contact with the contents of the vessel and efficiently preserve them from the action of bacteria.—J. F. B.

Milk, &c.; Pasteurising and Sterilising ——. E. von Bühler, Charlottenburg, Germany. Eng. Pat. 25,329, Dec. 21, 1899.

The milk or liquid to be treated is gradually heated in two batteries joined together according to the counter-current principle, each battery being composed of two or more pasteurising or sterilising apparatus connected together. In one of the two batteries the previously heated liquid is further heated by an independent heating medium; it is then passed to the other battery where its heat is utilised for the preliminary heating of a fresh supply of liquid.

—J. F. B.

Milk; Production of Condensed ——. A. Gürber, Würzburg, Germany. Eng. Pat. 25,484, Dec. 23, 1899.

Skimmed milk is concentrated by freezing out the water in the form of ice whilst rotating in a centrifugal machine. Freezing is effected by introducing a refrigerator cooled by

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brine into the rotating machine; as the ice accumulates, it is separated from the heavier concentrated milk by the centrifugal action. The cream may then be added to the condensed milk.—J. F. B.

Blood, Milk, &c. in the Form of Dry Powder; Obtaining the Solid Constituents of ——. R. Stauf, Posen, Germany. Eng. Pat. 14,724, Aug. 16, 1900.

THE process claimed is carried out by converting the liquid into a fine spray, bringing the spray of atomised liquid into contact with an ascending current of hot air, so that the liquid constituents are completely vaporised and the dry powder produced is collected. The apparatus consists of spray producing jets supplied with air under pressure, and a shaft through which a current of heated air passes into a spacious chamber in which the dry powder is deposited.—J. F. B.

Rennet Ferment; Preparation of ——. J. R. Hatmaker, London, from J. A. Just, New York. Eng. Pat. 877, Jan. 15, 1900.

A LIQUID extract of rennet is prepared by digesting the stomachs in a relatively weak solution of calcium chloride, afterwards adding additional calcium chloride to the extract in order to precipitate the mucus, which is then removed. For the extraction of the rennet, the inventor prefers an 8 per cent. solution of calcium chloride; this is then made up to 10—18 per cent. for the separation of the mucus; more than 18 per cent. of calcium chloride would precipitate the ferment. The calcium chloride solutions must be made perfectly neutral to litmus. Both the product and the process for making the same are claimed.—J. F. B.

Brewers' Spent Grains; Manufacture of a Food from ——. J. Schroeder and L. Diefenthal, Osnabrück, Germany. Eng. Pat. 11,639, June 27, 1900.

THE inventors claim the process for the manufacture of a food product, possessing many advantages, by mixing the spent grains from breweries or distilleries with substances containing gluten or other nitrogenous proteid bodies and then submitting the product to a baking process as in the manufacture of bread. The use of crude molasses in the mixture is also claimed. Crushed rye with a small proportion of flour, is mentioned as giving good results.

—J. F. B.

Carbonating Apparatus. E. E. Murphy, Boston, U.S.A. Eng. Pat. 14,136, Aug. 7, 1900.

IN a carbonating apparatus there are claimed, an inlet pipe for supplying liquid under pressure, a gas-inlet pipe for supplying gas under less pressure than that on the liquid, a mixing chamber for the gas and liquid in constant open communication with the liquid supply under initial liquid pressure, and normally filled with gas and liquid, a valve normally closing said gas inlet pipe by the pressure in said mixing chamber, and adapted to open automatically by the pressure of the gas, upon a reduction of pressure in the mixing chamber below the gas pressure to admit the gas which flows into the mixing chamber by its own pressure, independently of the flow of the liquid, means for subdividing and combining the gas and liquid," (a metallic sponge composed of layers of wire cloth), "means for retarding the flow of the liquid from the liquid supply pipe into the mixing chamber to allow the gas to fill the mixing chamber before it is filled with the liquid, a passage establishing communication between the mixing chamber and the storage reservoir, a valve controlling said passage, an outlet for the carbonated liquid from the storage reservoir, and a valve controlling said outlet." The liquid is admitted under a pressure of from 175 to 200 lb., and the gas at from 125 to 150 lb.—E. S.

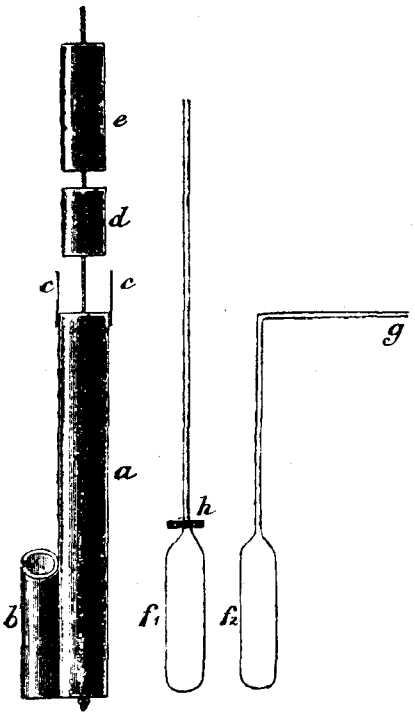
Albumin and Meat Extract; Preparation of ——. G. Deycke, Constantinople. Eng. Pat. 16,060, Sept. 10, 1900.

THE process for obtaining albumin from flesh, fish, &c., consists in finely chopping the material, treating it with a 2—3 per cent. soda lye at about 37° C., filtering, shaking the filtrate with ether, precipitating the albumin by means of dilute acid, freeing it from liquid, washing with alcohol and drying. The meat extract is prepared by mixing the liquid which was filtered from the albumin with alkali until it has only a slight acid reaction, concentrating, dialysing, and evaporating to dryness.—J. F. B.

(*B.*)—SANITATION; WATER PURIFICATION.

Water; Apparatus for taking Samples of ——, *for Bacteriological Examination.* H. Röttger. Chem. Zeit. 1900, **24**, 873.

THE glass test-tube f_1, of 10—15 c.c. capacity, is drawn out to a capillary at the end. The capillary is bent at right angles in the middle, as in f_2; and after the apparatus has been sterilised by boiling water, it is sealed up vacuous. It is



then rested in a brass case *b*, soldered to a lead cylinder *a*, about 2 cm. wide and 20 cm. long, bored throughout its length to pass a cord by which the whole is suspended. At the upper end of the lead cylinder are soldered two brass wires, *c c*. In use, the bulb of the test-tube rests in *b*, and the bent capillary passes between *c* and *c*, which prevent it from twisting round; the loose lead cylinder *d*, threaded on to the cord, and the lead disc *h* resting on the glass portion of the apparatus, serve to keep it in place. The whole is then lowered by means of the cord to any desired depth, the depth being indicated by indicating strings attached to the cord at intervals of 1 metre. As soon as the capillary has reached the position from which the sample is to be taken, the lead cylinder *e*, hitherto held in the hand, is allowed to fall down the cord, the force of impact on reaching *d* serving to break the capillary. The vacuous bulb at once fills with water, and the whole is drawn up to the surface, whereupon the capillary is again sealed up to preserve the sample until it is required for examination.

—W. G. M.

Ferruginous Waters; Purification and Rapid Filtration of ——. O. Kröhnke. Zeits. angew. Chem. 1900, [46], 1154—1161.

WATER largely depends for its purity on the amount of natural filtration it undergoes, and this is proportional to the depth from which it is drawn. The water found in low-lying districts often contains iron, which, if present in a greater amount than 1 mgrm. per litre, seriously impairs the industrial value of the water.

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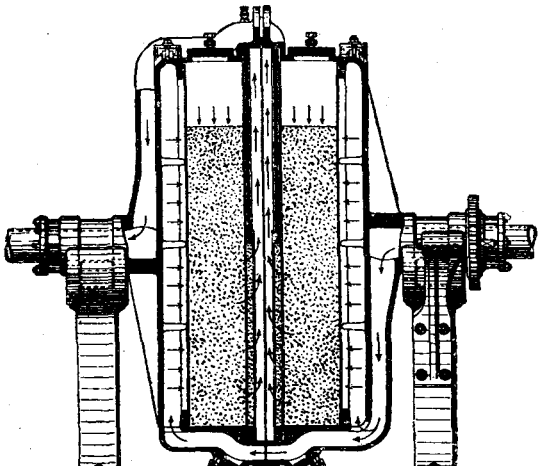
The methods of removing iron, however, are now so efficient, that the question of purification should always be considered before costly and uncertain borings are commenced for fresh sources. Iron is usually present as ferrous carbonate or bicarbonate, which on oxidation is converted into insoluble ferric hydrate with liberation of carbon dioxide. The mechanical shock of contact with angular particles, for example, with quartz sand, withdraws an appreciable amount of iron from solution, as laboratory experiments show. If the iron occur as sulphate, its removal is more difficult; chemical means must be employed, such as the addition of lime, magnesite, &c. The purification of potable waters requires extreme care and meets with little favour in Germany. The author reviews the methods of treatment applied to ordinary ferruginous waters, which all depend on oxidation followed by filtration. This may be attained by showering the water through the air and passing it through a surface filter.

A better method is to allow it to percolate through a bed of coke or brick, which after a time still further improves in efficiency, owing to the iron-mud which deposits in its lower layers, and the accumulation of organic matter which exerts a fermentative action. Various types of plant are referred to, including the common household expedients (the animal-charcoal filter and the "Leckfässer," common in some districts). The special advantages claimed for the Linde-Hess filter, consisting of wood-shavings impregnated with tin-oxide as an oxygen carrier, are considered illusory.

The filtering apparatus itself as distinguished from the oxidising portion, requires special consideration owing to the difficulty of effectually cleansing it. Surface filters are cleaned by raking over their contents with or without the aid of a stream of water or high pressure steam. Drum filters, which can be agitated, have many advantages. An American type, illustrated in the original paper, is rotated on a vertical axis, water under pressure being driven through in a reverse direction to that of filtration. The author exhibits a side elevation of the system adopted by the "Allgem. Städtereinigungsgesellschaft" in Hamburg, which consists of a large coke percolator made in sections, so that repairs can be effected without stopping the whole plant, and through which the water passes into a special filter, patented by himself. This is formed of a series of drums, any number of which can be coupled up as desired, mounted on a horizontal shaft. The internal arrangement will be seen from the annexed diagram:—



The water flows in at one end through the hollow axis, passes through the metallic sieve diaphragms into the chambers which are only partially filled with sand, and out again by the axis.

The special advantages claimed are the very large filtering surface and the rapid and effectual method of cleaning. For this, the drum or drums are whirled by the aid of a windlass, the loose sand scours itself thoroughly clean, and the dirt is washed out through the sides again by a current of water, the whole operation being automatic and occupying but a few minutes.—R. L. J.

Algæ; Soluble Colouring Matter of Blue-Green ——. R. Kolkwitz.

See under XXIV., *page* 77.

PATENTS.

Refuse Destructors. A. J. Liversedge, London. Eng. Pat. 23,209, Nov. 21, 1899.

THE combinations claimed include: two or more cells, separated from each other so far as the ash-pits and fire-grates are concerned, but communicating in their upper portions; a separate supplementary combustion chamber; a special supplementary air duct in the bridge, communicating with a source of air supply under pressure; special clinkering or charging doors with small supplementary openings and doors on their faces; a refuse-storage bunker with distributing and charging trucks, the bottoms of all being on the same level as each other and as the fire-grates of the cells; and an overhead railway with elevating apparatus and clinker trucks or barrows provided with means of attachment to the elevator.—C. S.

Refuse Consuming Furnaces or "Destructors." W. J. Glen, Leyton, Essex. Eng. Pat. 1743, Jan. 27, 1900.

THE opening through which the refuse is introduced is arranged so as to deliver the same direct on to the hearth, which latter, and the openings provided for stoking the charge, are placed at such a distance above the level of the fire-bars, that a body of incandescent fuel is always left ready to fire the next supply of refuse and maintain the combustion there.—C. S.

Disease Germs; Improved Means for Destroying ——. C. M. Johnson, Redhill, Surrey. Eng. Pat. 22,862, Nov. 16, 1899.

DISEASE germs are destroyed or expelled from the animal system by means of "an electric current of high voltage and low ampèrage, producing the violet or ultra-violet ray," which may be used alone or "in combination with medicines, drugs, and chemicals."—L. A.

Sewage to Filters or on to Land; Apparatus for Regulating the Delivery of Liquids, especially in connection with the Delivery of ——. D. Cameron, J. F. Commin, and A. J. Martin, Exeter. Eng. Pat. 18,322, Sept. 11, 1899.

REFERRING to previous specifications, Nos. 3003 of 1896 and 5671 of 1898 (this Journal, 1897, 459; and 1899, 511), a check-valve is placed in the siphon by which the actuating bucket is emptied, so that the filtered effluent from the filter previously filled, which fills the siphon, may not pass into the bucket thereby. The filling of the previous filter will, therefore, have no immediate effect on the filter under consideration, but when such previous filter is discharged, such discharge will cause the return, through the siphon, of the contents of the actuating bucket, which will then rise and permit the opening of the valve admitting sewage to the next filter in rotation.

Means are described for definitely storing sufficient liquid to fill a filter. These consist substantially of a valve actuated by a pair of floats immersed, respectively, in the liquid on the up-stream and down-stream side of the valve. A proper opening of the valve is secured by means of a weighted lever, connected with the floats in such a manner that it opposes their motion, but that such opposition becomes less as soon as such motion has commenced. The connection of the valve with the floats is made by means of a slotted link, in such manner that the motion of the float which opens the valve is not communicated to the latter until the float has risen sufficiently to cause the weighted

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lever to become overbalanced. The valve is then lifted right off its seat, and cannot again close until the liquid on the upper side of the valve, has fallen sufficiently to cause the buoyancy of the second float, added to the weight of the first, to again overbalance the lever in the reverse direction.

In order to facilitate the opening of the admission valve to a filter, a cylindrical counterweight is suspended from the valve lever within the discharge well of the filter supplied by such admission valve. When the discharge well fills, the weight of the cylinder will be wholly or partially neutralized, and will therefore not oppose the closing of the admission valve to the same extent as it would if the cylinder were still suspended in air.

An improved inlet for admitting crude sewage to a septic tank, furnished with a flap-valve for closing the opening if desired, is also described.—L. A.

Bacterial Treatment of Sewage Effluent and the Like. R. F. W. Smith and the Pioneer Investment Trust, Ltd., London. Eng. Pat. 550, Jan. 9, 1900.

SEWAGE effluent which has undergone treatment in a bacteria bed or septic tank is sterilised and aerated by forcing into it ozonised air or oxygen, in order to destroy pathogenic microbes.—L. A.

Sewage or other Liquid; Apparatus for the Automatic Intermittent Discharge of ——, to and Withdrawal from Filter Beds. H. B. Killon, Manchester. Eng. Pat. 2647, Feb. 10, 1900.

A SERIES of siphons, floats, and valves is so arranged, in connection with a corresponding series of filter beds and a central chamber, that, upon the collection of a regulated quantity of liquid in the central chamber, such liquid is automatically discharged by one or other of the siphons on to one or other of the filter beds. Another series of floats and valves connects the filter beds in such a manner that as each filter bed, in rotation, becomes full, the liquid standing in the previously filled filter bed is automatically discharged.—L. A.

Sewage and other Effluents, especially of Municipal Draining Systems; Method of and Apparatus for Purifying ——. O. Freysoldt, Stettin, Germany. Eng. Pat. 13,752, July 31, 1900.

THE strained sewage passes into the hollow walls of a series of heated evaporation chambers, into which it is sprayed. The steam or other vapours are exhausted into the air through scrubbers, and the mud flows into a collecting chamber, or on to a bed of soil.—L. A.

Water; Production of Reagents, specially designed for Purifying ——. H. H. Lake, London. From The Jewell Export Filter Co., New York, U.S.A. Eng. Pat. 12,862, July 17, 1900.

A SOLUTION of ferric sulphate is prepared by generating SO_2, passing the gas into water, forming ferrous bisulphite by leading the solution of sulphurous acid over iron, and oxidising it by means of a current of air.—L. A.

(C.)—DISINFECTANTS.

Fluorescent Bodies; Antiseptic Action of ——. A. Raab. Zeits. für Biologie; through Pharm. Zeit. **45**, [59], 569.

STRONGLY fluorescent bodies, such as acridine, act as powerful antiseptics in sunlight, while they show but slight action in the dark. Thus, a 1 : 20,000 solution of that body was found to kill infusoria, when exposed to sunlight, in six minutes, whereas, in the dark, the same organisms resisted its action for 24 hours. Similar results were obtained with solutions of quinine sulphate and of Eosine. It would therefore appear that these bodies act as antiseptics, not directly from their inherent chemical properties, but indirectly by the chemical activity of the fluorescent light rays of their solutions.—J. O. B.

PATENTS.

Disinfectant or Deodorising Composition; Manufacture of a New or Improved ——. R. H. Gordon, Glasgow. Eng. Pat. 15,979, Sept. 8, 1900.

THE following ingredients—sulphate of lime, 16 drachms; carbolate of camphor, 1 dr.; carbonate of ammonia, 2 drs.; carmine, 1 grain; strong ammonia solution, 2 fluid drs.; water, 8 fluid drs.—are mixed, and the paste, before it has set, is moulded into tablets or poured into small metal boxes, which can be carried about the person or placed in an apartment or elsewhere.—L. A.

Disinfectant Compound; Improved ——. D. McClellan Kelsey, Saratoga Springs, New York, U.S.A. Eng. Pat. 17,713, Oct. 5, 1900.

THE following ingredients, when mixed together, form a dry powder or flour, which is adapted for sprinkling wherever an effective disinfectant and deodoriser is required:—Hydrated calcium sulphate, 17 parts; charcoal, 2 parts; dried peat, 1 part; sublimed sulphur, 0·3 part; ferric oxide, 0·1 part; crude carbolic acid, 0·04 part.—L. A.

XIX.—PAPER, PASTEBOARD, Etc.

Russian Paper Industry. Papier Zeit. 1900, **25**, [93], 3487—3488.

ACCORDING to a report issued by the Russian Department of Commerce and Industry, on the position of the paper industry up to the end of 1897, paper and the allied industries comprise 558 factories, with an annual production of 51·7 million roubles and employing 39,363 hands.

Paper-making has been established in Russia for 200 years; the principal raw material is still old linen rags, since linen is very plentiful, being worn by the peasant classes. Russia exports large quantities of linen rags, on which there has been for some time an export duty of 0·3 rouble per pood; there is no import duty. The introduction of mechanical woodpulp has caused a considerable lowering of the cost of paper. The grinding of wood has become established in districts where forests and water-power are available. In Finland, especially, this industry has reached large proportions and considerable quantities are exported; Finnish wood cellulose, also, is exported to Russia and other countries. In spite of extensive forests and pyrites deposits, the manufacture of wood pulp in Russia proper (excluding Finland) is not very great, on account of the dearness of fuel, and the greater part of the wood material employed is imported. Roofing boards, made with millboard soaked in pitch, are very largely used in Russia; the home production is not sufficient, and these boards are still subject to a duty of 0·6 rouble per pood. In Russia the production of mechanical wood pulp is estimated at 10,000 tons, and of wood cellulose at 16,000 tons; the imports of wood materials in 1897 amounted to 35,000 tons. Finland is the main source of the mechanical pulp, and most of the cellulose comes from Germany and Belgium.

The most important paper works are in the district of St. Petersburg. Mechanical and chemical wood pulps are used principally in the north and west; in the other parts of the country, linen rags are the chief material. Cotton rags only constitute about 10 per cent. of the total quantity of rags employed. Most of the paper made is of medium and low grade; the demand for high qualities is small and is supplied from abroad. Only three or four factories manufacture products equal to the German standard or "normal paper." The papers containing wood stuff are weaker than German paper of the same class.

Amongst the allied industries, the manufacture of wall paper takes the first place; this industry has attained a high development and the products are exceptionally good.

—J. F. B.

Paper; Detecting Forgeries on ——. G. Bruylants and L. Gody. Paper read before the Belgian Academy of Medicine. Scientific American Supplement, 1900, **50**, [1300], 20,833.

THE authors communicate a method for the detection of frauds and alterations on business papers. They found that

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if the paper under examination be subjected to the action of iodine vapour, any irregular wetting or rubbing is plainly indicated. The erased surfaces assume a yellow or brownish tint. If, after being subjected to the action of the iodine, the paper on which an erasure has been made be moistened, it becomes of a blue colour, the intensity of which varies with the length of time of contact between the paper and the iodine vapour, whilst, after again drying, the erased portions are more or less darker than the remainder of the sheet. When the erasure has been so rough as to remove a considerable portion of the material, exposure to iodine vapour, wetting, and drying, result in less intensity of coloration on the parts erased. The action of the iodine also differs according to the quality of the paper. It is stated that irregular wetting and rubbing can be detected by this process after the lapse of three months. More characteristic, but considerably weaker, reactions are obtained if the paper, before examination, be immersed in a water-bath for 3—6 hours.—A. S.

PATENTS.

Material resembling Celluloid, and for other Purposes; Glazing, Covering, and Moulding of Surfaces for Producing ——. C. Hellriegel, London. Eng. Pat. 22,186, Nov. 6, 1899.

INSTEAD of making articles entirely of celluloid, a foundation of pasteboard, paper, or similar material, shaped, coloured, and printed as required, is coated with a thin layer of collodion in a centrifugal machine; it is then placed in a machine of special design, and first hot- and then cold-pressed under moulds or forms. The working table rotates round a vertical axis in such a manner that the action of the press is continuous. The process and the machine are claimed.—R. L. J.

Material suitable for Wrapping Purposes, also for the Manufacture of Envelopes as well as Bags for the Reception of Various kinds of Produce, such as Bacon, Hams, Flour, Frozen or Chilled Meat, and the Like; Manufacture of ——. W. J. Ward, Longsight, Manchester. Eng. Pat. 23,603, Nov. 27, 1899.

CALICO, muslin, or the like is placed on rollers and run on the surface of the endless wire of a paper-making machine. The prepared pulp is run on the material and wire. The whole goes through the various rollers and drying cylinders and can afterwards, if required, be run through a bath of melted wax, the excess of wax being afterwards squeezed out.—C. M.

Celluloid in Films, Pellicles, and other Forms; Manufacture of ——. O. Imray, London. From The Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 25,434, Dec. 22, 1899.

CERTAIN aromatic sulphonic acids, either separately or mixed, of the general formula, $R.SO_2.A$, where R denotes an aromatic radical or its substitution product, and A is an aliphatic or "aromatic ether residue," or a substituted NH_2 group (*e.g.*, glyceryl paratoluene sulphonate, paratoluene sulphonamide, or paratoluene alkyl amide), may be used as substitutes for camphor in the manufacture of celluloid. Films or pellicles may be also produced, on photographic paper, for example, by adding one or more of these compounds in small quantity to the ordinary solution of nitrocellulose. Cloth may be similarly impregnated. The substitutes, and films made in the way described, are claimed.—R. L. J.

Fireproof Wood-Pulp for use in the Manufacture of Boards and other Articles; Making ——. F. E. Keyes, New York, U.S.A. Eng. Pat. 4309, March 6, 1900.

THE fireproofing solution itself is used in the grinding machine instead of water only, thus avoiding the expense of drying the screened pulp, and mixing it with the solution in a special beater. The impregnated pulp is pressed and dried in the usual manner.—R. L. J.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Cerite Earths of Monazite Sand; Separation of the ——. R. J. Meyer and E. Marckwald. Ber. **33**, [16], 3003—3013.

THE raw material used consisted of a mixture of the oxalates of cerium, didymium, and lanthanum, with small quantities of yttrium earth oxalates. It contained 25 per cent. of water, as determined *by combustion*, it being impracticable to dry the oxalates at a sufficiently high temperature, owing to the risk of decomposition.

Conversion of Oxalates into Soluble Nitrates.—The oxalates are boiled with KOH solution, with the addition of hydrogen peroxide. The oxalic acid is completely decomposed, and a yellowish, crystalline precipitate is obtained, containing the Ce as a mixture of ceric hydroxide and peroxides. The precipitate is sucked off by a filter pump, washed, dried at 120° C., and it then dissolves readily in concentrated nitric acid to a dull-red solution. Drying the precipitate for some time at 120° C. is necessary for destroying the peroxides; otherwise, on subsequently dissolving in HNO_3, these would act like H_2O_2, causing partial reduction of the ceric solution.

If it is not desired to obtain the Ce at once in the ceric form, the oxalates are added gradually to twice their weight of nitric acid (1·4 sp. gr.), and the liquid is kept boiling, with the occasional addition of a few drops of fuming nitric acid, till the development of gas ceases, the oxalic acid being thus destroyed. If not boiled long enough, oxalonitrates are formed, which would separate out on cooling.

To the brownish nitric-acid solution, ammonium nitrate is added (80 grms. per 100 grms. of the original oxalates), and on evaporating the solution to about one-third of its volume and cooling, the double nitrates crystallise out almost quantitatively.

Separation and Purification of the Ceria.—Witt and Theel's process (this Journal, 1900, 766) is recommended for this purpose: it consists in oxidising the Ce by means of ammonium persulphate, in a solution of the nitrates which is kept neutral by the addition of $CaCO_3$. This precipitates the Ce to the last trace, but the precipitate (consisting of basic ceric sulphate and $CaSO_4$, with small quantities of Di and La salts) cannot be completely freed from Di and La by a reasonable amount of washing. It is dried at 120°C., powdered, and dissolved in 10 times its weight of warm, boiled-out nitric acid (1·4 sp. gr.); ammonium nitrate, dissolved in a small quantity of water, is added in amount equal to $1\frac{1}{2}$ times the weight of the dried precipitate; and the double nitrate $(NH_4)_2Ce(NO_3)_6$ crystallises out quickly in a fairly pure condition. It is purified by recrystallising once or twice from concentrated nitric acid; the crystals are sucked off on a platinum cone, and are dried over H_2SO_4 and KOH. The pure ceria obtained on igniting some of the double nitrate will have a very pale yellow tint, which does not disappear on further purification of any kind. In making this test the salt should be ignited on porcelain and not on platinum, as the latter is distinctly attacked and colours the oxide.

Separation of the Yttrium Earths.—In the present case, where the proportion of yttrium earths is small, precipitation by K_2SO_4 is good enough. The filtrate from the cerium separation is heated to boiling, and while a strong current of steam is passed through it, finely ground K_2SO_4 is added in small portions till the Di absorption lines have almost disappeared from the solution. The fractionation should not be carried further, to avoid precipitation of yttrium earths; the loss of Di and La is trifling. The hot liquid is decanted from the crystalline precipitate, which is sucked off and washed with cold saturated K_2SO_4 solution.

Conversion of the Double Sulphates into Nitrates.—The sulphates are boiled for a short time with five times their weight of concentrated nitric acid, and the mixture is poured into boiling water (1,500 c.c. per 100 grms. of double sulphates), complete solution ensuing. Ammonium oxalate is added (75 grms. per 100 grms.), and strong ammonia to saturation; the precipitated oxalates are sucked

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off and converted into nitrates by boiling with nitric acid as above described. The liquid is evaporated on a water-bath till no more HNO_3 is given off, and the syrup is diluted with hot water.

Separation of Didymium and Lanthanum.—The authors consider the method consisting in the fractional precipitation of the boiling, nearly neutral, nitrate solution with finely sifted magnesia (Muthmann and Rölig's process; this Journal, 1898, 789) is the best in every respect for this purpose. The material should be subjected twice to this treatment.—H. B.

Rare Earths; Combination of Hydrogen with the Metals of the ——. C. Matignon. Comptes Rend. **131,** [22], 891—892.

By reducing the metals from their oxides by means of magnesium, in an atmosphere of hydrogen (see next abstract), the author has shown that thorium, cerium, and lanthanum (in the case of these three confirming Winkler's work), praseodymium, neodymium, and samarium all combine rapidly with hydrogen, producing when cold a barometric vacuum in the apparatus. These hydrides dissociate at high temperatures; and the same apparatus in which they are prepared allows of the measurement of their dissociation pressures at various temperatures.

—J. T. D.

Rare Earths, Metals; Direct Combination of Nitrogen with ——. C. Matignon. Comptes Rend. **131,** [21], 837—839.

When the oxides of these metals are heated with slight excess of magnesium powder, in sealed tubes containing nitrogen, the magnesium reduces them to the metals, which then combine directly with the nitrogen, producing a vacuum in the tube. If the tube contains atmospheric air, a mixture of oxide and nitride of the metal is formed, and the argon contained in the original air is left. Nitrogen thus unites with thorium, cerium, lanthanum, praseodymium, neodymium, and samarium. Winkler had already proved that the first three of these are reducible from their oxides by magnesium; these experiments establish the fact for the last three. The heats of formation of thorium and cerium oxides are greater than those of the other oxides; samarium oxide seems to have the smallest heat of formation. By separating the mixture in the tube into two portions, exhausting the nitrogen by heating one portion, and then applying heat to the other, the pure metal is obtained, mixed with excess of magnesium, which can be distilled off by a longer application of heat.—J. T. D.

Cinchona Alkaloids. W. v. Miller and G. Rohde. Ber. 1900, **33,** [17], 3214—3237.

Cinchotoxine is an isomeride of cinchonine, obtained by heating that alkaloid in acetic acid solution for 36 hours under a reflux condenser. The differences in crystallographic form between cinchotoxine and the cinchonicine, obtained by Pasteur by heating cinchonine and cinchonidine salts, are now found to be due to dimorphism; the two substances are thus identical.

Isonitrosocinchotoxine, $C_{19}H_{21}N_3O_2$, is obtained by the action of amyl nitrite (1 mol.) upon cinchotoxine in the presence of sodium ethylate (1 mol.). By the action of methyl iodide in chloroform solution, it gives an addition compound, from which the hydriodic acid is not removed by caustic alkalis, but only by the prolonged action of excess of sodium ethylate. The separated base is probably identical with the isonitroso compound of Claus's so-called methylcinchonine. The action of excess of amyl nitrite upon cinchotoxine produces a substance identical with nitroso-isonitrosocinchotoxine (Ber. **28,** 1070).

Quinotoxine is the isomeride of quinine corresponding to cinchotoxine, and is obtained in a similar manner. It is identical with Pasteur's quinicine. The simplest method of preparation is as follows:—Quinine is dissolved in the proper quantity of dilute sulphuric acid; the solution of the bisulphate is evaporated in a dish until a pellicle forms, and is then further evaporated in a large conical flask in an oil-bath at 140°—150° C., the water vapour being aspirated away. The crystalline cake melts to a brown mass, and is then transformed into the isomeric quinicine bisulphate after 1—2 hours. The base is set free by caustic soda, dissolved in ether, the solution dried over potash, filtered from unchanged quinine, and the solvent removed. The base may be purified by recrystallisation of the oxalate or tartrate, but cannot itself be obtained crystalline.

Quinotoxine unites with *p*-bromphenyl-hydrazine, forming a hydrazone. Nitrous acid converts quinotoxine into the nitroso-compound $C_{20}H_{23}N_3O_3$, and the nitroso-isonitroso-compound $C_{20}H_{22}N_4O_4$. The former gives a crystalline hydrazone, melting at 140° C., with phenylhydrazine. Methyl iodide converts quinotoxine into methylquinine and its iodomethylate. Isonitrosoquinotoxine is obtained in a similar manner to isonitrosocinchotoxine; its compound with methyl iodide is similar to the corresponding derivative of cinchotoxine.—A. C. W.

α- and β-Isocinchonine. Z. H. Skraup and R. Zwerger. Monatsh. für Chem. **21,** 535—563. *β-Isocinchonine; Constitution of ——.* Z. K. Skraup, H. Copony, and G. Medanich. Monatsh. für Chem. **21,** 512—534.

Both of these alkaloids are obtained from cinchonine by heating it on the water-bath with sulphuric acid of sp. gr. 1·7; the α-compound is formed first, and on further heating is transformed into the β-compound. To obtain the latter, 15 grms. of cinchonine bisulphate are heated with 60 c.c. of sulphuric acid for about 40 minutes, the mixture quickly cooled and poured on ice. The acid is then nearly neutralised with ammonia, ether and excess of ammonia are added, and the alkaloid is thoroughly extracted with more ether. After distilling off the ether, the residue is treated with hot hydrochloric acid (about 5 × normal) till just acid; on cooling, the bulk of the alkaloid separates as hydrochloride, and a second crop can be obtained from the mother-liquors. A single recrystallisation yields a perfectly pure product.

Both α- and β-isocinchonine agree with cinchonine in forming addition compounds with hydriodic acid; and as they also, like cinchonine, yield on oxidation formic, as the only volatile acid, they probably contain the same viny group as cinchonine. Moreover, β-isocinchonine, like cinchonine, yields, with methyl iodide, two isomeric quaternary iodethyl compounds; one white and stable, the other yellow and unstable.

But while cinchonine contains a hydroxyl group, the authors could not obtain evidence of a hydroxyl group in α- or β-isocinchonine, nor of a ketonic group.

Cinchonine, when its acid sulphate is heated, is converted into the isomeric cinchonicine, which is ketonic. Both α- and β-isocinchonine also undergo isomeric change when similarly treated; but while the α-compound yields two isomers, that chiefly formed being ketonic, the other not, the β-compound yields but one, which has no ketonic group.

Both α- and β-isocinchonine yield, on oxidation with chromic acid, products similar to those from cinchonine; that is to say, not only cinchoninic acid, but also meroquinine or analogous substances.

Both from their mode of preparation, and from the action of heat on the acid sulphates, it would seem that the α-compound is constitutionally nearer to cinchonine than is the β-compound.—J. T. D.

Alkaloids; Precipitation of ——, by Picric Acid. T. Chandelon. Assoc. belge des Chim. Through Chem. Zeit. 1900, **24,** [89], 974.

The author has previously described the separation of certain alkaloids from the viscera of animals, and the identification of the former by precipitation with oxalic acid (see this Journal, 1885, 554). He has now investigated the utility of picric acid for the same purpose, employing pure alkaloids in the following manner:—

0·01 grm. of alkaloid was placed in 15 c.c. of dry ether and allowed to stand for 48 hours. 3—4 c.c. of the clear liquid was then mixed with an equal volume of a concentrated solution of picric acid in cold dry ether. Three degrees of solubility were thus observed, the alkaloids marked with an asterisk being only partially soluble in the given amount of ether:—

(*a*) *Entirely Precipitated.*—Cocaine (crystalline), quinidine (amorphous), *atropine (crystalline), pilocarpine, and *strychnine.

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(*b*) *Entirely Unprecipitated.*—Coniine, veratrine, *solanine, narcotine, *colchicine, *aconitine (crystalline), *caffeine, and *theobromine.

(*c*) *Partially Precipitated.* — Quinine (amorphous), *codeine, brucine (crystalline), *cinchonine, nicotine, thebaine, and papaverine.

Of the first and last series, quinine, quinidine, nicotine, strychnine, and brucine separated immediately; the others in the course of 24 hours. From weaker solutions, the crystals grow larger, but more slowly. Each alkaloid (except brucine) has, from a given solvent, a single characteristic crystalline form, which may be readily recognised and distinguished under the microscope, if the crystals are protected from evaporation of the solvent on the object glass, by flooding them with paraffin oil, after decanting the mother liquor. Brucine crystallises in two ways, either as large rectangular prisms truncated on two sides of the ground line (basal pinakoids), or as spherical conglomerates with a polarising effect like that of starch grains; but these never appear together from the same solution. The alkaloids may be recovered from the picrates in the usual manner.

The above results are only true when precipitation is effected from ether. If chloroform is substituted, the change may affect (1) the solubility of the alkaloidal salt, coniine picrate, for example, being insoluble in chloroform; (2) the crystalline form, *e.g.*, nicotine picrate crystallises better from chloroform than from ether, and with a different habit.

Contrasting these observations on the picrates with those previously made on the oxalates, it appears that the two derivatives of a given alkaloid may differ (1) as to solubility; coniine, for instance, is precipitated by oxalic and not by picric acid; and (2) as to crystalline habit in a marked manner in cases where both are insoluble. Thus, strychnine oxalate forms needles, and the picrate rhombic tablets with saw-like markings.—R. L. J.

Strychnine and Brucine; Action of Bromine on ——. C. Kippenberger. Zeits. anal. Chem. 1900, **39**, [10], 609—627.

Action of Bromine Water containing Bromine Salts.—On mixing a solution of a strychnine salt with bromine water containing, *e.g.*, 50 grms. of KBr per litre, the nearly insoluble hydrobromic acid monobromstrychnine superbromide is formed ($C_{21}H_{21}BrN_2O_2.HBr.Br_2$); but when there is a large excess of bromine, the corresponding dibrom-superbromide is produced in slight amount.

If, in the reaction, large quantities of a bromine salt be present, and the strychnine salt solution contain some free acid, the superbromide ($C_{21}H_{22}N_2O_2.HBr.Br_2$) is formed, together with some of the superbromide ($C_{21}H_{22}BrN_2O_2.HBr.Br_2$). The production of the latter is favoured by the addition of sodium chloride. These compounds are slightly soluble in water, and the solubility is increased by acids.

Brucine under analogous conditions forms corresponding compounds, but its hydrobromic acid superbromides are much more soluble than the strychnine compounds.

From the results of his experiments the author concludes that no exact analytical method for the quantitative estimation of strychnine and brucine can be based on the reaction between these alkaloids and bromine.—C. A. M.

Terpenes and Essential Oils. O. Wallach. XLIX. Annalen, 1900, **313**, [3], 345—370.

Phellandrene.—In preparing the nitrosite, the mixture of phellandrene and sulphuric acid should be stirred continuously whilst the sodium nitrite solution is being dropped in; the temperature should not exceed 4° C. The crude product is very unstable, and should be rapidly purified; it is dissolved in the least quantity of chloroform, a little alcohol and ether added, and the clear liquid cooled in ice for 3—4 hours, when crystallisation occurs. The freezing-point method indicates the double formula $(C_{10}H_{16}N_2O_3)_2$.

On oxidation by strong nitric acid, phellandrene nitrosite gives two isomeric compounds $C_7H_{10}N_2O_4$, terephthalic acid, isopropylsuccinic acid, and an isomeride of the last named. Oxidation by permanganate produces isopropyl succinic and isobutyric acids.

Reduction of Terpinene Nitrosite.—The nitrosite was rapidly reduced in alcoholic solution by sodium. The products were distilled in steam, the distillate was caught in an aqueous solution of oxalic acid, from which, after removal of the alcohol, ether extracted neutral products. The basic products were obtained by adding alkali, and were then purified by distillation *in vacuo*. The base, $C_{10}H_{17}NH_2$, boils at 209°—210° C.; its carbamide melts at 171° C. after recrystallisation from methyl alcohol. It is not identical with any compound hitherto known. By the action of nitrous acid, followed by oxidation with chromic acid, it was converted into an unknown ketone of carvone-like odour, which forms an oxime melting at 96°—98° C. The non-basic products of the reduction contained cymene and a ketone, $C_{10}H_{16}O$, which forms an oxime melting at 83°—84° C. When the oxime is warmed with sulphuric acid it regenerates a ketone of pure carvone odour.

Oxidation of Pinene.—When oil of turpentine has been oxidised by means of potassium permanganate in order to obtain *a*-pinonic acid (Ber. **29**, 22), a camphoraceous smell is noticed on evaporating the liquid. The volatile substance was obtained by distilling and fractionating the oily distillate. The fractions boiling between 170°—200° and 200°—215° C. reacted with semicarbazide solution. The semicarbazone is derived from a ketone, $C_9H_{14}O$, boiling at 209°—211° C., and identical with the nopinone obtained by Villiger by the oxidation of nopinic acid (Ber. **29**, 1927). The oxime could not be obtained crystalline, but the ketone forms a very characteristic compound with benzaldehyde, $C_9H_{12}O:CH.C_6H_5$. It is obtained by allowing a mixture of equal mols. of the two substances to stand with sodium ethylate for some time, and then diluting with water; the compound crystallises from methyl alcohol in colourless transparent crystals, which melt at 106° C.

Pinocamphone, $C_{10}H_{16}O$, is a ketone obtained, together with pinylamine, by the reduction of nitrosopinene. Its oxime melts at 86°—87° C.; on reduction by sodium in alcoholic solution it yields pinocamphylamine, $C_{10}H_{17}NH_2$, a liquid base which combines with carbonic acid.—A. C. W.

Geranium; Development of Terpene Compounds in the ——. E. Charabot. Comptes Rend. **131**, [20], 806—808.

THE author has examined geranium oil prepared from the green plants in July and in August, and from the completely matured plants in September. (Compare, for lavender and mint, this Journal, 1900, 272 and 372.) He finds that, as the plant matures (1) the acidity diminishes; (2) the oil becomes richer in esters; (3) the amount of total alcohol slightly increases, but that of free alcohol diminishes; (4) the proportion of rhodinol to geraniol increases. He finds that before maturity there exist mere traces of a ketonic constituent (menthone) or none at all; also that this is formed at or after maturity, when the plant possesses its maximum respiratory activity. The rhodinol is possibly formed by hydrogenation of the geraniol (Tiemann has already realised this reaction in the laboratory), but the author will not yet commit himself to this hypothesis; while the menthone is very probably formed from the rhodinol by its oxidation to rhodinal, which (this Journal, 1900, 769) is then converted by isomeric change into menthone.—J. T. D.

Sandal Wood [*Amyrol*], *West Indian* ——. H. v. Soden and W. Rojahn. Chem. Zeit. Rep. 1900, **24**, [94], 349.

IT has already been shown (this Journal, 1900, 464) that West Indian sandal wood contains a new sesquiterpene alcohol, $C_{15}H_{25}OH$, termed amyrol. According to later investigations this amyrol contains mixed with it an isomeric alcohol. Amyrol boils at 299° C., has a rotation + 36° and a specific gravity at 15° C. of 0·987. It is converted by dehydrating agents into a sesquiterpene, $C_{15}H_{24}$. Sandal wood contains another compound, *Amyrolin*, $C_{24}H_{12}O_3$, which separates from alcohol in colourless slightly fluorescent crystals, melting at 117° C. Amyrolin dissolves in alcoholic potash with a yellowish-green fluorescence; on prolonged boiling, the potassium salt of an acid is formed, which has not yet been obtained in a pure state.—T. A. L.

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Thujene, a New Tricyclic Terpene. L. Tschugaeff. Ber. 1900, **33**, [16], 3118—3126.

SEMMLER, who discovered thujone, could not obtain thujene from thujyl chloride (Ber. **25**, 3343). Also Wallach (Annalen, **272**, 111; **286**, 107) and Semmler, by the dry distillation of thujylamine hydrochloride, obtained a terpene, "thujene or tanacetene." It is apparently a monocyclic compound. Wallach has found that isothujylamine hydrochloride yields a terpene on dry distillation, which is most probably identical with the above thujene. This compound, in view of its relationship to isothujone, should be called isothujene. The true tricyclic thujene has now been prepared by the author.

Thujone was reduced to thujyl alcohol by boiling with sodium in absolute alcohol. Thujyl alcohol was boiled with sodium and toluene or xylene on the sand-bath, the solution was poured off from the sodium and treated with carbon bisulphide and methyl iodide, in order to obtain thujylxanthogenic methyl ester. After distilling off volatile matters in steam, the residue was taken up in ether, the solution dried, ether driven off, and the residue subjected to dry distillation. The distillate was rectified and boiled over sodium; it then forms a limpid liquid of slight odour, boiling at 151°—152°·5 C., and with the specific gravity $d\ \frac{20°}{4°} =$ 0·8275. It thus differs in physical properties from all terpenes hitherto known; it also differs in chemical properties. It produces no nitrosochloride. The action of two atoms of bromine gives, with evolution of hydrobromic acid, a reddish-brown syrup, soluble in alcohol to a deep-red solution. Thujene is rapidly oxidised in the air; it instantly decolorises permanganate. Thujene, as also pinene and limonene, when shaken with a hot strong solution of mercuric acetate containing free acid, gives in a few minutes a fine pearly crystalline substance, insoluble in most organic solvents and in water. The author has not yet been able to regenerate unaltered thujene from this compound.—A. C. W.

Rose Oils; Occurrence of Phenylethyl Alcohol in ——. H. von Soden and W. Rojahn. Ber. 1900, **33**, [16], 3063—3065. (See also this Journal, 1900, 768—769; 1036 and 1037.)

THE small proportion of phenylethyl alcohol in rose oils distilled by steam, as compared with the large percentage in extracted oils, is due to the considerable solubility of the alcohol in water; it is contained in the distilled water, from which it may be extracted by ether. The hypothesis of Walbaum, that the alcohol is not developed in the rose petals until they are dry, is therefore unnecessary. Stephan and Walbaum obtained mere traces of phenylethyl alcohol in working up 11 kilos. of German rose oil; the authors obtained larger quantities (though still a small percentage) by extraction with dilute caustic soda. Thus it is possible that the alcohol is present partly in the form of esters. Rose preparations obtained by extraction should contain a larger proportion of the alcohol; two technical products have now been examined:—

Rose Pomade, prepared by the maceration of fresh roses with warm fat. By the method of Hesse (this Journal, 1899, 396) 0·56 per cent. of volatile oil was obtained from the pomade. That portion of the volatile oil which was extracted from the water coming over in the steam distillation was several times shaken with 4 per cent. caustic soda solution. The phenylethyl alcohol dissolved was then extracted by ether; it constituted 46·5 per cent. of the total volatile oil.

"*Rose Pure,*" a brownish-yellow viscous oil, obtained by the extraction of free rose petals by means of a volatile solvent. This oil was distilled with steam until the distillate was almost odorless. The phenylethyl alcohol, obtained as before, was 25 per cent. of the total volatile oil.

This alcohol is thus a normal and important constituent of the essential oil of roses. Small quantities were also found in Bulgarian (Turkish) rose oil.—A. C. W.

Papaverinol. L. Stuchlik. Monatsh. für Chem. 1900, **21**, [8], 813—830.

ACCORDING to Goldschmidt, papaverine is a tetramethoxybenzylisoquinoline; on oxidation by potassium permanganate it forms a ketone, which, on reduction, should yield the alcohol, papaverinol—

$$C_6H_3(OCH_3)_2(1, 2),$$
$$|$$
$$CH(OH)(4, 1'),$$
$$|$$
$$C_9H_4N(OCH_3)_2(2, 3).$$

The best yield is obtained by adding a slight excess of zinc dust in small quantities at a time to a solution of papaveraldine in glacial acetic acid, heated on the water-bath. After diluting and removing zinc as sulphide, sodium carbonate was added almost to neutralisation, and the solution then precipitated by ammonia. The precipitate was dissolved in dilute hydrochloric acid, the solution filtered from unreduced papaveraldine, decolorised by animal charcoal, the base precipitated by ammonia, and recrystallised from methyl alcohol. The small, almost white, needles melted at 137° C. Papaverinol is readily soluble in organic solvents, but very slightly soluble in water. The hydrochloride is very soluble and difficult to crystallise; it was obtained crystalline by dissolving the base in dry ether, passing in dry hydrochloric acid gas, dissolving the precipitate in alcohol, and adding ether to incipient turbidity. After some hours the salt then separates in fine yellowish needles, forming star-shaped groups. It begins to darken at 180° C., and melts at 200°—202° C.

Papaverinol hydrochloride is similar as regards physiological effect to papaverine.—A. C. W.

Nitrosalicylic Acid and Nitrosulphonic-salicylic Acid. R. Hirsch, Ber. 1900, **33**, [17], 3238—3241.

AN almost quantitative yield of nitrosalicylic acid is obtained by the following process:—100 grms. of salicylic acid are dissolved in 300 grms. of cold strong sulphuric acid. The mixture is cooled to 0° C., and a mixture of 90 grms. of nitric acid and 270 grms. of sulphuric acid then added in portions. The temperature must not exceed 10° C. The excess of acid is drained off, and the residue twice boiled with 2 litres of water. Nearly pure *α*-(*m*)-nitrosalicylic acid remains.

Nitrosulphonic-salicylic acid is obtained by heating 100 grms. of salicylic acid for 30 minutes on the water-bath with 500 grms. of sulphuric acid, allowing to cool to 30° C., and adding a mixture of 90 grms. of nitric acid and 270 grms. of sulphuric acid in portions of 10 c.c., the temperature being kept between 30° and 40° C. Excess of acid is drained off, the residue dissolved in water, and the solution neutralised by barium hydrate. On cooling, the neutral salt separates in fine yellowish-red needles.—A. C. W.

Poisonous Boraginaceæ. K. Greimer. Archiv. **238**, 505. Pharm. J. 1900, **65**, [1584], 490.

THE author found that *Anchusa officinalis, Cynoglossum officinalis,* and *Echium vulgare* all contain a poisonous alkaloid, cynoglossine. The physiological action of this alkaloid is similar to that of curare. *Symphytum officinalis* also contains a toxic alkaloid, *symphyto-cynoglossine,* similar in chemical constitution to cynoglossine, but differing in its physiological action. The above-mentioned plants also contain a notable quantity of choline, and a toxic glucoside, *consolidin,* which, when hydrolysed with acids, splits up into glucose, and an alkaloid, *consolicine.* The latter is three times as powerful, as regards its physiological action, as the glucoside, consolidin, from which it is derived.—A. S.

Angophora; New Species of ——. R. T. Baker. Proc. Linn. Soc. N.S.W. 1900, 84. Pharm. J. 1900, **65**, [1584], 489.

THE New South Wales tree, popularly known as "Coolabah," appears to constitute a new species, and is named by the authors *Angophora melanoxylon.* It is a medium-sized tree, from 40 to 50 ft. high, and with a diameter up to 3 ft.; the bark is somewhat similar to a "Box" bark, and is much less fibrous than that of *A. subvelutina,* F. v. M., or *A. intermedia,* D.C. The botanical characters of the tree are described in detail. The kino obtained from the tree forms brownish-coloured, very friable masses, having a dull frac-

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ture. It is but little soluble in cold water, forming a whitish turbid solution; the turbidity disappears on boiling, but again appears when the hot solution is cooled. The substance causing the turbidity was extracted with ether, and was found to be aromadendrin. No eudesmin is present. The presence of that substance in the kinos of some Angophoras indicates a chemical connection between those trees and the Eucalypts. Eudesmin appears to be the more common in the Eucalypts, but in the kinos of some species, both eudesmin and aromadendrin are present; up to the present, aromadendrin alone has only been found in one species, *E. calophylla* of Western Australia. The tannin present in the kino of *Angophora melanoxylon* gives a green coloration in a very dilute aqueous solution, with one drop of ferric chloride solution, and in that respect differs from the kino of *E. calophylla*, which gives a blue coloration under similar conditions.—A. S.

Aloïn; Oxidation of ——, by means of Potassium Persulphate and Caro's Acid. E. Seel. Ber. 1900, **33**, [17], 3212—3214.

The author has examined the products of the oxidation of aloïn from Barbados aloes. The action of potassium persulphate yields different products according to the quantity of the reagent, excess of which produces a pale-red compound in almost quantitative yield. It appears to be an unstable oxygen addition compound. It is also formed by the electrolytic oxidation of aloïn in dilute sulphuric acid, or by means of potassium percarbonate. Caro's reagent, obtained from potassium persulphate and sulphuric acid (this Journal, 1900, 172), or Baeyer's mixture of hydrogen peroxide and sulphuric acid (Ber. **33**, 124), produces a brownish-red powder, from which chloroform extracts tetrahydroxymethyl-anthraquinone, $C_{15}H_{10}O_6$.
—A. C. W.

Erysimin; New Glucoside from Erysimum Seeds. Schlagdenhauffen and Reeb. Comptes Rend. **131**, [19], 753—755.

The seeds of various species of *Erysimum*, freed from fatty matters by extraction with petroleum spirit, are lixiviated with alcohol; the residue, after evaporating the alcoholic solution, is dissolved in water, precipitated by sodium sulphate, and the precipitate redissolved and reprecipitated by sodium sulphate two or three times. The crude glucoside is dissolved in alcohol, the solution filtered and evaporated, the residue dissolved in water and precipitated by lead acetate. After removal of the lead by sulphuric acid and neutralisation by ammonia, the solution is evaporated to dryness and the residue extracted with alcohol. Evaporation of the alcoholic solution yields the pure substance. This is a pale-yellow amorphous mass, slightly hygroscopic, soluble in water or alcohol, not in ether, chloroform, benzene, or carbon bisulphide. It melts at 190° C., and begins to decompose at a slightly higher temperature. It gives the reactions of a glucoside, and the results of analysis are expressed by the empirical formula $C_4H_7O_2$. It is a violent poison to warm-blooded animals and to frogs.

The seeds appear also to contain an alkaloid, which, however, the authors have not yet obtained in a pure state.
—J. T. D.

Frangula, Sagrada and Rhubarb, Soluble Active Glucosides of ——. E. Aweng. Apoth.-Zeit. **15**, 537. Chem. Centr. 1900, **2**, [14], 766.

The author has before shown that the above-mentioned drugs contain two groups of active constituents; the primary glucosides easily soluble in water, and the secondary glucosides slightly soluble in water. Both groups are completely extracted by 70 per cent. alcohol.

Frangula Bark.—If the alcoholic (70 per cent.) extract be evaporated to expel the alcohol, then treated with dilute ammonia, and the solution faintly acidified with acetic acid, the secondary glucosides separate in large flocks, and can be easily filtered off, whilst the primary glucosides remain in the filtrate. The latter contains Kubly's "frangula acid." This may be obtained in a crystalline form from a mixture of equal parts of benzene and absolute alcohol; if it be heated in aqueous solution for a long time, the acid becomes insoluble, but again becomes soluble if dissolved in ammonia and reprecipitated with acetic acid. Baryta water does not produce a precipitate in the aqueous solution of the acid, although the foreign substances that are contained, together with "frangula acid" in the aqueous percolate of the bark, and are also present in Kubly's red acid, are precipitated by this reagent. The pure acid reddens blue litmus paper. It is a secondary glucoside, and on hydrolysis yields, besides the sugar, frangularhamnetin, which dissolves in concentrated alkali to a yellowish-red solution, changing to golden-yellow on dilution, and is probably a decomposition product of rhamnetin.

The secondary glucosides of frangula bark contain emodin, chrysophanic acid and frangulin, soluble in benzene; a glucoside soluble in a mixture of benzene and absolute alcohol, which yields emodin on heating with dilute sulphuric acid; and another glucoside, insoluble in the solvents mentioned, but which dissolves in caustic soda to a violet solution, and corresponds to the "eisenemodin" described by the author.

Sagrada.—The secondary glucosides have not yet been examined. The primary glucosides contain "frangula acid" and a glucoside, which on hydrolysis yields emodin. The two glucosides may be separated by 96 per cent. alcohol. The *emodin glucoside* is almost completely precipitated from its aqueous solution by baryta, gelatin solution, and formalin.

Rhubarb.—Only the primary glucosides were examined. They contain the same compounds as those of sagrada. With ammonia, "frangula acid" (from all three drugs) gives yellow, emodinglucoside (from sagrada and rhubarb), bright raspberry-red solutions. Emodinglucoside appears to be more active than "frangula acid," and this fact becomes important in connection with the valuation of rhubarb.—A. S.

Corybulbine into Corydaline; The Conversion of ——. Alkaloids of Corydalis Cava. J. J. Dobbie, A. Lauder, and P. G. Paliatseas. Proc. Chem. Soc. **16**, [229], 205. (See also this Journal, 1896, 125—826.)

Corydaline, $C_{18}H_{15}NO(OCH_3)_4$, differs from corybulbine, $C_{18}H_{16}NO(OCH_3)_3$, by CH_2, and contains four methoxyl groups, whilst the latter alkaloid contains only three. The authors have now proved that corybulbine contains a hydroxyl group and forms a mon-acetyl derivative, $C_{18}H_{15}N(OCH_3)_3O.C_2H_3O$. By treatment with concentrated hydrogen iodide the two alkaloids yield the same phenolic derivative, $C_{18}H_{15}N(OH)_4HI$. Corybulbine can be readily converted into corydaline by treatment with equivalent quantities of methyl iodide and potassium hydroxide in methyl alcohol solution. The artificial corydaline agrees in melting point, solubility in various reagents, and specific rotation with the natural alkaloid. The platinichloride, ethyl sulphate, and hydroiodide of the natural and artificial substances have been compared and found to be identical.

Hyoscyamus Muticus, and of Datura Stramonium grown in Egypt; The Alkaloids of ——. W. R. Dunstan and H. Brown. Proc. Chem. Soc. **16**, [229], 207.

In a previous paper (this Journal, 1891, 1177) the authors showed that *Hyoscyamus Muticus* grown in India contained 0·1 per cent. of hyoscyamine, which is readily isolated in a pure state. Subsequently Gadamer (see this Journal, 1899, 171) in a brief note recorded the fact that the same plant grown in Egypt contains more than ten times this quantity. Through the kindness of Mr. E. A. Floyer, the authors have been enabled to examine a specimen of the plant from Egypt. They find it to be much richer in hyoscyamine than the sample of Indian growth previously examined. The seeds furnished 0·87 per cent. and the stems and leaves 0·59 per cent. It remains to be determined whether the Indian plant is always poorer in alkaloid, or whether it was a peculiarity of the sample examined.

The authors call attention to the Egyptian plant as an important source of the alkaloid hyoscyamine.

Datura Stramonium grown in the Egyptian desert also contains hyoscyamine, unaccompanied by other atropaceous alkaloids, to the extent of 0·35 per cent.

An abundant supply of either plant could be obtained from Egypt.


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"*Tutu.*" *Part I.* T. H. Easterfield and B. C. Aston. Proc. Chem. Soc. **16**, [229], 211.

THE authors have examined three varieties of tutu—*Coriara ruscifolia, C. thymifolia, C. angustissima*—which cause serious loss of stock in New Zealand, and have isolated from them a glucoside, *tutin*, $C_{17}H_{20}O_7$, along with acetic, gallic, succinic, and other acids. From *C. thymifolia* quercetin or an isomeric compound was obtained; and from *C. angustissima* a volatile acid, $C_8H_2O_4$, which has not been identified.

Tutin was obtained in colourless crystals melting at 208°—209° C. (uncorr.), and is perceptibly volatile at 120°—130° C. Its solubility is 1·9 grms. in 100 grms. of water at 10°; 1·5 grms. in 100 grms. of ether at 10°; 8·2 grms. in 100 grms. of alcohol at 16° C. It is very soluble in acetone, sparingly soluble in chloroform, insoluble in benzene and carbon bisulphide. Its optical rotation was determined, and gives $[\alpha]_D^{19^\circ} = +9{\cdot}25^\circ$.

The authors also discussed the formula for coriamyrtin, and conclude that the formula $C_{15}H_{18}O_5$, which is half that usually accepted, harmonises better with the facts. A comparison of the chemical and physical characters of tutin and coriamyrtin proved that these substances are not identical.

A note by Prof. Marshall on the pharmacology of tutin states that its action is similar to that of coriamyrtin, but is more slowly produced, and it is much less toxic. Its action is exerted mainly on the medulla oblongata, and the basal ganglia of the brain.

Nux Vomica; Determination of ——. F. C. J. Bird.

See under XXIII., *page* 75.

Alkaloids; Use of Tannin in Purifying Residues containing ——. C. Kippenberger.

See under XXIII., *page* 74.

Lemon Oil; Determination of Citral in ——. Schimmel's Semi-ann. Rep., Oct. 1900, 25.

See under XXIII., *page* 75.

Lemon Oil; Determination of Citral in ——. E. J. Parry.

See under XXIII., *page* 75.

Lichens; Constitution of ——. VI. W. Zopf.

See under XXIV., *page* 77.

Carvone; Analysis of Oils containing ——. E. Kremers.

See page 16.

PATENT.

Camphor; Pinyl Oxalate and Pinyl Formate; Process for the Production of ——. C. K. Mills, London. From The Ampère Electro-Chemical Company, Jersey City, U.S.A. Eng. Pat. 14,754, Aug. 17, 1900.

TURPENTINE (5 parts) from any recognised source, if containing sufficient pinene, is heated with anhydrous oxalic acid (1 part) to 120°—130° C., the resulting product is treated with caustic alkalis in excess, and the mixture of camphor and borneol so obtained is steam-distilled to remove impurities.

The borneol is then oxidised to camphor. The inventor claims this process in its various stages, and also the intermediate products, pinyl formate and pinyl oxalate.

—R. L. J.

XXI.—PHOTOGRAPHY.

Light; its Influence on the Action of Chlorine on Metallic Silver.—II. V. v. Cordier. Monatsh. für Chem. **21**, [7], 655.

THE author gives an account of his further experiments on this subject. The formation of silver chloride is not increased under the influence of red light; whilst it is under the influence of violet and blue light, although the reducing action, which takes place at the same time, is also increased. Light filtered through a sufficiently thick layer of chlorine gas, behaves generally like red light. Filtration of the light through dry chlorine weakens its influence on the reaction very little or not at all; with moist chlorine, however, there is a considerable weakening, which may be increased by the addition of small quantities of hydrogen.

Röntgen rays have practically no influence on the reaction.—J. W. H.

Sensitiveness of Photographic Plates; Increasing the ——. R. Neuhauss. Phot. Rundsch. 1900, **14**, 233. From Chem. Zeit. Rep. 1900, **24**, [90], 336.

PHOTOGRAPHIC plates may be rendered more sensitive by a preliminary very short exposure to light. The author recommends that the plates should be exposed in the dark room, before the red lamp, until on development a very slight fog appears. The time required for this preliminary exposure should be ascertained once for all, and is then applicable to all plates made from the same emulsion.

—J. S.

Absorption Spectra; Plates for Photographing ——. A. Miethe. Zeits. angew. Chem. 1900, 1199.

THE method which Formánek has already described (this Journal, 1899, 611) for differentiating colouring matters and for examining mixtures thereof, becomes still more useful if the absorption spectra can be photographed and preserved for reference. Ordinary photographic plates are not suitable for this purpose, as the characteristic absorption bands of the dyestuffs lie principally in the less refrangible part of the spectrum; and even commercial colour-sensitive (ortho-chromatic) plates are not completely satisfactory, for their sensitiveness stops at about the wave-length 590. The author publishes two formulæ for the preparation of either slow or rapid plates, which have given good results, and which permit an impression of the spectrum to be obtained up to the Fraunhofer line A.

Rapid Plates.—The bath is made by dissolving 1 grm. each of Glycin Red (Kinzelberger), Quinoline Red, and Quinoline Blue (with a little ammonia) separately in 500 c.c. of 93 per cent. alcohol, filtering after a few days. 20 c.c. each of the red dye solutions are then poured into 150 c.c. of water, 50 c.c. of alcohol are added, and the mixture is allowed to rest for two hours. 2 c.c. of the blue solution are next introduced; and after another two hours' standing, the liquid is carefully filtered. Finally, 3 c.c. of ammonia and 1 c.c. of the Quinoline Blue are added, and the whole is diluted with 150 c.c. of water and the same quantity of alcohol.

Slow Plates.—The bath consists of 100 c.c. each of 1 : 5,700 aqueous solutions of Diazo Black (Bayer), and Iodeosine, with 3 c.c. of ammonia.

Bromide plates, which are as free as possible from fog, are thoroughly cleaned and dusted, and immersed for two minutes in either of the baths; they are then held under a rose, soaked for two minutes in distilled water, and dried as quickly as possible, preferably in a cupboard with artificial draught.

The rapid plates are sensitive from the ultra violet to the wave-length 680. If they are required to photograph bands in the green, yellow, and red, they are used behind a screen of Tartrazin or Martius Yellow. If bands in the blue also are to be recorded, the screen should be a very weak aqueous solution of Neutral Red, when the plates give an uniform image from B to the violet. The slow plates are sensitive even to less refrangible light; their range extends to the extreme end of the visible red. As their sensitiveness is uniform beyond the line 500$\mu\mu$, for work at the red end of the spectrum, they should be protected by a somewhat stronger screen of Martius Yellow; for an image of the whole spectrum, a stronger filter of Neutral Red should be used. They require about three times the exposure of the rapid plates. Both kinds keep for at least five or six days, but they are advisedly used before they are four days old. All manipulations should be carried out in absolute darkness, especially with the slow plates. Development is rather prolonged. The author recommends the Welsbach mantle as a source of light for observing the absorption bands of colouring matters; for it contains a large proportion of the less refrangible rays, and therefore easily gives an uniform spectrum with a comparatively translucent colour screen.

—F. H. L.

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Photographic Fixing Baths. Brit. Jour. Phot. **47**, [2116], 741.

EDER first suggested the addition of an acid to the ordinary fixing bath to prevent staining, but, unfortunately a decomposition takes place which may be injurious to both plates and papers. Briefly, the addition of an acid to excess of sodium thiosulphate results in the formation of sulphurous acid, sulphuretted hydrogen, a sodium salt of the acid used, sodium sulphate, sulphur, sodium bisulphite, pentathionate, and acid sulphide. The addition of alum to prevent "frilling" has a similar effect. Lainer states that if the acid be added to a solution of sodium sulphite, and the mixture then poured into the solution of sodium thiosulphate, no deposition of sulphur takes place. He suggests the addition of 50--100 parts of acid sulphite lye to every 1,000 parts of thiosulphate solution (1:4). As a substitute for the lye he recommends: solution of sodium sulphite (1:4), 60 parts; tartaric acid solution (1:2), 20 parts. His alum bath contains saturated solution of alum, 1,000 parts; saturated solution of sodium sulphite, 300 parts; solution of thiosulphate (1 : 4), 1,250 parts. Mercier showed that on using an organic acid in the fixing bath, the addition of an acetate, citrate, or tartrate prevented any deposition of sulphur, and that the plate could be safely transferred to the fixing bath after development without washing. The following is his formula:—

	Parts.
Anhydrous sodium thiosulphate	100
Potassium metabisulphite	20
Sodium citrate	5
Sodium chloride	20
Potash alum	20
Water	1,000

The acid fixing bath, when properly made, preferably with an organic acid, the acid being added to the sodium sulphite solution and the mixture then added to the thiosulphate solution, gives results remarkably free from stain or deposit, and is far superior to the ordinary bath.

—J. W. H.

Photographic "Reducer"; Ammonium Persulphate as a ——. D. Myblin. Atelier des Phot. 1900, **7**, 108; through Chem. Zeit. Rep. 1900, **24**, 344.

THE author is unable to accept either of the theories advanced by Lumière Bros. (this Journal, 1898, 870; 1899, 856) and Namias to explain the "reducing" action of ammonium persulphate upon negatives. His own idea is as follows:—The solution penetrates the gelatin film where most silver is congregated (*i.e.*, the high lights of the positive picture), attacks the metal, and converts it into silver sulphate, which partly dissolves. The persulphate is (chemically) reduced to sulphate, oxygen being liberated. By the action of the water, free sulphuric acid is also formed, which dissolves the gelatin, chiefly that which surrounds the disappearing image. The process will continue until the deepest particles of silver are reached, that is, until the whole picture is ruined. Nevertheless, the image is not wholly destroyed, for the negative still retains a faint blue colour, which is probably due to the undissolved silver sulphate that resists the action of washing with water. In the fixing bath, the blue colour disappears; but by mechanical intensification, the remaining image can be somewhat strengthened.—F. H. L.

Trichromatic Photography; Optics of ——. F. E. Ives. Brit. Jour. Phot. **47**, [2116], 742.

FOR the correct reproduction in colour by photographic methods, the obtaining of the three colour records must involve a strictly quantitative photographic analysis, for no other will admit of the correct synthetical reproduction of the spectrum itself, the only test for any trichromatic process. By positive synthesis of the colour records, the image is built up by adding light to light, red, green, and blue, but in the production of paper prints the picture is obtained by superposing coloured shadows. It will be clear that since red, green, and blue are the colours in positive synthesis, their complementary colours, or minus red (cyan blue), minus green (bright crimson), and minus blue (yellow), are the printing colours; the white printing surface, however, not being illuminated by a mixture of red, green, and blue light only, but by all the spectrum rays, makes it necessary to consider the absorption of the colours in the intermediate spectrum regions; on this account the absorption of the printing colours should not conform to the Maxwell curves, but should be greatest for the pure colours, and fall gradually to the next "primary" in the spectrum. In any case, however, a slight but perceptible degradation of colour takes place unless the prints be viewed in a mixture of pure red, green, and blue light.

—J. W. H.

PATENTS.

Transparent Photographic Films. J. E. Thornton, Altrincham, and O. F. S. Rothwell, Hulme, Manchester. Eng. Pat. 17,165, Aug. 24, 1899.

THE invention consists of a stripping film mounted on a transparent paper base. The paper is made transparent by any suitable method, and rolled and glazed (without this treatment the grain of the paper would appear in the image obtained); the stripping medium, preferably consisting of aluminium or zinc salts of fatty or resin acids, is then applied, and, after drying, the coating with sensitive emulsion takes place in the ordinary way. Such a film, although quite adherent to the base, can be stripped dry, and needs neither heat nor solvent to facilitate the operation.

—J. W. H.

Photo-Printing and Developing; Apparatus for ——. J. W. Vickers and H. W. Rumsey, London. Eng. Pat. 1530, Jan. 24, 1900.

THE invention relates to means of reproduction of engineers' and other drawings by photography. Exposure is made by incandescent gas light; arrangements are described for moving the series of lights to different parts of the flat printing frame used; development is carried out in a cylindrical vessel, the print being clamped to a frame capable of rotation.—J. W. H.

XXII.—EXPLOSIVES, MATCHES, Etc.

Nitrogen Iodide. O. Ruff. Ber. 1900, **33**, [16], 3025.

CHATTAWAY has shown that "nitrogen iodide," prepared in aqueous solution, has the composition NH_3, NI_3 (Proc. Chem. Soc. 1898, **15**, 17—22). Recently C. Hugot, by the action of iodine on liquid ammonia, has obtained the compounds NI_3, $3NH_3$, and NI_3, $2NH_3$ (Ann. Chim. Phys. [7], **21**, 5). At the low temperatures attained by the use of liquid air and alcohol, the author has prepared similar compounds with different amounts of ammonia of crystallisation. At $-60°$ C. a substance is obtained having the composition NI_3, $12NH_3$, and crystallising in brownish-red leaflets. At $-35°$ to $-40°$ C. NI_3, $3NH_3$ is produced, crystallising in olive-green needles. These, when dried *in vacuo* at $-35°$, turn a light brownish-green colour, and then have the composition NI_3, $2NH_3$. Dried *in vacuo* at $-25°$ they are converted into the ordinary "nitrogen iodide" NH_3, NI_3, in the form of reddish-violet needles.

Sodium amide, iodine and liquid ammonia react together to form a substance of the composition Na_2 NI_3.—A. M.

Chlorates; Decomposition of ——. *Part III. Calcium Chlorate and Silver Chlorate.* W. H. Sodeau.

See under VII., *page* 42.

Explosives; Heat Test for ——. W. Cullen.

See page 8.

PATENTS.

Explosives. J. Fuehrer, Vienna. Eng. Pat. 16,277, Sept. 13, 1900.

THE inventor claims the use of aluminium or other light metal mixed with material which will convert it into oxide on firing. This oxidation sets free a large amount of heat. A suitable mixture may, for instance, be made of ammonium nitrate, aluminium, and charcoal in the proportions $4NH_4NO_3 + 2Al + C$.—A. M.

Explosives; Manufacture of ——. E. Gathmann, Washington, U.S.A. Eng. Pat. 18,920, Oct. 23, 1900.

THE invention relates to propulsive explosives made in the form of rods having a number of longitudinal perforations.

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In rods thus constructed, but without any provision other than the longitudinal apertures for permitting the ignition flames to communicate with the more distant portions of the rods, the gases are generated within these perforations in such great volume, that these passages cannot accommodate their flow, and the rods are therefore burst open and broken into fragments, thereby causing a sudden and dangerous rise of pressure in the bore of the gun. In order to obviate this difficulty, the inventor makes a number of V-shaped cuts half through the rods, these cuts being made alternately on opposite sides of the rods. He claims "a longitudinally multi-perforated powder rod having alternate cuts or grooves on its opposite sides, each pair of said cuts or grooves intercepting the several longitudinal perforations."—A. M.

Explosives; Manufacture of ——. E. Gathmann. Washington, U.S.A. Eng. Pat. 18,923, Oct. 23, 1900.

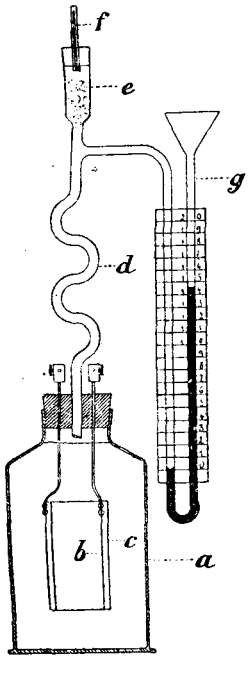
The invention described is similar to that of Eng. Pat. 18,920 (preceding abstract), except that in this case the transverse cuts are of different form, each cut intercepting all the longitudinal perforations. Diagrams and descriptions are given of a number of ways in which this may be carried out.—A. M.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Ampère-Manometer. G. Bredig. Zeits. für Elektrochem. 1900, **7**, [19], 259—260.

The ampère-manometer devised by the author is shown in the accompanying figure. The bottle *a* is nearly filled with a 2 per cent. solution of sodium hydroxide, and contains two concentric cylindrical nickel electrodes *b* and *c*, which are insulated from each other by means of several glass rods. The oxygen and hydrogen given off are conveyed through the bent tube *d* to the wider portion *e*, which is loosely plugged with cotton-wool. After being filtered by the cotton-wool (which must be renewed from time to time) the gases escape through the capillary tube *f*. A manometer *g* attached to the tube *d* registers the excess pressure within the apparatus. This excess pressure, for a capillary tube of given length and bore, will rise as the rate of evolution of the gases increases, and, for not too large excess pressures, will be approximately proportioned to the rate of evolution of the gases according to the Poiseuille formula.



The rate of evolution of the gases is, however, proportional to the current strength, and hence small internal excess pressures (above that of the atmosphere) will be very nearly proportional to the current strength. The current strength in ampères can thus be measured as a pressure.

The author employs several capillary tubes which are so adjusted that 1 ampère produces a deflection of, *e.g.*, 1 cm., 10 cm., &c., on the water manometer; so that by simply interchanging the capillary tubes the range and sensitiveness of the instrument can be altered at will.

The temperature coefficient is about + 0·56 per cent., so that for the ordinary variations in the temperature of the laboratory, the instrument is liable to an error of about 5 per cent. An E.M.F. of 1·6—2·0 volts is required. If dew becomes deposited inside the capillary tubes, it can easily be removed by washing with water, alcohol, and ether.

The ampère-manometer is not a precision instrument, but it has been found very useful in analytical and synthetical electrolysis.—J. S.

INORGANIC CHEMISTRY.—QUALITATIVE.

Thomas Slag; Detection of Mineral Phosphate in ——. N. von Lorenz. Chem. Zeit. Rep. 1900, **24**, 355.

The process depends upon the detection of fluorine, which is assumed to be always present in mineral phosphates, and always absent in Thomas slag. The slag is treated with concentrated sulphuric acid in a beaker covered with a large watch-glass, upon the under side of which, and therefore exposed to the fumes generated, a small filter paper moistened with a dilute solution of soda is caused to adhere. After exposure to the fumes for about five minutes, the paper is washed with a few c.c. of water, and the wash-water is then acidified with acetic acid and tested by the addition of a solution of calcium chloride acidified with acetic acid. The production of a white precipitate or turbidity on or before boiling indicates the presence of fluorine, and indirectly of mineral phosphate.—H. H. B. S.

INORGANIC CHEMISTRY.—QUANTITATIVE.

Chromic Acid; The Iodometric Estimation of ——. K. Seubert. Zeits. angew. Chem. 1900, [46], 1147.

This paper is virtually an introduction to the one following.

Potassium Bichromate on Potassium Iodide in the presence of Sulphuric Acid; Action of ——. K. Seubert and A. Henke. Zeits. angew. Chem. 1900, [46], 1147—1154.

After a series of experiments on the influence of time on the completeness of the reaction, of mass on its speed, on the influence of dilution, the author concludes that, for perfect safety, the molecular ratio—

$$K_2Cr_2O_7 : KI : H_2SO_4 = 1 : 18 : 110$$

should be adopted, under which conditions the reaction proceeds so rapidly that titration can be at once proceeded with. This ratio converted to parts by weight is = 1 : 10 : 36 in a total volume of 2,000. The following practical points are mentioned: 0·15 grm. $K_2Cr_2O_7$ (= 0·05 grm. Cr), requiring about 30 c.c. N/10 thiosulphate, is a convenient quantity to use when determining chromium. The chromate should be placed in a 500 c.c. stoppered flask, neutralised if necessary, the reagents added in the above ratio, avoiding concentrated H_2SO_4, and diluted before titration with 200—300 c.c. of water.—R. L. J.

Tungsten Trioxide; Separation of ——, *from Molybdenum Trioxide.* M. J. Ruegenberg and E. F. Smith. J. Amer. Chem. Soc. **22**, [11], 772—773.

When the two metals are both present as trioxides, they are readily and completely separated by sulphuric acid of sp. gr. 1·378, in which tungsten trioxide is completely insoluble. The analytical figures were equally accurate, both in the case of mixtures in various proportions of the two oxides alone and in the case of mixtures of the two with a large excess of ferric hydroxide.—J. T. D.

Arsenic; New Method of Determining ——. O. Ducru. Comptes Rend. **131**, [22], 886—888.

The solution containing the arsenic in the form of arsenic acid, is concentrated, or is evaporated to dryness and redissolved in the least possible amount of water; any alkali carbonates are decomposed by hydrochloric acid, and ammonia is added, just to alkaline reaction. Into a conical flask is put, in the proportion of 10 c.c. per 100 mgrms. of expected arsenic, a solution of cobaltous chloride containing 75 grms. of the crystallised salt per litre. To this is added ammonium acetate solution, made by saturating 40 per cent. acetic acid with 20 per cent. ammonia, so as to form about one-fourth of the whole bulk of the liquid

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finally contained in the flask. This is followed by 3 per cent. of the same total volume of 20 per cent. ammonia, and then the solution of arsenic is added. The flask, closed by a porcelain stopper, is heated in the water-bath or steam oven till the deposition of crystals has ceased, cooled, allowed to stand for a few hours, and the precipitate is then collected on a filter and washed with cold water. The precipitate can now be treated in any of the following ways :—(*a*) Dried in the steam oven to constant weight, and weighed on the tared filter as $Co_3(AsO_4)_2.NH_3.7H_2O$. (*b*) Transferred as completely as possible to a large crucible, into which the rest is also got by solution on the filter in hot dilute nitric acid; the acid is then evaporated on the water-bath, and the crucible very gradually heated to dull redness till constant in weight. This plan is not so accurate as the former, but the weight of the residue in the crucible multiplied by the empirical coefficient 0·3193 gives fairly constant results. (*c*) Dissolved in hot dilute hydrochloric acid, the arsenic removed by Wöhler's method, or the cobalt precipitated by bromine and soda, and in either case the cobalt determined by electrolysis of the ammoniacal solution of the sulphate. Co_3 corresponds to As_2. The author's figures, for amounts of arsenic from 1 to 500 mgrms., are very satisfactory.—J. T. D.

Ferrochrome; Determination of Carbon in ——. A. A. Blair. J. Amer. Chem. Soc. **22**, [11], 719—723.

In burning ferrochrome with acid potassium sulphate in a stream of oxygen in a combustion tube, with copper oxide in the after part, carbon may get into the absorption apparatus from the oxidation, by the sulphuric acid, of the corks; the boat may become cemented into the tube by the spattering of the acid sulphate, and the tube is often broken by the swelling of the copper oxide, caused through absorption of sulphuric acid. The author avoids these difficulties by using a platinum tube for the combustion and substituting platinised asbestos for the copper oxide. boat, and the tube is kept clean. The platinum tube has a ground joint at the rear end, is constricted at the fore end for the reception of the platinised asbestos, then further constricted, bent at right angles, and fused to the narrow glass U-tube filled with beads. The two plugs, of pumice, wrapped in platinum foil, are pushed in behind the boat, and serve to check diffusion backwards, and consequent deposition of sulphuric acid near the joint. The general arrangement of the apparatus (Fig. 2) for the most part explains itself. D D contain chromic acid solution (150 grms. with 300 c.c. of strong sulphuric acid per litre), and stand on a copper plate heated by a Bunsen burner; E is filled with glass beads, F with pumice saturated with chromic acid, and G with calcium chloride. The guard tube beyond the absorption apparatus is connected with an aspirator to relieve the otherwise high pressure in the apparatus.

The method is as follows :—Put 25 grms. of acid sulphate in the boat, and melt it. When cold, spread over it 1 grm. of finely divided ferrochrome, put the boat into the platinum tube, followed by the plugs, and connect up the apparatus, sending a slow stream of oxygen through. Heat the platinised asbestos first, then work backwards till the whole of the boat is red-hot. After 20 minutes, turn off the oxygen, and allow the tube to cool for half an hour in a current of air. A slow current of oxygen must be used to ensure the condensation of the sulphuric anhydride, and the tube must be heated very gradually, so that the sulphur dioxide may never be in excess of the oxygen. A combustion takes about two hours and a half.—J. T. D.

Uranium and Vanadium Ores; Analysis of ——. O. P. Fritchie. Eng. and Mining J. 1900, **70**, [19], 548.

The following method, which is particularly adapted to the analysis of the mineral carnotite, depends upon the reduction of the uranium and vanadium in sulphuric acid solution to their lower oxides by metallic aluminium, and

Fig. 1.

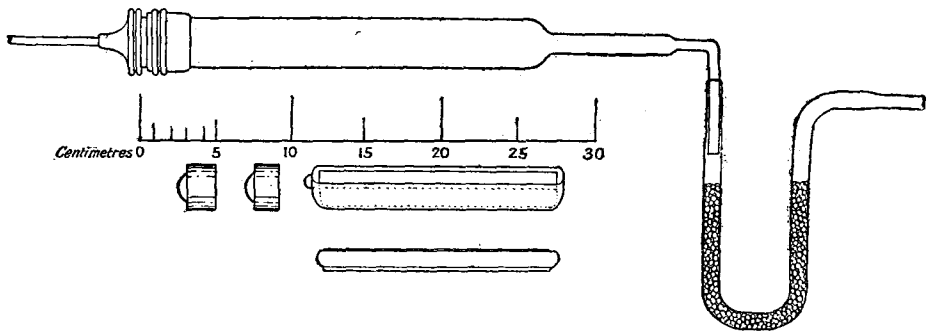
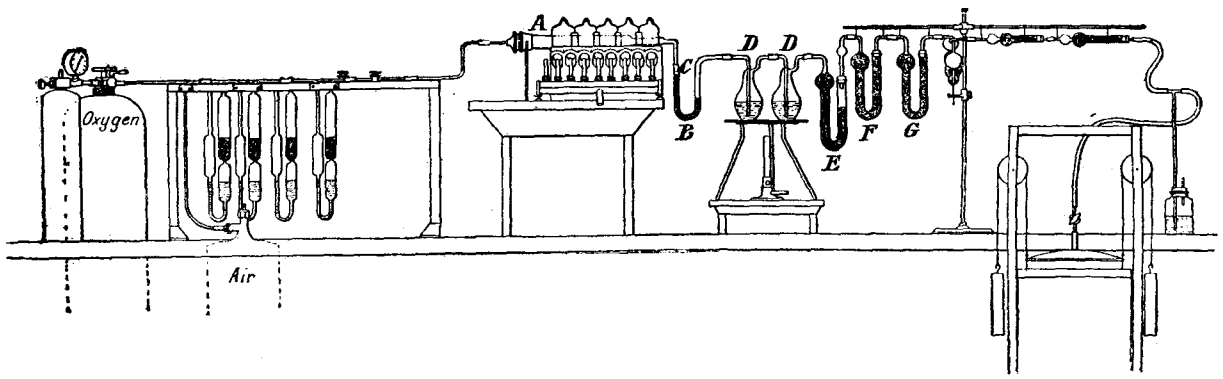


Fig. 2.



Two platinum boats are used (Fig. 1), one inside the other. The lid of the inner boat is so arranged that particles of the melted sulphate spirted against it drip into the outer

then oxidation to their higher oxides with permanganate solution. Metallic aluminium was found to be preferable to either zinc or sulphurous acid as a reducing agent.

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0·5 grm. of the finely powdered mineral is moistened with water and digested for one hour with 10 c.c. of nitric acid, at a temperature at which the liquid boils gently. The solution is diluted with 10 c.c. of water, neutralised with a saturated solution of sodium carbonate, 5 c.c. excess of the latter added, and then 20 c.c. of a 20 per cent. solution of caustic soda. The whole is boiled gently for about half an hour and then allowed to settle. The uranium, vanadium, and iron are all precipitated by the sodium carbonate, but the vanadium is redissolved on boiling with the excess of caustic soda. The precipitate is filtered off and washed a few times with caustic soda solution. Water must not be used for washing, or some of the precipitate may pass through the filter. The filtrate should not give any uranium reaction when acidified with nitric acid and treated with potassium ferrocyanide. The whole of the vanadium is contained in the filtrate, but it is better to weigh out a fresh sample of the material for the determination of this constituent.

The precipitate is dissolved on the filter with 20 c.c. of hot dilute nitric acid (1 : 1), and the solution run into the original flask, where it is diluted with about 40 c.c. of water, treated with ammonia until a slight permanent precipitate is formed, and then with 40 c.c. of a saturated solution of ammonium carbonate, which has been freshly prepared and heated slightly to remove any excess of carbon dioxide. The uranium is readily soluble in the excess of ammonium carbonate, whilst the iron remains undissolved. The liquid is heated to incipient ebullition for a few minutes, and the iron precipitate filtered off and well washed with a 2 per cent. solution of ammonium carbonate. The filtrate, which should not give any vanadium reaction (red coloration) when acidified with nitric acid and treated with hydrogen peroxide, is treated with 20 c.c. of dilute sulphuric acid (1 : 1), added gradually, and boiled until dense white fumes are given off. It is then cooled, diluted to about 100 c.c., about 4 sq. ins. of sheet aluminium cut into six strips added, and the liquid boiled until the yellow colour changes to a sea-green. The solution is diluted, and titrated whilst hot with a standard solution of permanganate. The uranium equivalent of the permanganate is obtained by multiplying the iron equivalent by 120/56.

For the determination of the vanadium, 0·5 grm. of the ore is moistened with water and heated with 10 c.c. of nitric acid and 10 c.c. of sulphuric acid, until the whole of the nitric acid is expelled and dense white fumes of sulphuric anhydride are evolved. The solution is cooled, diluted, and reduced with aluminium. It is then further diluted, and titrated whilst hot with permanganate. The number of c.c. of permanganate solution used, less the number of cubic centimetres required for the uranium and iron, is the permanganate required for the oxidation of the vanadium. The vanadium equivalent of the permanganate is obtained by multiplying the iron equivalent by 51·1/112. The end reaction is slow with vanadium, and permanganate must be added gradually until a permanent pink is obtained.

—A. S.

Titanic Acid; Colorimetric Determination of ——. J. Brakes.

See page 23.

ORGANIC CHEMISTRY.—QUALITATIVE.

Millon's Reagent. W. Vaubel. Zeits. angew. Chem. *1900*, [45], *1125—1130*.

MILLON'S reaction which is given by phenolic substances and derivatives thereof, such as albuminoids, consists in the production of a red coloration or the separation of a red precipitate on adding Millon's reagent to a solution of the substance and if necessary, warming. The reagent is obtained by adding sufficient mercury to nitric acid to produce the mercurous salt. For example, one part by weight of metallic mercury is dissolved in one part by weight of nitric acid (sp. gr. 1·4), the mixture being finally gently warmed and then diluted with two parts by weight of distilled water. Hence the reagent contains together with some nitric acid principally mercurous nitrate and nitric oxide. Possibly part of the latter is converted by the atmospheric oxygen into nitrogen dioxide and since it is necessary that these gases should be present, it is advisable to employ only gentle heat in preparing the reagent. The author has investigated the behaviour of a number of substances to Millon's reagent and arrives at the following conclusions. (1) Substances of the formula $1.4\ C_6H_4OH.X$, such as tyrosin, *p*-diphenol, phenolphthaleïn and hydroquinone give the reaction. (2) The same is also the case with substances of the formula $1.2\ C_6H_4OH.X$ and $1.2.4\ C_6H_3OH.X_2$ such as pyrocatechol, guaiacol, *p*-nitrosalicylic acid; of the formula $1.2.3\ C_6H_3OH.X_2$ and $1.2.3\ C_6H_2OH.X_3$ such as *α*- and *β*-naphthol, 1·4 bromo- and chloro-*α*-naphthol and bromo-*β*-naphthol, and also substances like resorcinol and *m*-cresol of the general formula $1.3\ C_6H_4OH.X$. (3) Substances of the general formula $1.2.4.6\ C_6H_2OH.X_3$ such as tribromophenol, dibromo-*p*-diphenol, dibromotyrosin, dibrom-*o*-cresol, dibromo-*p*-cresol and dibromo-*p*-nitrophenol and these of the formula $1.3.5.C_6H_3OH.X_2$, like orcinol and phloroglucinol, do not give the reaction. The same is also true of thymol and pyrogallol. (4) In the case of phenol the following reactions take place:—

$$2C_6H_5OH + 2NO + O = 2C_6H_4OH.NO + H_2O.$$

$$C_6H_4OH.NO + 4HgNO_3 + NO + 3C_6H_5OH$$

$$= HON : \left[\begin{matrix} .N.O.C_6H_4.O \\ O \text{———} Hg \end{matrix} \right]_4 + NO_2 + 3H_2O.$$

(5) On heating with soda lye, these products lose mercury and a compound is obtained soluble in soda lye with a reddish brown colour and precipitated by acids—

$$HON(NO_2C_6H_4OHg)_4 + 9NaOH =$$

$$NaON \begin{matrix} \diagup (OC_6H_4ONa)_2 \\ \diagdown (C_6H_4ONa)_2 \end{matrix} + 4Hg + 5H_2O + 2NaNO_2 + 2NaNO_3.$$

(6) By the action of bromine these compounds yield products of the type—

$$BrN \begin{matrix} \diagup (OC_6H_3BrOH)_2 \\ \diagdown (C_6H_3BrOH)_2 \end{matrix}$$

(7) No reaction takes place with Millon's reagent in the case of di-*o*- and di-*m*-substituted compounds. (8) In the case of the naphthols, only *β*-naphthol yields a product analogous to that from phenol. Other naphthol derivatives so far as they have been investigated give nitroso compounds.—T. A. L.

Methyl Alcohol in Mixtures; Detection of ——. S. P. Mulliken and H. Scudder. Amer. Chem. Journ. 1900, **24**, [5], 444—452.

THE method given by the authors for the detection of methyl alcohol in mixtures, *viz.*, oxidation of the alcohol to formaldehyde followed by condensation of the latter with resorcinol with the formation of a red precipitate, is objected to by Jandrier on the grounds that acrolein answers to the test, and that the test is interfered with by furfurol; he further recommends the use of gallic acid as a reagent for the formaldehyde, but the authors find that the colours thus obtained are also given by the oxidation products of many other compounds. An improved method of applying the resorcinol test is as follows:—Only that part of a mixture is tested for methyl alcohol which can be completely distilled between 50° and 100° C., and which, after distillation, gives a clear, colourless solution when shaken with two or three times its volume of water. A blank experiment should be made on the liquid before the latter is oxidised, to make sure that no precipitate or coloured ring is formed. No solution suspected to contain phenols, alkaloids, or organic bases should be tested without preliminary treatment. Methyl alcohol may be separated easily from most colouring matters, oils, resins, sugars, glycerin and glycols by distillation; from phenols and acids by distillation with aqueous caustic alkali; from bases by distillation from strongly acidified aqueous solutions. Should the blank experiment, without oxidation, yield a coloration or precipitate, and the solution also give aldehydic reactions with ammoniacal silver nitrate and with Schiff's Rosaniline aldehyde reagent, 12 c.c. of the alcoholic distillate, which must

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contain at least 75 per cent. of water, is heated in a stoppered bottle with 3 grms. of resorcinol and 1 c.c. of concentrated sulphuric acid in a water-bath for two hours at 70°—80° C.; the cooled solution is diluted to 50 c.c. with water, 5 c.c. being then distilled off and tested in the usual way. If ethyl alcohol be present with methyl alcohol in the liquid, acetaldehyde will be formed on oxidation, but this is got rid of by the new method of testing. Two c.c. of the liquid are made up to 6 c.c. with water and then treated six times in succession with intermediate cooling with a short, closely-wound spiral of light copper wire which is heated to redness and superficially oxidised, and then plunged into the liquid. The test-tube, which should be 6—7 ins. long, is next fitted with a double-bored stopper, one hole containing a piece of glass tube connected with a Bunsen pump, and the other fitted with a piece of glass tube drawn out to a very fine capillary, the end of which reaches nearly to the bottom of the tube. The latter is then immersed about two-thirds in water at 25°—30° C., the air passage partially stopped by a screw-clamp, and gentle suction applied so as to saturate the liquid with air. The clamp is next screwed tight, and the pump turned full on, when a stream of bubbles, consisting of acetaldehyde, alcohol, and water vapours, rises from the capillary. After one-half the liquid has been boiled away in this manner, to the residue is added one drop of a solution of one part of resorcinol in 200 of water, the liquid being then carefully poured into a second tube containing sulphuric acid, so that no mixing occurs. After standing for three minutes, the tube is rocked slowly to produce a gentle mixing of the layers. If methyl alcohol be present, this treatment will cause the separation of more or less voluminous flocks of a characteristic rose-red colour. One part of methyl alcohol in 2,000 parts of the solution as prepared for oxidation, can be detected in this way. With a mixture of ethyl and methyl alcohols in the proportion of 100 parts of the former to three of the latter, the test answers, but it cannot be depended on if there be only two parts of methyl to 100 of ethyl alcohol. The only substances giving the same reaction as methyl alcohol with the above described test are the methyl esters and ethers (including methylal) and secondary and butyl alcohols.

—T. H. P.

Maize in Wheaten Flour; Detection of ——. G. Embrey. Analyst 1900, **25**, [297], 315—316.

BAUMANN'S quantitative method (this Journal, 1899, 301) has not given satisfactory results in the author's hands, and he has, therefore, devised the following modification:—Mixtures of pure wheat and maize flours are prepared containing respectively 10, 15, 20, 25, and 30 per cent. of the maize. Weighed quantities (0·2 grm.) of each of these and of the sample under examination are placed in test tubes (15 cm. × 2 cm.) which are fitted with paraffined corks. To each are added 20 c.c. of potassium hydroxide solution (18 grms. per litre), and the tubes shaken uniformly for three minutes. Twelve drops of hydrochloric acid (HCl of sp. gr. 1·16, 50 c.c.; water, 100 c.c.) are next introduced and the tubes whirled in a centrifugal machine at 600 revolutions per minute. One c.c. of the clear liquid is transferred to a Nessler tube, and diluted to 50 c.c., after which 1 c.c. of an iodine solution (I, 0·25 grm.; KI, 1 grm.; water, to 250 c.c.) is added. The tint obtained compared with those of the standard tubes gives the proportion of maize within about 5 per cent. For a more exact determination, 10 c.c. of the clear liquid from each tube are boiled for two hours with 1 c.c. of dilute sulphuric acid (1:7), then neutralised, diluted to 50 c.c., and run from a burette into a boiling mixture of Gerrard's solution, 10 c.c., and Fehling's solution 2 c.c., until the colour is discharged. The percentage of maize is obtained from the standard tube of which the same amount is required to discharge the colour.

Gerrard's Solution is prepared by diluting 10 c.c. of freshly-prepared Fehling's solution with 40 c.c. of water, and adding a solution (about 5 per cent.) of potassium cyanide from a burette, until the blue colour is only just perceptible. During the addition of the cyanide, the diluted Fehling's solution is kept boiling and constantly stirred in a porcelain dish.—C. A. M.

Maize in Wheaten Flour; Detection of ——. E. J. Bevan. Analyst, 1900, **25**, [297], 316.

ACCORDING to the author the following test of A. C. Wilson gives satisfactory results:—The flour is mixed with clove oil and examined under the microscope with a $\frac{1}{4}$ or $\frac{1}{6}$ objective. Wheat or other starches are practically invisible, whilst the hilum of maize is indicated by a black dot or star.—C. A. M.

"Saccharin" in Wine and Beer in the Absence of Salicylic Acid; Detection of ——. F. Wirthle. Chem. Zeit. 1900, **24**, 1035.

SCHMITT'S method of detecting saccharin (*cf.* this Journal, 1887, **6**, 681) consisting of heating the extracted substances with caustic soda for half an hour in the oil-bath at 250° C., has not always proved satisfactory. This may be due to an incorrect use of the thermometer, as the author finds that when using two exactly similar thermometers, one completely immersed, the other so far immersed that the mercury column projects 37° above the cork, the indications at the same moment were 260° and 221° respectively. Results are satisfactory if the treatment with soda last for 15 minutes at a temperature indicated as 210°—220° C., when the thermometer is placed with the mercury column projecting 37° above the cork. It is recommended that 100 c.c. of the wine to be tested be evaporated to about 20 c.c., which is then transferred to a separating funnel, any residue being washed in with a few drops of caustic soda and some water; the whole is then acidified strongly with sulphuric acid, and shaken three times successively with 50 c.c. of ether. The ethereal solution is filtered into an Erlenmeyer-flask, and shaken with 10 c.c. of a 5 per cent. solution of caustic soda, after which the ether is distilled off. The residue is rinsed into a small porcelain dish, about 1 grm. of solid caustic soda is added, and the whole is heated slowly in an air-bath to 215° C., after which it is kept for 15 minutes at a temperature indicated as 210°—220° C. by a thermometer, of which the mercury column projects 37° above the cork. After cooling, the mixture is taken up with hot water, and is then carefully acidified with sulphuric acid and shaken with ether and petroleum spirit. The evaporation-residue from the resulting ethereal solution is diluted with a few c.c. of water. The addition of a few drops of very dilute ferric chloride solution will produce a beautiful violet-colour, even if only 1 mgrm. of saccharin had been present in 100 c.c. of the wine. Wines containing no saccharin, even though they contained much tannin, showed at most a dirty yellow-red (never a violet) coloration under these conditions. It is recommended always to try a blank experiment, simultaneously with a wine test, evaporating the alcoholic solution of 1 mgrm. of saccharin with 1 c.c. of caustic soda solution, and then adding 1 grm. of the solid soda. Beer is tested in the same way; the author having found that the presence of hops (and of tannic acid from that source) is without influence on the applicability of the test.

—W. G. M.

Dulcine (Phenetol-carbamide) in Foods and Beverages; Detection of ——. J. Bellier. Ann. de Chim. Analyt. **5**, 333. Pharm. J. 1900, **65**, [1587], 616.

DULCINE, in concentrated sulphuric acid solution, if treated with a few drops of formaldehyde, and the mixture diluted with water, gives a turbidity or precipitate, whilst saccharin does not. With less than 1 mgrm. of dulcine, a distinct precipitate is obtained by dissolving in 1 c.c. of sulphuric acid, adding 1 drop of formaldehyde, and diluting with water to 5 c.c. In order to apply this reaction, the dulcine is extracted from syrups, lemonade, waters, &c., by making alkaline, and shaking out with acetic ether. Beer is treated with sodium phosphotungstate, acidulated with a few drops of sulphuric acid, filtered and made alkaline, before shaking out. Fruit syrups, preserves, confectionery, and similar articles are rendered fit for extraction by dilution and precipitation with basic lead acetate. Wines should be first treated with mercuric acetate.

For the quantitative determination of dulcine, the sample is evaporated, if necessary, to free from alcohol, treated with the purifying precipitant, filtered, the solution made alkaline, and twice extracted with acetic ether (50 c.c. each

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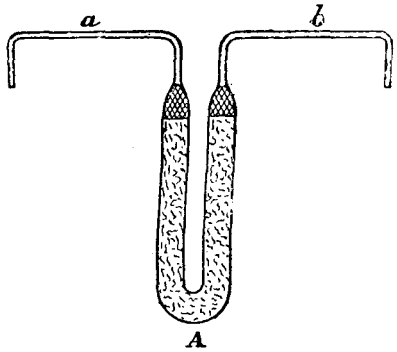
time). The evaporation residue of the extract is dissolved in from 1 to 5 c.c. of concentrated sulphuric acid, a few drops of formaldehyde added, and the solution, after standing for 15 minutes, diluted to ten times its volume. After standing for 24 hours, the precipitate is collected on a tared filter, washed with distilled water, the filter and contents drained between filter paper, dried and weighed.—A. S.

ORGANIC CHEMISTRY—QUANTITATIVE.

Coal Gas; New Method for the Volumetric Determination of Carbon Monoxide in ——. A. Smits, H. Raken, and P. C. E. Meerum Terwogt. Zeits. angew. Chem. 1900, [40], 1002—1004. (Compare this Journal, 1898, 377 and 490.)

The principle of the method depends on the oxidation of the carbon monoxide to carbon dioxide, which is subsequently absorbed by caustic potash. The oxidising agent employed is I_2O_5 at a temperature of 150°—180° C. In the accompanying illustration, the U-tube A is filled with a mixture of I_2O_5 (about 8 grms.) and asbestos. Two asbestos plugs keep the mixture in position, and immediately above these plugs the limbs of the U-tube are attached to two capillary tubes *a* and *b*. The tube *a* is connected to the gas burette, whilst *b* communicates with a KOH pipette.



In performing an analysis, the illuminating gas, previously freed from carbon dioxide, heavy hydrocarbons and oxygen, is passed through the I_2O_5 pipette, heated at 150°—180° C. The iodine liberated sublimes into the tube *b*, whilst the CO_2 is absorbed by the KOH pipette. If there is any tendency for the tube *b* to become blocked up by the sublimed iodine, this can easily be overcome by passing the gas backwards and forwards rapidly through the apparatus, in order to distribute the iodine between the tubes *a* and *b*. Finally, the gas is passed through very slowly to complete the oxidation.

After allowing the I_2O_5 pipette to cool down to the normal temperature, the diminution in volume of the gas represents the amount of carbon monoxide contained in it. The authors have confirmed the statements made by Nicloux and Gautier, *viz.*, that under the above conditions, neither hydrogen nor methane is attacked by the hot I_2O_5 or the nascent iodine.

In subsequently determining the hydrogen and methane, corrections must be made on account of the free space in the I_2O_5 and palladium pipettes. Assuming that the analysis was made with 100 c.c. of illuminating gas, and that *a* c.c. were removed by the caustic potash pipette, *b* c.c. by the fuming sulphuric acid pipette, *c* c.c. by the phosphorus pipette, *d* c.c. by the iodine pentoxide pipette, *e* c.c. by the palladium pipette, and that the remaining *f* c.c. of gas was found to contain *g* c.c. of methane: then the true percentages of hydrogen and methane are—

$$H_2 = \frac{e}{A}(A + p) - \frac{p+q}{5} \text{ per cent.}$$

$$CH_4 = \frac{g}{f} \cdot \frac{A+p}{A}(A + q - e) \text{ per cent.}$$

where *p* represents the free space in the I_2O_5 pipette, *q* the free space in the palladium pipette, and A is the volume of the gas immediately before absorbing the hydrogen, *viz.*, $100 - (a + b + c + d)$.

The spaces *p* and *q* should, of course, be kept as small as possible, and *p* should be redetermined from time to time as the I_2O_5 gradually becomes used up.—J. S.

Sulphuretted Hydrogen in Coal-Gas; Determination of ——. H. Leicester Greville. J. Gas Lighting, 1900, **76**, [1958], 1264.

The author published some years ago a method for the rapid determination of sulphuretted hydrogen in gas liquor. The process is based upon the use of a standard solution of ammoniacal copper sulphate, which reacts with the sulphuretted hydrogen with formation of copper sulphide. The results obtained differ at the most by only 0·025 per cent. from those obtained by precipitation as arsenic sulphide. It is now proposed to apply this method to the determination of sulphuretted hydrogen in coal-gas. The gas is passed into Harcourt tubes, such as are used for the ordinary volumetric determination of carbon dioxide and sulphuretted hydrogen. The first tube is charged with a solution prepared by mixing 1 volume of strong liquid ammonia with 10 volumes of water; and the second is filled with pure distilled water. A small piece of lead test-paper is placed in the outlet of the second tube, as a check on the total absorption of the sulphuretted hydrogen by the solutions. After a definite quantity of the gas has been drawn through the apparatus, the contents of the tubes are washed into a porcelain basin and titrated with the ammoniacal copper solution, which is of such strength that each c.c. equals 0·05 grain of sulphuretted hydrogen. It is stated that $\frac{1}{10}$ cb. ft. of gas can be passed through in 10—15 minutes without the slightest discoloration of the lead test-paper.—A. S.

Sulphuretted Hydrogen in Coal-Gas; Determination of ——. A. Müller. J. für Gasbeleucht. **43**, [42], 792—793.

The author applies Schulte's process for the estimation of sulphur in iron (Stahl und Eisen, 1896, 865) to the estimation of sulphuretted hydrogen in gas in the following manner:—A known volume—about 15 litres—of the gas is bubbled slowly through 25 c.c. of a solution consisting of 25 grms. of cadmium acetate and 200 c.c. of acetic acid, made up to a litre with distilled water. The volume of gas may be measured by means of a small meter, or by means of a bottle having the necessary capacity between its mouth and a mark slightly above a tubulure near its bottom. The bottle is filled with water covered by a layer of petroleum, and is connected through the tubulure with a levelling vessel, by lowering which it is filled down to the mark with gas, which is then forced, by raising the levelling vessel, through the solution of cadmium. After the gas has been bubbled through the solution, the bubbling tube is washed into the latter and removed. There is then added to the solution, after warming to 50°—60° C., 10 c.c. of a solution made by dissolving 80 grms. of pulverised crystals of cupric sulphate in 750 c.c. of water, and adding, when cool, 175 c.c. of concentrated sulphuric acid, and making up to a litre with distilled water, and filtering. The liquid changes in colour, on addition of the copper solution, from yellow—due to suspended cadmium sulphide, which can be filtered off and washed only with difficulty—to brownish-black, due to the formation of cupric sulphide, which is filtered off, well washed with hot water, dried, and ignited. The cupric oxide thus obtained is weighed, and the weight (in grammes) multiplied by $\frac{34}{79 \times 1{\cdot}43} = 0{\cdot}301$, gives the volume (in litres) of sulphuretted hydrogen in the volume of gas dealt with, on the assumption that the temperature of the latter was about 18° C., at which temperature a litre of sulphuretted hydrogen weighs 1·43 grms.—J. A. B.

Metacresol in Mixtures of Cresols; Determination of ——. H. Ditz. Zeits. angew. Chem. 1900 [42], 1050.

Referring to the method of estimation described by Raschig (this Journal, 1900, 857), the author points out that it has the great advantage of giving directly the amount of metacresol, though it is not applicable when the

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mixture of cresols contains a large proportion of phenol, or when xylene is present. He considers that in the case of pure cresol mixtures, the method first described by himself and Cedivoda (Zeits. angew. Chem. 1899, 873 and 897), is the most suitable.

About 1 grm. of the anhydrous cresol mixture is weighed out, dissolved in water with the aid of some sodium hydroxide, and the solution diluted to 250 c.c. Two portions of 25 c.c. each are transferred to well-stoppered flasks, and decomposed with a sufficient quantity of Koppeschaar's bromide-bromate solution, and 10 c.c. of hydrochloric acid (1 : 1). After being shaken for exactly one minute, 20 c.c. of a 5 per cent. solution of potassium iodide are introduced, the iodine which separates titrated with standard thiosulphate after one hour, and the amount of bromine absorbed calculated from the result. The quantity of metacresol is then obtained from the equations—

$$x + y = a \quad \text{and} \quad \frac{3\text{Br}\,x + 2\text{Br}\,y}{108{\cdot}08} = b,$$

in which x = the amount of metacresol; y, the sum of the ortho- and para-cresol; a, the weight of the total cresols; and b the weight of bromine absorbed, hence—

$$x = a - y = a - \frac{2{\cdot}2195a - b}{0{\cdot}7397} = \frac{b - 1{\cdot}4798a}{0{\cdot}7397}$$

If the cresol mixture contain any traces of water, the latter is removed preferably by heating 5 to 10 grms. of the mixture in a small fractionating flask, and after removal of the water distilling over the cresol. According to the author's experimental results, the accuracy of the method is within 0·5 per cent.

It is not possible to determine separately by this method each of the individual constituents in a mixture of phenol with the three cresols, but it suggested that this problem may be solved by a combination of the author's method with that of Raschig. The only difficulty is that in the latter, the presence of more than 10 per cent. of phenol interferes, but this may be obviated by adding to the mixture a known quantity of pure metacresol, or a definite quantity of a cresol mixture which is free from metacresol, so as to reduce the total amount of phenol below 10 per cent. (this Journal, 1900, 278).—C. A. M.

Wax; Acid and Saponification Values of ——. Modification of Hübl's Method of Determining them. O. Eichhorn. Zeits. anal. Chem. 1900, **39**, [10], 640—645.

THE modification recommended consists in the use of amyl alcohol as a solvent.

Determination of the Acid Value.—About 6 grms. of the wax are heated with 60 c.c. of pure amyl alcohol until the liquid boils, when it is titrated with decinormal potassium hydroxide solution. The advantage over the ordinary method is that the last drops of alkali can be added at a temperature of about 60° C. without the wax separating, and thus avoiding a partial saponification. Hence in all the experiments described, the results were considerably lower than those usually obtained. Thus, with a pure yellow wax, the respective values were 22·34 and 22·8. In the case of Carnauba wax it is best to use only 3 grms. and 120 c.c. of amyl alcohol. The value found by the author (9·71) is the highest yet recorded.

Determination of the Saponification Value. — About 5 grms. of the wax are placed in an Erlenmeyer flask, into which are then introduced 60 c.c. of amyl alcohol and 25 c.c. of normal alcoholic potassium hydroxide, and the same quantities of amyl alcohol and alkali are placed in a second flask for a blank determination. Both flasks are then placed in a boiling water bath, where they are left for 30 minutes, with occasional shaking at first. 1 c.c. of a 1 per cent. phenolphthaleïn solution is now added, and the excess of alkali titrated with semi-normal hydrochloric acid.

The author states that all the waxes examined by him gave too low results when saponified by the usual Hübl method. That the action is complete in 15 minutes in the new method is shown by the following results, taken from the author's longer table :—

—	Saponification, 15 minutes.	Saponification, 30 minutes.	Saponification, 50 minutes.	Saponification, 90 minutes.
Wax, No. 1	94·6, 94·3 } 94·4	94·5, 94·5 } 94·5	94·3, 94·4 } 94·3	94·4
„ No. 3	89·2, 89·6 } 89·4	89·5, 89·6 } 89·5	89·3, 89·4 } 89·3	89·3
„ No. 7	86·3, 86·5 } 86·4	86·5, 86·4 } 86·4	86·5, 86·5 } 86·5	86·5

The presence of ceresin neither prevents nor retards the saponification. With Carnauba wax the mean saponification value of 95·1 was obtained.—C. A. M.

Proteid Nitrogen in Vegetable Matter; Determination of ——. G. S. Fraps and J. A. Bizzell. J. Amer. Chem. Soc. **22**, [11], 709—719.

A COMPARATIVE study of the methods of Stutzer (copper hydroxide), Mallet (phosphotungstic acid at 90° C.), and Wiley (bromine), as applied to the precipitation of proteids in vegetable materials. The authors conclude that—(i) Phosphotungstic acid does not precipitate proteids completely at 90° or 100°, though at 60° C. it precipitates practically the same amount as does copper hydroxide; (ii) Extraction of proteids with hot water does not always give concordant results; (iii) Bromine is not a suitable precipitant for proteids in vegetable materials; (iv) The Stutzer method is that open to the fewest objections. It is carried out as follows :—Place 0·7 grm. of the substance in a beaker, add 100 c.c. of water, heat to boiling (with substances rich in starch, heat on the water bath for ten minutes); add a quantity of copper hydroxide mixture containing about 0·5 grm. of the hydroxide; stir thoroughly, filter when cold, wash with cold water on the filter, and determine the nitrogen in the precipitate, adding sufficient potassium sulphide solution to precipitate all copper and mercury. If the substance is rich in alkaline phosphates, add a little concentrated solution of alum before adding the copper hydroxide. It is not certain that albumoses are completely precipitated by copper hydroxide; but in the rare cases when they do occur, they can be precipitated by the addition of tannic acid after the copper hydroxide.

—J. T. D.

Alkaloids; Use of Tannin in Purifying Residues containing ——. C. Kippenberger. Zeits. anal. Chem. 1900, **39**, [10], 627—633.

ACETONE has been found by the author to be a suitable solvent for alkaloids in combination with tannin, and for separating them from albuminous substances. It dissolves the freshly precipitated tannates of the following alkaloids: —Brucine, strychnine, atropine, morphine, aconitine, veratrine, papaverine, narceïne, thebaïne, codeïne, emetine, nicotine, coniine, sparteïne, quinine, narcotine, and cocaine. On the other hand, the precipitates formed by tannin in solutions of albumin and peptone did not yield any trace of the albuminous constituents to the solvent after being treated with acetone for 1½ hour, although tannin was found in solution.

In applying this principle in forensic analysis the following method is recommended :—The substance under examination is extracted with *acidified* alcohol, and the alcohol evaporated. The residue is stirred into a paste with a little water and acetone, mixed with tannin, and gently warmed with a sufficient quantity of acetone containing a few drops of hydrochloric acid. The filtrate from this is mixed with 10 to 20 c.c. or more of glycerin, together with some water and 1 or 2 c.c. of hydrochloric acid, evaporated on the water bath so as to expel all acetone, diluted with water and filtered. The liquid is then ready for extraction with chloroform.

The author still advocates the retention of his former method of direct extraction with glycerin containing tannin (Zeits. anal. Chem. **34**, 303—308) for cases in which alkaloids which are volatile with steam are present.

—C. A. M.

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Nux Vomica; Determination of. F. C. J. Bird. Pharm. J. **65**, [1587], 574.

As an alternative for the method of Dunstan and Short, in which the alkaloids are extracted by hot percolation with a chloroform-alcohol menstrum, the author recommends a method of cold maceration in a solvent of amyl alcohol, chloroform, and ether, as being more rapid, more convenient, and not requiring the same degree of comminution of the drug.

Process for Analysing Nux Vomica Seeds.—5 grms. of the seeds, in No. 10 powder, are triturated in a mortar with solution of potash (10 per cent.) 2 c.c. until uniformly moistened. The extraction menstrum is composed of amyl alcohol, 1 vol.; chloroform, 3 vols.; ether, 4 vols.; 20 c.c. of this mixture is placed in a separator previously plugged above the stopcock with cotton wool, and the moistened powder added to it. The whole is macerated for half an hour, with occasional agitation; at the end of that time a pressure ball is adapted to the separator and the liqnid forced out, as completely as possible, by air pressure. The residual drug is again covered with a fresh portion of solvent, and again macerated, with occasional agitation, for 15 minutes, and the liquid removed as before. This process is repeated until a drop of the extract, when evaporated, gives no reaction with Mayer's alkaloidal reagent. Usually five to six extractions will be sufficient. To remove all the alkaloids, the mixed ethereal extracts are then shaken out with a mixture of dilute sulphuric acid, 6 c.c., and water, 25 c.c., in three successive portions. The acid solutions are transferred to a 200 c.c. separator half filled with water at 21° C. and having the neck above the stopcock plugged with a very small pledget of cotton wool. To this, a freshly prepared solution of potassium ferrocyanide (1·25 grms. in water, 25 c.c.) is added, and the separator completely filled with water at 21° C. and closed by a cork carrying a thermometer. The temperature is carefully maintained at 21° C., the contents of the separator rotated occasionally for 30 minutes, then allowed to remain at rest for 90 minutes. A pressure ball is then fitted, and the mother liquor forced out. The residual precipitate is washed with 50 c.c. of a mixture of 5 c.c. of dilute sulphuric acid and 19 c.c. of water at 37·7° C., the liquid being removed by air pressure as before. The remainder of the wash water is then employed in a similar manner. Washing being completed, the stopper is inserted, the separator inverted, the cotton plug displaced by a stiff wire passed through the stopcock; 10 c.c. of water is then added to suspend the precipitate, 75 c.c. of chloroform and 2 c.c. of strong solution of ammonia are introduced, and the whole well agitated. After separating the chloroformic layer, the aqueous portion is shaken out with another portion of that solvent. To the mixed chloroformic extracts, 2 c.c. of amylic alcohol is added, the solvent evaporated off, and the residual strychnine weighed when dry. An addition of 0·002 grm. is made to the weight obtained, as the equivalent to the amount of strychnine ferrocyanide dissolved in the wash-water.

The packing of the cotton wool in the neck of the separator demands some care, or it may either be displaced by agitation, or, if too tight, impede the flow of liquid. To avoid this, a single tuft of wool, about 3 cm. in diameter, is placed lightly in the neck of the separator by means of a pointed glass rod, the point of which is passed down to the plug of the stopcock. In this way the wool forms a hollow cone, which filters rapidly and has no tendency to become misplaced.

Alternative Method for Analysing Liquid and Solid Extracts of Nux Vomica.—The following method obviates difficulties met with in separating immiscible solvents due to the presence of varying quantities of fatty oil in extracts of nux vomica. To wash the alkaloidal extracts, ammonium carbonate solution is substituted for that of ammonium hydrate usually employed, since it exhibits less tendency to form an inseparable emulsion. 10 c.c. of liquid extract (or 3 grm. of solid extract, dissolved in hot water, 6 c.c., and alcohol, 90 per cent., 2 c.c.) is placed in a small separator (No. 1), with chloroform, 10 c.c., and ether, 5 c.c., and after agitation, strong solution of ammonia, 4 c.c., is added. The mixture is agitated and separated, the immiscible layer being run into a second small separator (No. 2), and shaken out with three successive portions of 5, 5, and 3 c.c. of 10 per cent. ammonium carbonate solution, the washed ethereal liquid being then passed on to a third small separator (No. 3).

To the mixed aqueous washings in No. 2, chloroform, 10 c.c., and ether, 3 c.c., are added. This is shaken out and run off into the mother liquor in No. 1, well shaken, and the ethereal layer run into (empty) No. 2, washed with ammonium carbonate solution twice, using 3 c.c. each time; the washed ethereal extract is run off into No. 3. To the mixed aqueous washings in No. 2, another 13 c.c. of the ether-chloroform solvent is added, and again shaken out as before, and transferred to No. 1. The ethereal layer is washed in No. 2 with 1 c.c. of ammonium carbonate solution. From the washed ethereal extracts in No. 3, the alkaloid is then removed by shaking out with a solution of dilute sulphuric acid, 6 c.c., in water, 25 c.c., used in three portions of 11, 10, and 10 c.c. From this stage the process is conducted as directed for the assay of the seeds.

Tincture of Nux Vomica.—100 c.c. of tincture is evaporated to 8 c.c., 2 c.c. of alcohol, 90 per cent., is added, and the process continued as described under the liquid extract.

—J. O. B.

Lemon Oil; Determination of Citral in ——. Schimmel's Semi-ann. Rept., Oct. 1900, 25.

Although the cyanacetic method of E. J. Parry (this Journal, 1900, 384) is found to give fairly accurate results with mixtures of limonene and citral, it is not found to be workable with commercial lemon oils. From the presence of foreign substances, probably derived from the constituents of the peel, a thick layer of insoluble, waxy matter is formed in the graduated tube of the Hirschsohn flask, which renders correct reading of the volume of the supernatant liquid impossible. The problem of devising a workable method for the determination of citral in lemon oil has, therefore, yet to be solved.—J. O. B.

Lemon Oil; Determination of Citral in ——. E. J. Parry. Chem. and Druggist, **57**, [1091], 1000.

Messrs. Schimmel and Co. raise (see preceding abstract) two objections to the author's method (this Journal, 1900, 384). The first objection raised is, that, although the results are satisfactory, a certain proportion of the citral passes over in the distillation at very low pressure, whilst this is made up by an absorption of limonene by the cyanacetic acid. They find, they say, as much as 1 per cent. of citral goes over in the distillation, and therefore 1 per cent.—or rather more, as the results are always a little too high—of limonene is absorbed by the acid, or, taking into account the concentration, the aqueous reagent is said to absorb 2·5 per cent. of its volume of terpene. This, on the face of it, is very improbable. The author has distilled many samples of lemon oil, keeping the pressure down to the lowest possible limit, possibly below even 10 mm., and he has never found any portion of the limonene to contain more than merest traces of citral. Indeed, in general, unless the pressure has been allowed to rise, there is practically no absorption by any of the usual aldehydic reagents.

The second objection raised, is that the reading is obscured by the presence of the stearoptene in the concentrated oil. He has not found that there is much more difficulty in reading the dividing line in this case than in the case of several other absorption processes, and he does not think it more than a trifling difficulty in the process. He reiterates his claim that this method yields more accurate results than any other.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Reaction Velocities; Influence of Chemically Indifferent Solvents on ——. N. Menschutkin. Zeits. Phys. Chem. 1900, **34**, 157—167. (Through Science Abstr. **3**, [11], 887.)

From the results of fresh experiments here given and from those previously obtained (Ber. 1897, **30**, 2966), the influence of various solvents on reactions between aromatic

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amino compounds and allyl- or methyl-bromide, &c., is examined. It appears: that chemical reactions between organic non-electrolytes in fluid systems occur in a similar manner whether the bodies interact directly or in the presence of indifferent solvents; that the regularities in the relations between the velocities of formation depend on chemical structure and are independent of the presence of indifferent solvents; that the presence of solvents facilitates the study of such relations, and that, with aromatic compounds showing side-chain isomerism, the relative magnitude of the reaction velocities of the isomers often depends on the nature of the solvent used.—W. G. M.

Reactions; Change of Weight in Chemical and Physical ——. A. Heydweiller. Phys. Zeits. 1900, **1**, 527—529. (Through Science Abstr. **3**, [11], 886—887.)

CONTINUING Landolt's experiments (Zeits. Phys. Chem. 1893, **12**, 1), and examining the reactions of Fe with $CuSO_4$ in neutral, acid and alkaline solutions; of $CuSO_4$ and KOH; of oxalic acid and ammonia; of $BaCl_2$ and H_2SO_4; and also the solution of $CuSO_4$ in neutral and acid aqueous solutions, and the mixing of $CuSO_4$, and dilute H_2SO_4 solutions, the author finds the greatest alteration in weight to be 0·229 mgrm.; that the changes are in all cases but one decreases; and that they are not proportional to the reacting masses; in many cases they are produced only in the presence of small quantities of foreign substances, and are therefore probably due to a secondary action.
—W. G. M.

Radio-Active Lead and Rare Earths. K. A. Hofmann and E. Strauss. Ber. **33**, [16], 3126—3131.

THE authors have obtained, from various minerals, lead compounds and rare earths which did not contain a trace of Bi, Ba, Ti, Th, or U, but which, nevertheless, on testing by 24 hours' exposure to a gelatin-bromide photographic plate, were found to be radio-active.

Active Pb from Pitchblende.—The mineral was heated with soda for several hours, the mass extracted with water, the residue decomposed by repeated evaporation with hydrochloric acid, extracted with hot water, and the lead precipitated by H_2S. The $PbSO_4$ obtained by evaporation of the PbS with nitric and sulphuric acids, was strongly radio-active.

Active Pb and Rare Earths from Bröggerite.—Bröggerite consists mainly of uranate of uranium, thorium, and lead. The mineral was decomposed by repeated evaporation with sulphuric acid. Both the lead rendered insoluble as $PbSO_4$, and that subsequently precipitated from the solution were found to be active, through the methods of purification precluded the possibility of polonium being present. The ammonium sulphide precipitate from the solution of the mineral was oxidised by aqua regia and the earths precipitated with oxalic acid. The ignited precipitate was converted into sulphates, dissolved in hot water, thrown down by a large excess of ammonium bicarbonate, and the earths remaining insoluble were purified by precipitation as oxalates from their chloride solution. Thoria, in the authors' opinion, was thus excluded, as were also radium, polonium, and lead, yet the oxalates were radio-active and the oxides obtained on ignition were still more so. The ignited U_3O_8 obtained from bröggerite was active, but by repeated crystallisation of the oxalate, inactive oxalate, yielding inactive U_3O_8, was obtained in the more readily soluble fractions.

Active Pb, Ba, and Rare Earths from Cleveite.—Cleveite was decomposed in the same way as *bröggerite*, and yielded active Pb, Ba, ThO_2, and rare earths. On the other hand the $PbCl_2$, which crystallised out from the hydrochloric acid solution of the mineral, was inactive.

From *autunite*, *copper-uranite*, and *zeunerite* were obtained radio-active Ba, Pb, Bi, and U; on the other hand As, Cu, Fe, Al, and Zn were inactive. *Samarskite* yielded active $PbSO_4$, ThO_2, and rare earths. *Euxenite*, however, yielded ThO_2, rare earths, TiO_2, and Pb only in the inactive condition, and U_3O_8 very strongly active.—H. B.

Hydrogen Peroxide on Thiosulphates; Action of ——. A. Nabl. Ber. 1900, **33**, [16], 3093.

IN the presence of very dilute sulphuric acid, according to the author, the action takes place as shown by the equation:

$$2Na_2S_2O_3 + H_2O_2 = Na_2SO_4 + Na_2SO_3 + S_2H.OH.$$

Dilute sulphuric acid must be added gradually during the course of the reaction to neutralise the basic body $S_2H.OH$. The latter has not yet been obtained pure in sufficient quantity to establish its exact composition. It is a weak base having reducing properties, and in many respects resembles hydroxylamine. With mercuric chloride it gives a precipitate consisting of a mercuro-mercuric double salt. This property has been utilised to separate the base from the sulphate and sulphite, with which it is mixed. The mercury compound was filtered off, washed, and decomposed with sulphuretted hydrogen. The solution was then extracted with a mixture of sulphuric acid and alcohol. The sulphate of the base was filtered off, washed with ether-alcohol, dissolved in water, and decomposed with barium carbonate. By this means a colourless solution was obtained having a green fluorescence and a strong alkaline reaction.
—A. M.

Cadmium Selenide. Fonzes-Diacon. Comptes Rend. **131**, [22], 895—897.

CRYSTALLISED cadmium selenide, CdSe, is obtained by passing hydrogen selenide, largely diluted with hydrogen, over red-hot cadmium chloride. It is isomorphous with zinc selenide similarly obtained. Hydrogen selenide gives, in a solution of cadmium sulphate, a chocolate-brown precipitate of cadmium selenide; but in a solution of a cadmium halide, it gives a yellow or orange double salt (*e.g.*, $3CdSe.CdI_2$).—J. T. D.

Xanthorhamnin and Quercitrin; Sugar Constituents of ——. E. Votocek and V. Fric. Zeits. Zuckerind. Böhmen, 1900, **25**, [1], 1—7.

CONTRARY to the view hitherto held that rhamnose is the only sugar constituent of xanthorhamnin, the latter is found to contain galactose also.

The glucoside was prepared from Persian berries by digestion with 85 per cent. alcohol on the water-bath, and purified by repeated recrystallisation from alcohol. Distillation with 12 per cent. of hydrochloric acid, gave methyl furfural, which furnished phloroglucide, equal to 37·52 and 37·9 per cent. of rhamnose, calculated on the dry xanthorhamnin. Now, as Liebermann and Hörmann found 55·14 per cent. of the sugar by titration with Fehling solution, the presence of another sugar, not a methyl-pentose, was indicated. This was further confirmed by the polarisation and cupric reducing power of a large quantity of substance.

The syrup obtained on hydrolysis gave an osazone which, purified by soaking with acetone on a porous tile, fused at 196° C., the melting-point of galactosazone. In appearance it also agreed with that substance. The presence of galactose was further confirmed by the mucic acid test, and finally, a mixture of 2 mols. of rhamnose and 1 mol. of galactose gave polarisation equal to that found directly.

The hydrolysed syrup from quercitrin (Quercitron bark) was found to contain neither galactose nor mannose, but only rhamnose.—L. J. de W.

Gentianose and Sucrose in Fresh Gentian Root; Simultaneous Presence of ——. E. Bourquelot and H. Hérissey. Comptes Rend. **131**, [19], 750—752.

FROM the mother liquors in the preparation of gentiopicrin (this Journal, 1900, 846), the authors were able to extract, by systematic treatment with alcohol, the sugar gentianose (this Journal, 1898, 257). The residue from this extraction contained another, more highly dextrorotatory sugar, which was extracted by methyl alcohol, and finally obtained in a pure state, when it was found to be cane sugar. The authors suggest that as gentianose, though its constitution is not yet clearly made out, certainly contains at least as many carbon atoms in the molecule as cane sugar, the latter may arise in the plant through the molecular change or decomposition of gentianose.
—J. T. D.

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Erythritol in Trentepohlia Jolithus. M. Bamberger and A. Landsiedl. Monatsh. Chem. **21**, 571—573.

During the extraction of this alga with ether, there appeared in the boiling flask first, brownish, afterwards white, crystalline crusts, which, after recrystallising from alcohol and from glacial acetic acid, had the appearance, taste, melting-point, and composition of erythritol.
—J. T. D.

Algæ; Soluble Colouring Matter of Blue-Green ——. R. Kolkwitz. Zeits. Vereins deutsch. Zucker-Ind. 1900, [538], 1015—1016.

The author draws attention to the fact that the blue-green colouring matter—"Phykocyan"—present in many *Algæ* (*Polycystis, Oscillaria,* and *Nostoc*), although retained by the living plant, becomes readily soluble and diffusible in water when the plant dies. The aqueous solution is indigo-blue in colour, and exhibits a fine blood-red fluorescence. A phenomenon of this kind, occurring, for example, in the waste water from sugar factories, &c., in which liquid, algæ are very apt to appear, must not, therefore, too hastily be ascribed to the presence of an aniline dyestuff.
—H. T. P.

Milk; Production by Lactic Bacteria of Acetic Acid in ——. C. Bartel. Centralbl. Bakt. (II. Abth.), 1900, 419; through Zeits. Spiritusind. 1900, **23**, [48], 438.

The formula for the decomposition of milk sugar into lactic acid, $C_{12}H_{22}O_{11} + H_2O = 4C_3H_6O_3$, is not correct, other products being also formed, such as ethyl alcohol, carbon dioxide, and acetic acid. The author's experiments were directed mainly to the estimation of the acetic acid. Leichmann's *B. lactis acidi* was employed and allowed to ferment milk, both with strong aëration and in absence of air. The quantities of acetic acid produced in the two cases were as 3:2. As regards the effect of temperature on the production of acetic acid, it was found that the quantity increased as the temperature was lowered. The smallest proportion of acetic acid was produced at the temperature at which the lactic bacteria thrive best. Hence it is concluded that acetic acid is a pathogenic product of the cell life of the bacterium.—J. F. B.

α- and β-Naphthol; Comparison of ——. Maximowitch. Therap. Gaz. **24**, 402. Pharm. J. 1900, **65**, [1587], 572.

The author states that the preference for β-naphthol for medicinal use is not well-founded. It is shown that α-naphthol is three times as antiseptic as β-naphthol and only one-third as poisonous; also β-naphthol is not so well tolerated by the stomach, and causes irritation of the mucous membrane of mouth and stomach.—A. S.

Lichens; Composition of ——. *VI.* W. Zopf. Annalen, 1900, **313**, [3], 317—344. (See this Journal, 1898, 807.)

Leprariu latebrarum Ach.—After extraction of this lichen with two vols. of hot ether, and removal of about five-sixths of the solvent, leprarine and atranoric acid crystallise out on standing, whilst roccellic acid, $C_{17}H_{32}O_4$, remains in solution, from which it is obtained in colourless plates on slow evaporation. When carbon dioxide is passed through a solution of roccellic acid in sodium carbonate, the sodium salt is precipitated; under the same conditions hydroxyroccellic acid, $C_{17}H_{32}O_5$, remains in solution. If the above mixture of leprarine and atranoric acid be boiled for a moment with alcohol, the former dissolves, whilst the latter remains insoluble, but if boiled for an hour with absolute alcohol, leprarine is converted into hæmatommic acid.

If leprarine, $C_{21}H_{20}O_{10}$, be boiled with methyl, ethyl, or normal propyl alcohol and two drops of strong hydrochloric acid, leprarinine (melting at 135° C.), lepraridine (melting point 120°—121° C.), or lepraline (melting point 100° C.) is obtained respectively. These three substances are insoluble in caustic alkalis, which colour them yellow; their alcoholic solutions redden litmus, and give a wine-red coloration with traces of ferric chloride.

Gyrophora vellea (L.) Ach.—The ethereal extract deposits gyrophoric acid, which was identified by its decomposition into orsellinic acid and its ethyl ester on long boiling with absolute alcohol.

Cladonia Deformis L.—From this lichen zeorine and usnic acid were extracted. *Cladonia cyanipes Sommerfelt* also contains usnic acid in fair quantity.

Parmelia incurva (Pers.) Fr. contains usnic acid.

Rhizocarpon viridiatrum (Flörke).—From this lichen, by extraction with chloroform, removal of the solvent, and gradual evaporation of the ethereal solution of the residue, rhizocarpic acid was obtained. The same acid had been previously found in *Rhizocarpon geographicum L.* (Annalen, **284**, 114).

Pertusaria amara (Ach) Nylander.—Hesse has recently found five different substances in a lichen he supposed to be identical with *P. amara,* but did not obtain picrolichenine (J. prakt. Chem. **58**, 501). From what follows, it would appear that Hesse's lichen could not be *P. amara.* The material employed by the author was tested by taste; no other *Pertusaria* has an intensely bitter taste. On concentration of the ethereal extract, a white crystalline powder was obtained. It gave red salts with alkalis, and was identical with salazinic acid (Annalen, **306**, 309—311). The ethereal extract, on further concentration, yielded a substance melting at 175°—176° C. with evolution of gas, dissolving in alkalis to red solutions, and expelling carbonic acid from carbonates; it is identical with picrolichenine.

Evenia furfuracea L.—This lichen, as also *Parmelia olivetorum Nyl.,* contains a substance giving a red coloration with bleaching powder; the author regarded this substance as erythrin, Hesse as lecanoric acid. It is now proved to be a new compound, for which the name olivetoric acid is proposed. The lichens are extracted by cold absolute alcohol, and the filtered extract precipitated by water. After purification, the substance melts at 141°—142° C., the alcoholic solution reddens litmus and is coloured violet by ferric chloride. Dilute potash gives a yellow solution, turning red on boiling. Baryta water gives a yellow solution, which changes to green and then becomes colourless. Analysis indicates the formula $C_{27}H_{35}O_8$.
—A. C. W.

Iron Nitride. G. J. Fowler. Proc. Chem. Soc. **16**, [229], 209.

Nitride of iron was prepared by three different methods: by the action of ammonia on (*a*) finely divided iron, (*b*) ferrous chloride and bromide, (*c*) iron amalgam. Of these methods (*a*) is the most convenient. The substance was found to correspond to the formula Fe_2N. The temperatures of the formation of iron nitride in ammonia and of its decomposition in hydrogen are identical. These results confirm the conclusions of Stahlschmidt. Heated in a current of nitrogen, iron nitride begins to decompose at about 600°; it is slightly magnetic; its specific gravity is 6·35.

When oxidised in air or oxygen, only traces of oxides of nitrogen are produced; heated in a current of air, the substance begins to be converted into ferric oxide and nitrogen at about 200°. It takes fire in chlorine either spontaneously or when slightly warmed, ferric chloride and nitrogen being formed, but no trace of nitrogen chloride. It is only slowly attacked by bromine, the action probably being due to the presence of hydrobromic acid in the bromine as an impurity. An ethereal solution of iodine has no action on it.

Dilute hydrochloric and sulphuric acids yield the corresponding ferrous and ammonium salts, hydrogen being liberated, according to the following equation: $2Fe_2N + 6H_2SO_4 = 4FeSO_4 + 2NH_4HSO_4 + H_2$.

The simultaneus action of hydrogen peroxide and sulphuric acid is not distinguishable from that of the acid alone. Nitric acid acts only slowly on the nitride even when strong; the products formed vary with the concentration of the acid.

Gaseous hydrochloric acid begins to attack the nitride at about 220°, and at 350° the reaction becomes rapid, the substance being completely converted into ferrous chloride and ammonium chloride. Gaseous hydrogen sulphide has a precisely similar action at 200°.

Nitric oxide acts similarly to oxygen, and converts the nitride into oxide, the reaction beginning at about 120° and becoming rapid at 170°. Carbon dioxide oxidises the nitride

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at about 530°. On heating the nitride in steam at 100°, ammonia is very slowly formed. The nitride heated with sodium and carbon yields sodium cyanide.

PATENTS.

Abrasive Material from Bauxite or other Hydrous Oxides of Alumnium; Processes of Manufacturing ——. B. J. B. Mills, London. From The General Electro-Chemical Company, New Jersey, U.S.A. Eng. Pat. 16,529, Sept. 17, 1900.

BAUXITE or other hydrous oxides of aluminium may be transformed into a hard material suitable for abrasives by first calcining the soft amorphous aluminium hydrate to drive out the water, and then heating it to a state of quiet fusion in an electric furnace, after which it is allowed to cool slowly into a solid crystalline mass. A finer grain of crystal may be obtained by agitating the mass while cooling.—G. H. R.

Tobacco; Free or Partly Free from Nicotine; Production of ——. F. W. Haase, L. Broeckmann, and C. Haase, Bremen. Eng. Pat. 23,808, Nov. 29, 1899.

THE process claimed is for the production of tobacco free or partly free, from nicotine, with improvement in its quality, by macerating the leaf tobacco in an aqueous solution of hydrogen peroxide, with or without the addition of ammonia. The treatment is continued for a length of time sufficient to convert the nicotine into oxynicotine and nicotinic acid, either completely or to the desired extent. Oxynicotine is non-volatile, and only produces small quantities of volatile pyridine bases on combustion. The oxidation products of the nicotine may either be left in the treated tobacco, or, if desired, may be removed by washing and pressing.—J. F. B.

New Books.

MICROBES ET DISTILLERIE. Par LUCIEN LÉVY, D. ès Sc., &c., Professeur à l'Ecole nat. des Ind. agric. de Douai et à l'Institut d. ferment. de Bruxelles. Georges Carré et C. Naud, 3, rue Racine, 3, Paris. 1900. Price Fr. 10.

8vo volume, containing introduction, 316 pages of subject-matter, and the table of contents. The text, illustrated with 85 engravings, is divided into two parts. 1st. A Systematic Study of Microbes from the two points of view of morphology and physiology. 2nd. The Theory of their Application. In this section, the applications considered are those of the Spirit Distillery, &c., Culture of Yeasts, and in the Brewery, &c.

DIE ARZNEIMITTEL-SYNTHESE AUF GRUNDLAGE DER BEZIEHUNGEN ZWISCHEN CHEMISCHEM AUFBAU UND WIRKUNG. Für Aertze und Chemiker. Von Dr. SIGMUND FRÄNKEL, Docent für med. Chemie an der Wiener Universität. Julius Springer's Verlag, Monbijouplatz 3, Berlin, N. 1900. Price M. 12.

THIS work is devoted to the chemistry of those materials used in the latest developments of pharmacology. It is an 8vo volume, containing introduction, subject-matter filling 520 pages, and the alphabetical index. The following are the main heads of the work, which is divided into two special parts, *viz.*, THE GENERAL and THE SPECIAL. GENERAL PART: I. Theory of the Actions of Inorganic Bodies. II. Of Organic Bodies. III. Significance as to Modes of Action of the Atomic Groups. IV. Changes which the Substances undergo in the Organism. SPECIAL: I. General methods for building up bodies of equal physiological action from substances of known effects, in which, however, certain objectionable counter-reactions shall be absent. II. Antipyretics. III. Alkaloids. IV. Narcotics and Anæsthetics. V. Antiseptics and Astringents. VI. The Ichthyol Group. VII. Substances which act on the Intestinal Membranes and Lining. VIII. Camphors and Terpenes. IX. Reducing Agents for the Epidermis. X. Glycerophosphates. XI. Diuretics. XII. Gout Specifics.

HANDBOOK OF INDUSTRIAL ORGANIC CHEMISTRY. Adapted for the Use of Manufacturers, Chemists, and all interested in the Utilisation of Organic Materials in the Industrial Arts. By SAMUEL P. SADTLER, Ph.D., F.C.S., Professor of Chemistry in the Philadelphia College of Pharmacy, and in the Franklin Institute of the State of Pennsylvania, &c. Third Revised and Enlarged Edition. J. B. Lippincott Company, Philadelphia, U.S.A. 1900. Price 25s. 36, Southampton Street, Covent Garden, London.

LARGE 8vo volume, containing prefaces, table of contents, 503 pages of subject-matter, and an appendix of 25 pages. The work concludes with an alphabetical index of subject-matter. It is illustrated with 126 engravings and 16 diagrams. The following subjects of Technology are treated of:—I. Petroleum and Mineral Oil Industry. II. Industry of the Fats and Fatty Oils. III. Essential Oils and Resins. IV. Cane Sugar Industry. V. Starch and its Alteration Products. VI. Fermentation Industries. A. Nature and Varieties of Fermentation. B. Malt Liquors and the Industries connected therewith. C. Manufacture of Wine. D. Manufacture of Distilled Liquors or Ardent Spirits. E. Breadmaking. F. Manufacture of Vinegar. VII. Milk Industries. VIII. Vegetable Textile Fibres. IX. Textile Fibres of Animal Origin. X. Animal Tissues and their Products. A. Leather Industry. B. Glue and Gelatin Manufacture. XI. Industries based upon Destructive Distillation. XII. Artificial Colouring Matters. XIII. Natural Dye-Colours. XIV. Bleaching, Dyeing, and Textile Printing. In each of the foregoing groups respectively, a general method of treatment is adopted, the following subdivisions representing the course laid down. I. Raw Materials. II. Processes of Treatment. III. Products. IV. Analytical Tests and Methods. V. Bibliography and Statistics.

THE NEWER REMEDIES. Including their Synonyms, Sources, Methods of Preparation, Tests, Solubilities, Incompatibles, Medicinal Properties, and Doses as far as known, together with Sections on Organo-Therapeutic Agents, and Indifferent Compounds of Iron. A Reference Manual for Physicians, Pharmacists, and Students. By VIRGIL COBLENTZ, M.A., Ph.D., &c., Professor of Chemistry and Physics in the New York College of Pharmacy, &c. Third Edition. Revised and very much enlarged. P. Blakiston's, Son and Co., 1012, Walnut Street, Philadelphia, U.S.A. 1899. Price $1.00.

8vo volume containing preface to third edition, and 141 pages of subject-matter, followed by appendix covering six pages. As the substances are arranged alphabetically in the text, there is no need of an alphabetical index. The author says in his preface: "In addition to giving as complete a list as possible of all modern medicinal synthetics, the author has endeavoured to include all such proprietary combinations as are made up of mixtures containing one or more of these synthetics; also such other preparations as employ specially coined titles, many of which are deceptively similar to those of well-known chemical compounds."

Trade Report.

LEGISLATION; TARIFF CHANGES AND CUSTOMS REGULATIONS.

FRANCE.

Allowance to Sugars of French Colonies during the season, 1900–1901, "for waste in manufacture."—Under the provisions of Article 2, Section 1, of the Law of the 13th July, 1886, sugars of French Colonies shipped to France, are entitled to an allowance for waste in manufacture equivalent to the average excess-yield obtained by the home sugar industry in the preceding season. This average excess-yield having been equal to 28·72 per cent. in the season 1899–1900, French colonial sugars imported into France during the season from the 1st September, 1900, to the 31st August, 1901, will receive an allowance for waste of 28·72 per cent.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

Residuum from the manufacture of Maize-Starch.—This article (also known as *gluten meal, gluten-cake, maize-cake*, &c., and imported in powder, lumps, or loaves), when it contains less than than 40 per cent. of starch, is to be free of duty under No. 166 of the Tariff as "cake of oilseed and malt." When containing more than 40 per cent. of starch, it is to be dutiable as maize in the grain, under No. 72 of the Tariff, at the rate of 3 francs per 100 kilos., gross weight (1*s.* 2¾*d.* per cwt., gross weight).

New Zealand.

Customs Divisions.

Articles, and how Classified.	Unit.	Rate of Duty.
Leather, viz., "mineral kip," chrome dressed; as kip.	Lb.	4*d.*
Leather, "tan hide"; as buff	„	3*d.*
Manganese borate, and resinate; as articles and materials suited only for, and to be used solely in, the fabrication of goods in the Colony.	..	Free.
Manganese oxide; as chemicals not otherwise enumerated in the tariff.	*ad val.*	15 %
Nucoline (nucoa butter); as articles not otherwise enumerated in the tariff.	..	Free.
Oil of myrban; as articles and materials suited only for, and to be used solely in, the fabrication of goods in the Colony.	..	„
Terpineol (artificial oil of violets); as articles and materials suited only for, and to be used solely in, the fabrication of goods in the Colony.	..	„
Vermin-killer, Battle's; as insecticide	..	„

Netherlands.

Salt for purifying Gum Copal and Gum Dammar.—A Dutch Decree, dated the 26th October last, exempts salt required for purifying gum copal and gum dammar from Excise duty.

Spirit in Perfumed Waters.—A Dutch Decree, dated the 9th Nov., provides that, in the case of perfumed waters and toilet waters exported by manufacturers in quantities containing at least 50 litres of spirit at 50 per cent., drawback of the Excise duty paid shall be allowed for the quantity of spirit contained in the exported liquids.

Customs treatment of Casein.—It has been decided by the Dutch Customs authorities that casein, if it does not contain any sweetening substances, fats, or salt, is to be admitted *into the Netherlands free of duty.*

On the other hand, a liquid composed of casein, lime-water, oil, and a little phenol, and used in the manufacture of colours, is to be dutiable at the rate of 5 per cent. *ad val.*, as a colouring matter prepared with oil.

Greece.

Treatment of Copper Sulphate.

The following words are to be added to class 103 paragraph *a*, under which the articles specified will be exempt from import duty—"and sulphate of copper (blue vitriol) as well as chemical preparations of sulphate of copper mixed with other materials employed against peronosporus."

Sulphate of copper (blue vitrol) was formerly dutiable under class 103, paragraph *b*, of the Tariff at the rate of 5 drachmæ per 100 okes.

Servia.

Import Duty on Olein.

Under a Decree of the Servian Ministry of Finance dated the 17th March last, olein is to be subject to duty under No. 266 of the Servian Tariff at the rate of two dinars per 100 kilos. (9¾*d.* per cwt.), instead of being free of duty as heretofore under No. 273.

New Venezuelan Customs Tariff.

See Bd. of Trade J., Jan. 10, *p.* 84.

United States.

Customs Decisions.

"*Iraldeine.*"—"Iraldeine," a preparation containing alcohol, is dutiable under paragraph 2 of the Tariff, as an alcoholic compound, at the rate of 60 cents per lb. and 45 per cent. *ad valorem.* It is immaterial that the alcohol contained in the compound is of small commercial value as compared with the value of the article as imported.

Dyestuffs from Coal Tar.—So-called "Alizarin Black," "Alizarin Black G A," "Alizarin Black F," and other dyestuffs, produced by various methods from coal-tar products and from substances other than alizarin or anthracene, are dutiable at the rate of 30 per cent. *ad valorem.*

Phthalic and Tetra-chlor-phthalic Acid, and Anhydride.—1. So called phthalic acid or anhydride, a product of coal tar used in making the phthalein series of dyestuffs, is exempt from duty under the provision for phthalic acid in paragraph 464 of the present Tariff Act.

2. Tetra-chlor-phthalic acid or anhydride is dutiable at the rate of 25 per cent. *ad valorem* under the provision for "all other acids not specially provided for," &c., in paragraph 1 of the Tariff, being a distinct and different article from phthalic acid.

United States Mineral and Metal Production.

Eng. and Mining J., Jan. 5, 1901.

No.	Products.	Customary Measures.	1899. Quantity. Customary Measures.	1899. Quantity. M. Tons or Kilos.	1899. Value at Place of Production. Totals.	1899. Value at Place of Production. Per M. Ton or Kilo.	1900. Quantity. Customary Measures.	1900. Quantity. M. Tons or Kilos.	1900. Value at Place of Production. Totals.	1900. Value at Place of Production. Per M. Ton or Kilo.
	Non-Metallic.				Dols.	Dols.			Dols.	Dols.
1	Asbestos	Sh. T.	912	827	13,860	16·76	1,100	998	15,400	15·43
2	Barytes	„	32,636	29,607	137,071	4·63	41,910	38,021	171,831	4·52
3	Bauxite	L. T.	36,813	37,402	101,235	2·71	23,145	23,515	71,749	3·05
4	Bromine	Lbs.	433,003	196	125,571	640·67	512,743	232	143,568	618·83
5	Carborundum	„	1,741,245	790	156,712	198·37	2,660,000	1,207	239,400	198·34
6	Cement, nat. hydraul.	Bls.	10,150,947	1,381,332	5,175,950	3·75	8,832,240	1,201,883	4,256,238	3·54
7	Cement, Portland	„	5,805,620	1,053,365	10,441,431	9·91	8,503,308	1,542,376	11,947,614	7·75
8	Cement, slag	„	244,757	44,408	360,800	8·10	493,150	89,473	715,067	7·99
9	Coal, anthracite	Sh. T.	60,622,398	54,996,279	103,753,780	1·89	54,255,540	49,220,303	97.229,032	1·97
10	Coal, bituminous	„	191,456,350	173,688,061	172,301,679	0·99	220,592,239	200,119,966	224,502,483	1·12
11	Coal, cannel	„	36,639	33,239	91,597	2·76	25,000	22,680	60,750	2·68
12	Coke	„	18,025,256	16,352,405	42,081,002	2·57	18,928,372	17,171,706	48,456,384	2·82
13	Cobalt oxide	Lbs.	10,200	4,627	15,810	3·42	11,200	5,080	20,160	3·96
14	Copper sulphate	„	67,903,370	30,801	3,530,975	114·64	76,959,486	34,909	3,770,278	108·00
15	Copperas	Sh. T.	13,770	12,492	108,508	8·69	13,785	12,506	110,280	8·82
16	Crushed steel	„	337	306	47,250	154·41	345	313	48,300	303·31
17	Fluorspar	„	24,030	21,800	152,655	7·00	23,456	21,279	114,700	5·35
18	Fuller's earth	„	13,620	12,356	81,900	6·63	15,700	14,243	89,750	6·30

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UNITED STATES MINERAL AND METAL PRODUCTION—*cont.*

No.	Products.	Customary Measures.	1899. Quantity. Customary Measures.	1899. Quantity. M. Tons or Kilos.	1899. Value at Place of Production. Totals.	1899. Value at Place of Production. Per M. Ton or Kilo.	1900. Quantity. Customary Measures.	1900. Quantity. M. Tons or Kilos.	1900. Value at Place of Production. Totals.	1900. Value at Place of Production. Per M. Ton or Kilo.
	NON-METALLIC—*cont.*				Dols.	Dols.			Dols.	Dols.
19	Garnet	Sh. T.	2,565	2,327	72,672	31·23	2,913	2,643	83,890	31·74
20	Grahamite	„	3,150	2,858	97,650	34·17	3,300	2,991	105,000	35·11
21	Graphite, amorphous	„	1,030	934	8,240	8·82	340	308	3,000	9·74
22	Graphite, crystalline	Lbs.	3,632,608	1,647,740	145,304	0·09	3,518,731	1,596,086	143,648	0·09
23	Graphite, artificial	„	405,870	18,410	32,475	0·18	845,000	38,329	67,600	0·18
24	Iron ore	L. T.	25,341,000	25,746,456	58,284,300	2·26	26,417,315	26,839,992	79,251,945	2·95
25	Lead, white	Sh. T.	103,466	93,864	10,812,197	115·20	90,853	82,421	9,902,868	120·15
26	Lead, red	„	10,199	9,252	1,070,895	115·67	9,918	8,998	1,096,633	121·88
27	Lead, orange mineral	„	928	842	139,200	165·32	829	752	98,112	130·47
28	Lepidolite	„	124	112	4,600	41·07	100	91	3,700	40·66
29	Limestone flux	L. T.	6,707,435	6,814,754	3,475,525	0·51	6,964,255	7,075,683	3,691,055	0·53
30	Litharge	Sh. T.	10,020	9,090	1,032,060	113·53	10,209	9,261	1,121,663	121·11
31	Magnesite	„	2,000	1,814	7,600	4·19	2,768	2,511	10,518	4·19
32	Monazite	Lbs.	330,000	150	18,480	123·20	350,000	159	19,600	123·27
33	Petroleum, crude	Bls.	57,234,304	8,007,368	64,143,890	8·01	63,100,596	8,828,090	75,365,685	8·54
34	Phosphate rock	L. T.	1,823,391	1,852,565	7,031,785	3·80	1,599,990	1,625,590	5,569,131	3·43
35	Pyrites	„	178,498	181,263	583,323	3·22	208,409	211,743	694,318	3·28
36	Salt	Bls.	19,861,948	2,522,610	5,437,941	2·16	20,905,099	2,655,097	6,471,098	2·44
37	Slate, roofing	Squares	1,098,374	332,146	3,055,988	2·78	987,412	298,198	2,775,698	2·81
38	Slate Manufactures	..	..	..	540,434	..	..	..	516,755	..
39	Soda, manufactured	M. T.	..	387,020	5,925,276	15·31	..	395,902	6,655,113	16·81
40	Sulphur	L. T.	1,565	1,590	33,585	21·12	4,630	4,704	101,212	21·51
41	Zinc-white	Sh. T.	39,663	35,982	3,331,692	92·04	44,568	40,432	3,788,180	33·69
42	Zinc Ore, exported	„	28,220	25,601	725,944	28·36	37,920	34,401	1,140,612	33·16
	Other products, unspecified	..	..	..	141,063,263	..	..	..	165,040,973	..
	Total non-metallic	..	..	..	645,754,305	..	..	..	755,680,991	..
	METALLIC.									
43	Aluminium	Lbs.	6,500,000	2,948,381	2,112,500	0·72	7,150,000	3,243,219	2,288,000	0·71
44	Antimony	„	2,500,000	1,137	241,250	212·18	3,100,000	1,406	286,750	203·92
45	Copper	„	581,319,091	263,685	100,916,994	382·72	685,576,802	279,223	100,154,345	358·69
46	Gold	Ozs.	3,391,196	105,471	70,096,021	664·60	3,805,455	118,362	78,658,755	664·60
47	Iron, pig	L. T.	13,400,735	13,615,350	234,725,754	17·24	13,914,596	14,137,230	238,078,737	16·84
48	Iridium	Ozs.	5·6	..	165	..	8	..	240	..
49	Lead	Sh. T.	217,085	196,938	19,407,399	98·55	251,781	228,414	22,005,659	96·34
50	Nickel	Lbs.	22,500	10,205·9	8,156	0·80	20,000	9,072	7,800	0·86
51	Platinum	Ozs.	Nil.	Nil.	Nil.	Nil.	173	5·4	3,113	576·48
52	Quicksilver	Flasks	28,879	993	1,155,160	1163·30	32,315	1,121	1,474,533	1,315·37
53	Silver	Ozs.	57,126,834	1,776,829	34,036,168	19·16	60,478,276	2,881,068	37,085,248	19·71
54	Zinc	Sh. T.	129,675	117,644	14,912,625	126·76	122,850	111,449	10,786,230	96·78
	Other metals unspecified	..	..	..	18,415,128	..	..	..	18,971,582	..
	Total metals	..	..	..	496,057,320	..	..	..	509,800,992	..
	Total non-metals and metals	..	..	..	1,141,811,625	..	..	..	1,265,481,983	..
	Deduct duplications	..	..	..	92,581,031	..	..	..	108,319,801	..
	Grand total	..	..	..	1,049,230,594	..	..	..	1,157,162,182	..

III.—TAR PRODUCTS, PETROLEUM, Etc.

NEW OIL DISTRICT IN MEXICO.

Bd. of Trade J., Dec. 27, 1900, 705.

According to the *Iron Age* (New York), of 6th inst., arrangements have just been concluded at Tampico, Mexico, for the purchase, by a Californian syndicate, of 400,000 acres of prospective oil lands, situated 25 miles west of Tampico, at a cost of over 200,000*l*. The land is said to contain also large deposits of liquid asphaltum.

OIL SHALES OF THE LOTHIANS, SCOTLAND.

Eng. and Mining J., Dec. 29, 1900, 754.

At a recent meeting of the Edinburgh Geological Society, Mr. Henry M. Cadell gave an address, in which he said that, although the mineral oil industry had existed in Scotland for 30 years, the Geological Survey had never published any general account of the rocks of the lower carboniferous system. The correct reading of the geological sections and the construction of the oil shale districts was for several reasons a matter of no small difficulty, and no geologist had up till now been successful in working out the structure by merely examining the surface outcrops and natural sections. It was necessary to compare natural sections with mining information derived from pits and borings all over the district, and even then there still remained many uncertainties and gaps to fill up, and much was still left in this direction for future geological investigators to accomplish. In the shale districts, several well-marked horizons or landmarks existed for the guidance of mining men and geologists. The lowest of these was the Burdiehouse, Camps, or Queensferry limestone, which was, in the West Calder district, 2,400 ft. below the Hurlet or carboniferous limestone, and above which were to be found all the oil shales hitherto worked, with the exception of the shales of Pumpherston, which were situated 600 ft. below that landmark. Above this limestone were the barracks shale, an inferior seam, then the Dunnet, 500 ft. higher up, under the Binny sandstone, then the Broxburn shale above the sandstone, and the Fells shale above the marls that covered the Broxburn seams. The Houston coal, with its distinctive green and red overlaying marls, formed another very conspicuous landmark all over the district, and above the marl only one seam of value—the Raeburn shale—was to be found. Oil shale was now worked for ammonia as well as oil, and the production of sulphate of ammonia, which had a high agricultural value, formed an important branch of the industry. The lowest seams of shale at Pumpherston were richest in ammonia; and Mr. Cadell thought it likely that the shales richest in ammonia would prove to be those in which the proportion of animal to plant remains was greatest, while the shales richest in hydrocarbons, such as those of Broxburn, probably contained an excess of vegetable matter.

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V.—TEXTILES.

Artificial Silk Factory in Belgium.

Bd. of Trade J., Dec. 27, 1900, 712.

According to the *Handels Museum*, of the 13th inst., a factory for the production of artificial silk has been established by a French firm in Soignies, in Belgium. This factory, which is the first of its kind in Belgium, commenced work on the 1st October last. About 40 operatives are employed.

VII.—ACIDS, ALKALIS, AND SALTS.

Chemicals Imports of United States in 1900.

Eng. and Mining J., Jan. 5, 1901, 34.

Substance.	Imports.	Re-exports.	Entered for Consumption.	
			1900.	1899.
Bleaching powder. Lb.	143,000,000	148,250	142,851,750	123,583,061
Potash:—				
Chlorate.... Lb.	1,275,000	342,500	932,500	1,478,948
Muriate .... „	96,000,000	279,000	95,721,000	117,219,080
Nitrate..... „	12,090,000	26,500	12,063,500	18,849,853
Other..... „	49,750,000	14,500	49,735,500	46,441,086
Soda:—				
Ash..... „	67,000,000	43,250	66,956,750	48,641,284
Caustic..... „	7,800,000	1,025,000	6,775,000	12,330,708
Sal..... „	4,600,000	1,200	4,598,800	6,238,772
Nitrate..... „	192,591	3,930	188,661	144,032
Other..... „	18,000,000	260,000	17,740,000	26,409,718
Salt..... „	416,000,030	3,550,000	412,450,000	331,162,816
Brimstone. Long Tons	153,000	415	152,585	142,757
Pyrites „	335,000	..	335,000	310,615
Grayhite „	*12,500*	4	12,496	20,760

The Chlorate of Potash Explosion at St. Helens.

This Journal, Dec. 1900, *p.* 1159.

Erratum.

The report of the proceedings before Mr. Justice Bucknill contains the following errors:—

1st. Line 36 from bottom:—"The defendants denied that they manufactured and stored chlorate of potash," &c. This denial was never made, since chlorate of potash has actually been manufactured and stored ever since the Company existed, and for 40 years previously by its predecessors.

2nd. Line 28 from bottom:—Mr. Brock is spoken of as "the Manager of the defendants' works," whereas Mr. Brock is, of course, the Chairman of the United Alkali Co., Ltd.

Sulphate of Ammonia Statistics.

Bradbury and Hirsch, Liverpool.

Production in the United Kingdom during 1900 from all sources:—

	Tons.
Gasworks	138,000
Iron	18,000
Shale	39,000
Coke and carbonising works	15,000
	210,000

Of this production—

	Tons.
England contributed	134,000
Scotland „	73,000
Ireland „	3,000

The production during the previous five years was:—

—	1899.	1898.	1897.	1896.	1895.
	Tons.	Tons.	Tons.	Tons.	Tons.
Gasworks	136,500	130,000	133,000	127,500	119,600
Iron	18,000	17,700	18,000	16,500	14,600
Shale	38,500	37,300	37,000	38,000	38,300
Coke and carbonising works.	15,000	11,500	10,000	9,000	7,000
Total	208,000	196,500	198,000	191,000	179,500

IX.—CEMENTS, Etc.

Bricks from Glass-Works Refuse.

U.S. Cons. Reps., Dec. 1900, 456.

Dr. Ormandy, of St. Helen's, has recently discovered a process by which good furnace bricks can be made from glass-works refuse. The refuse consists mainly of spent sand, minute particles of glass, and about 3 per cent. of iron from the various processes, and it has hitherto been considered that the presence of the iron prevented the use of the material for the manufacture of bricks.

Patents have been taken out to protect the process, and a large firm is now putting up an extensive plant for the manufacture of the bricks. It is claimed that the bricks will stand a great amount of heat They are about the colour of silica bricks and can be glazed. Considerable secrecy is observed as to the process.

Concrete in Mines.

Eng. and Mining J., Dec. 29, 1900, 754.

At the collieries of the John Cockerill Company at Seraing, in Belgium, concrete has been extensively used instead of brickwork for lining circular shafts, lining drifts, air-passages, &c. The concrete used has been made entirely from blast furnace slags, those from forge-iron broken to 30 or 50 mm. being used as ballast, while the mortar is made of granulated slags, hydraulic lime in the proportion of 5 to 1 by volume and slag cement. These are incorporated in a mortar-mill, but no addition of water is necessary, as the granulated slag contains enough. Slag cement is made of about 75 per cent. of granulated gray iron slags and 25 per cent. of slacked lime. When the slags are tolerably uniform in character, chemical analysis of the materials is not necessary except when the furnace charges contain magnesia, which should not be present to a greater extent than 3 per cent. The materials required for a cubic metre of concrete are 0·750 cubic metre granulated slag and 0·150 cubic metre hydraulic lime.

Fuller's Earth Production.

Chem. and Druggist, Jan. 12, 1901, 68.

The production of fuller's earth in the United States has increased greatly in the last five years, though recently it has shown a decline, owing to large importations of the English material, which is preferred for filtering cotton-seed and lard oils. The chief source of the material in the United States is Quincy, Florida, though deposits have been found in New York, Colorado, and Utah, as well as one of a promising nature in South Dakota, which furnishes almost an exact duplicate of the English earth. The American product is largely used as a substitute for bone-black in the filtering of mineral oils. As the cotton-seed oil business is growing rapidly, there promises to be a large demand for the English earth, and, naturally, for such of the native material as comes up to the standard.

X.—METALLURGY.

Tropenas Process for Steel Castings.

Eng. and Mining J., Dec. 29, 1900, 761.

Since March, 1900, the Sargent Company, at Chicago Heights, has been manufacturing small steel castings by what is known as the Tropenas process. This method was adopted after several years of experience with open hearth and crucible steel plants, and after a careful study of the subject of steel making at home and abroad, where the process is in successful operation in some 40 different plants.

The Tropenas process consists in the use of special converters, in which pig iron and selected scrap, previously melted in a cupola, are subjected to an air blast of 3 to 4 lb. pressure per square inch, directed horizontally across the top of the molten bath. This action generates intense heat by the combustion of the metalloids in the

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pig iron, and after a period varying from 16 to 20 minutes, depending on the quality of the charge used, there remains in the converter a bath of nearly pure iron. Addition is made of ferro-manganese, of ferro-silicon, or both, to bring up the silicon, manganese and carbon contents to the specified proportions, when the metal is drawn off into a ladle and poured. The process is very simple and the product very uniform.

The peculiar advantage of the Tropenas process lies in the fact that the resultant metal is better, and consequently more fluid than that produced by any other method, and it is this fact which makes it valuable in the manufacture of small and intricate castings, as it can be poured over the lip of the ladle in as small a stream as desired, and will run through thin sections, producing solid castings free from pin holes and cracks. Any grade of metal is readily produced by varying the additions. It is consequently valuable not only in the production of low carbon steel of the maximum permeability, so much desired in electrical castings, but also in the production of special grades of hard steel for mining machinery parts and other purposes.

Huelva Industries.

Bd. of Trade J., Dec. 27, 1900, 685.

In a report published in the *Moniteur Officiel du Commerce*, of 22nd November last, by M. Prévost, the French Commercial Adviser at Huelva, upon the trade of that district, he calls attention to the recent creation of various companies formed for working copper and manganese mines, which offer little prospect of being of permanent value. Attention is also called in the report to the opportunities for the sale of mining material of all descriptions, and especially of overhead cables for transport purposes, in this district.

Exports.—The quantities of merchandise exported from Huelva during 1899 were as follow:—

	Tons.
Copper pyrites, averaging from 1½ to 3 per cent. of copper	950,000
Iron pyrites, averaging from 45 to 50 per cent. of sulphur	350,000
Carbonate of manganese, averaging from 30 to 35 per cent. of manganese	136,000
Copper matte, containing an average of 30 per cent. of copper	16,000
Copper precipitate, containing an average of 70 per cent. of copper	30,000
Iron ore	25,000
Sulphate of copper	5,000
Lead ore, zinc ore, &c.	5,000
Fruit, cereals, cork, &c.	4,000
Wine	30,000
	1,551,000

Mining.—Besides the pyrites mines, several deposits of carbonate of manganese of low grade containing 30 per cent. to 35 per cent. of mineral, are worked for the most part by native concessionaires; these mines are usually in the form of small pockets or lodes, and will doubtless be exhausted in a comparatively short time.

Platinum in 1900.

Eng. and Mining J., Jan. 5, 1900, 21.

The world's supply of platinum has for several years past ranged between 160,000 and 170,000 troy ounces. In 1900 the total, so far as ascertained, was about 165,000 oz., which is somewhat below the demand, so that the metal has commanded high prices throughout the year, its cost gradually approaching that of an equal weight of gold. The uses of the metal are limited by the high prices and could be much extended if the supply could be increased.

Over 90 per cent. of the total comes from the Russian placers, the output of which in 1900 was approximately 153,000 oz. The conditions of production in Russia have not changed materially, though the business is gradually passing into the hands of the combination of Russian mine owners and of Belgian and French refiners, which was formed in 1898. The details of this combination have been kept from the public, and it is hard to obtain definite knowledge about its operations or the exact production.

The only considerable production outside of Russia is in Columbia, in South America. The output of that country is about 11,500 oz. An increase was promised in 1900, but the revolution there and the prolonged contest between the Government and the insurgents prevented any extension in mining.

The production in the United States is insignificant; it amounts to about 200 oz. yearly, which is obtained at the San Francisco Mint in parting and refining gold from certain localities in Trinity, Shasta, and Plumas counties. Imports into the United States increased in 1900, the total for the 10 months ending with October being 6,305 lb., indicating a total for the year of about 7,000 lb., or 800 lb. more than in 1899. A considerable part of the imports is in crude form, the metal being refined here.

A small quantity of platinum is obtained from British Columbia, being parted from gold, as in California. Some platinum is known to exist in nickel matte from the Sudbury District in Ontario, but we are not advised of any production from that source.

New discoveries were reported in 1899, but have not yet resulted in the marketing of any quantity of the metal. The most promising of these is on the Hootalinqua River in the Yukon Territory in Canada. No work has been done on the discovery, which was reported in Algeria two years ago.

The price of platinum in New York at the close of the year is 18.20 dols. to 18.50 dols. per troy ounce. In London, the quotation is 75s. an ounce, or about on a parity with New York. Manufactured into chemical ware or wire, the price in New York is 72 c. per grm.

Mercury in Texas.

Chem. and Druggist, Jan. 19, 1901, 105.

The cinnabar or quicksilver deposits in Brewster County, Tex., are being developed on an extensive scale. Although it has been only about a year since any recognition was taken of these deposits, over 1,000 flasks of quicksilver were produced up to January 1, 1900. The production for the present year will reach several thousand flasks. This new quicksilver district is located near the Rio Grande border, and is over fifty miles distant from the nearest railroad-point. Fuel and water are scarce, otherwise the development of the field would be much more rapid than at present.

Mercury Statistics.

Alex. S. Pickering, London.

—	Imports.	Exports.	Price. Highest.	Price. Lowest.
	Bottles.	Bottles.	£ s. d.	£ s. d.
1900	32,725	25,869	9 12 6	9 2 6
1899	51,696	32,239	9 12 6	7 15 0
1898	54,563	34,014	7 15 0	6 16 0
1897	54,734	30,768	7 7 6	6 9 6
1896	47,159	35,211	7 6 0	6 5 6
1895	49,654	36,827	7 8 6	6 7 6
1894	51,251	43,598	6 14 0	5 7 0
1893	52,525	38,022	6 17 0	6 2 0
1892	56,990	50,211	7 13 0	6 1 0
1891	62,771	56,643	9 0 0	7 5 0

Estimated consumption, United Kingdom, 13,000 bottles per annum.

XII.—OILS, Etc.

Seal Oil in Greenland.

Bd. of Trade J., Jan. 3, 1901.

The trade in seal blubber is carried on directly with the Greenlanders at the various trading stations and the outlying stations in connection therewith, where it is boiled down into oil, in which form it is exported to Denmark. There the oil is still further refined, and is put upon the market

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as light brown and brown seal oil. A third kind of oil is the so-called "three crown oil," *i.e.*, seal oil which has undergone a further boiling and refining process. The seal oil of the Greenland trade is stated to be very well known, and to be everywhere recognised as an excellent product. One thing that always brings it (the so-called "Company Oil") to the front is that it is always produced as an unadulterated article. During the last few years, with a view to safeguard purchasers abroad against imitations, a rule has been in force that, if desired, every cask of seal oil must, on delivery, have the bunghole closed with the seal of the Greenland Company. By this precautionary measure the purchaser has a guarantee that the oil in the cask is real "Company Oil." About 10,000 casks of seal oil are produced annually, of which about one-fifth is light brown oil. Seal oil was formerly sold by auction, but is now sold privately at prices which are fixed by the administration of the Greenland Company in Copenhagen. The Greenland trade always has been, and is monopolised by the State, and only Government vessels are allowed to sail in Greenland waters. This is to protect the Greenlander from being deceived by unscrupulous merchants, and from selling more than they can dispense with.

XIII. A.—PIGMENTS, PAINTS, Etc.

Ochre in Germany.

***Eng. and Mining J., Dec.* 15, 1900, 696.**

United States Consul-General Mason writes from Berlin, Nov. 9, 1900, that he has received a sample of crude ochre from Texas, which he requested in a previous report. Mr. Mason adds: "This sample I caused to be divided and distributed among several of the leading consumers of yellow ochre in Germany, who, after examination, report unanimously that the tint and quality of the ochre are alike excellent, but that it should be prepared for market by being first washed free from sand and other impurities, then dried, pulverized and put up in wooden casks. In this condition it would meet with a ready and extensive sale in Germany, where its wholesale value would range from 19·44 dols. to 21·87 dols. per metric ton, including casks, c. i. f. Hamburg. As above indicated, it will be necessary, in order to introduce the new product into this country, that the exporters shall provide for its transportation to a German port—preferably Hamburg or Bremen—and give a definite price free on board at one or other of those ports. It is impossible for importers in this country to ascertain freights or provide charters from a port on the Gulf of Mexico to Germany. That belongs to the exporter, whose product will in the present case have to compete with French ochre, which has for many years controlled the market in Germany."

XIII. C.—INDIA-RUBBER, Etc.

Caoutchouc in the Congo.

***Bd. of Trade J., Jan.* 3, 1901.**

Caoutchouc is the largest item in the export records both of the French Congo and the Congo Free State, and the following figures show the quantity and value of the export of this article during the four years 1896—1899:—

Exports of Caoutchouc.

Years.	From French Congo.		From Congo Free State.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
1896	548	105,000	1,317	263,000
1897	518	99,000	1,642	332,000
1898	578	111,000	2,113	634,000
1899	670	120,000	3,746	1,124,000

Caoutchouc Trade in Hamburg.

***Bd. of Trade J., Dec.* 27, 1900, 713.**

According to the *Dépeche Coloniale* of 13th inst., caoutchouc has a tendency to occupy an increasingly important position on the Hamburg market. The following table shows the quantity and value of caoutchouc imported during the last four years:—

Year.	Quantity.	Value.
	Tons.	£
1896	7,191	1,253,000
1897	7,576	1,422,000
1898	9,026	2,012,000
1899	11,493	2,333,000

Nearly the whole of the quantity imported is used in Germany; in 1899 only 6,625 tons were re-exported. The imports of caoutchouc come either direct from the countries of origin (East and West Africa, Madagascar, Brazil, &c.) or from European entrepôts, principally English ports.

Caoutchouc Substitute.

The *India Rubber Trades Journal* says that preparations are being made for the erection of a plant in Monterey, Mexico, for the manufacture of rubber substitute from a native shrub called guayula. It is claimed that the substance can be vulcanised, and is in every way equal to the product of the rubber tree. The shrub grows in unlimited quantity in many of the Central American states, and has been hitherto considered useless.

XV.—MANURES, Etc.

Phosphate Discoveries in Egypt.

***Bd. of Trade J., Dec.* 27, 1900, 704.**

According to a report from the German Consulate in Cairo, published in the *Nachrichten für Handel und Industrie*, discoveries of phosphate deposits have recently been made in Egypt by geologists commissioned by the Government to make exhaustive investigations in consequence of traces of such deposits having been observed.

It appears that, apart from deposits of minor importance, two phosphate deposits of considerable extent and depth have been found, which could be worked without great difficulty, one being situated in the desert, east of Kenah, near the great caravan route leading thence to Kosseir, on the Red Sea, and the other in the Dakleh oasis in the Libyan desert. From both places transport to the Nile Valley, possibly by means of light railways, could be easily effected, especially in the case of Dakleh, which is only 275 kilom. (170 miles) distant, and whence the export of dates on camels is accomplished in seven or eight days' march.

Chemical experts speak somewhat favourably of the phosphate found. So far as samples have yet been analysed, phosphoric acid has been found in quantities corresponding to from 40 to 60 per cent. of phosphate of lime. The German Consul is of opinion that these discoveries may have an important effect on Egyptian agriculture, as on account of their high price, foreign artificial manures have so far been relatively little used in that country, where there was reason to fear that the phosphoric constituents of the soil were being exhausted, and the Government on this account decided about a year ago to admit artificial manures duty free.

Phosphate Rock Production of United States.

***Eng. and Mining J., Jan.* 5, 1901, 31.**

State.	1896.	1897.	1898.	1899.	1900.
Florida	498,400	542,490	546,881	706,677	582,990
Tennessee	49,047	121,251	272,191	462,561	436,000
South Carolina	382,068	333,646	434,273	636,153	562,000
North Carolina	7,418	7,000	2,200	15,000	15,250
All other.....	439	2,000	2,100	3,000	3,750
Total {Long Tons}	937,372	1,007,367	1,257,645	1,823,391	1,599,990

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Nitrate of Soda.

W. Montgomery & Co.'s Half-Yearly Report.

Our earliest trade information regarding nitrate of soda is derived from a circular issued by Mr. Alfred Bourne, in January, 1841, in which Mr. Bourne reviews the business of the previous 10 years, and tells us that imports into England in 1831 amounted to 100 tons, the price at that date being 28*s.* per cwt. That the imports gradually increased during the decade, reaching 7,200 tons in 1840, with a price of 20*s.* 6*d.* per cwt. That the increase was chiefly for agricultural purposes, and also that there were symptoms of demand from Scotland and for transhipment to France.

For the 20 years ending with 1860, progress in consumption was very slow, reaching to 50,000 tons; nearly the whole of which was used in the British Isles. During the next decade these figures had little more than doubled, the quantity being about equally distributed between the United Kingdom and the Continent.

From 1870 to 1875, with remunerative prices for cereals in England, the consumption rapidly rose until in the latter year it reached 165,000 tons in the United Kingdom and 132,000 tons on the Continent. For the next 22 years, until 1897, there was an almost unbroken record of greatly reduced deliveries. It was in the year 1879 that the relative positions of the United Kingdom and Continent began to change as regards consumption, and the latter speedily and irretrievably left the former far behind.

Nitrate of soda has, from time to time, suffered serious mishaps. In 1868 a terrible earthquake and tidal wave overtook and destroyed Iquique, causing great havoc to the nitrate industry, and producing in Europe violent changes in price. In 1877 Peru was again visited with a similar calamity, although not so disastrous. This was followed in 1879 by the outbreak of war between Chili and Peru, which lasted over 12 months, and its effect upon the nitrate shipments was very serious. In the end the whole of the rich nitrate districts which belonged to Peru passed into the possession of Chili. For a few years preceding this war Peru had been expropriating the nitrate fields. When Chili took possession, she adopted the policy of permitting the private owners to work their own deposits, the Government merely imposing an export duty of about 2*l.* 12*s.* 6*d.* per ton, and this system has continued down to the present date.

One consequence of the curtailed shipments, caused by the war between Chili and Peru, was to raise the price in Europe from 13*s.* per cwt. to 19*s.* 6*d.* per cwt., and the following season the European farmer used 30 per cent. less than the previous year.

With a recurrence to more moderate prices and a great stimulus in agriculture on the Continent, especially in the cultivation of beetroot, a vast increase in the consumption of nitrate was noticeable in the decade ending with the year 1890.

The figures during that period for the Continent grew from 113,000 tons to 666,000 tons. In the United Kingdom during the same time, owing to agricultural depression, caused chiefly by the disastrously low price of cereals and the consequently reduced acreage under cultivation, especially of wheat, the consumption fluctuated between about 70,000 tons in 1880 to 120,000 in 1890. From 1890 until to-day, the record of consumption throughout the world is one of almost unbroken advance, slow perhaps, but of such uniform steadiness that there is every reason to believe that it is of a staying character. The following figures will show at a glance the total progress made during the periods to which we have referred:—

Year.	World's Consumption.	Price on 31st December.
	Tons.	Per Cwt. *s.* *d.*
1831	100	28 0
1840	7,200	20 6
1860	50,000	15 0
1870	103,000	15 9
1880	228,000	14 3
1890	885,000	7 7½
1900	1,324,000	8 6

Nitrate of Soda.

Shipments, Consumption, Stocks, and Prices for Three Years

	1898.	1899.	1900.
	Tons.	Tons.	Tons.
Shipments from South American Ports to all parts for the six months ending 31st December	819,000	819,000	889,000
Shipments from South American Ports for the 12 months ending 31st December	1,260,000	1,373,000	1,421,000
Afloat for Europe on 31st December	571,000	505,000	573,000
Stocks in United Kingdom ports:—			
Liverpool	4,500	6,000	10,000
London	2,400	1,800	4,000
Out ports	9,100	22,200	21,000
	16,000	30,000	35,000
Stocks in Continental ports on 31st December	116,000	296,000	186,000
Consumption in United Kingdom for the six months ending 31st December	32,000	34,000	43,000
Consumption in Continent for the six months ending 31st December	234,000	270,000	235,000
Consumption in United Kingdom for the 12 months ending 31st December	132,000	123,000	135,000
Consumption in Continent for the 12 months ending 31st December	900,000	1,017,000	991,000
Consumption in United States for the 12 months ending 31st December	142,000	160,000	175,000
Consumption in other Countries for the 12 months ending 31st December	12,000	30,000	23,000
Consumption *in the World* for the 12 months ending 31st December	1,186,000	1,330,000	1,324,000
Visible supply on 31st December (including the quantity afloat for Europe, and Stocks in United Kingdom and Continent)	703,000	741,000	791,000
Price on 31st December .....per Cwt.	7*s.* 7½*d.*	7*s.* 9*d.*	8*s.* 6*d.*

XVI.—SUGAR.

Beet Sugar Industry of Germany.

U.S. Cons. Reps., Dec. 1900, 450.

The official year of the German sugar industry is calculated from the 1st of August to the 31st of July, and the *Reichsanzeiger* has recently published an interesting summary of the production and export of sugar for last year, with a comparison with preceding years, from which the following statement is taken:—

While the consumption of raw beets was somewhat greater last year, it was considerably less than some former years. There were consumed last year 12,466,432 tons of raw beets, while the consumption in the preceding year (1899) was 12,150,644 tons. In the year 1897–98, the consumption of raw beets was 13,697,892 tons; in 1896–97, 13,721,601 tons. While in comparison with the preceding year the increase was 315,790 tons, or 2·6 per cent., on the contrary, the beet consumption in the years 1897–98 and in 1896–97 was more than 1,000,000 tons greater than in the year now ended. The sugar production was as follows:—

Year.	Raw Sugar.	Refined Sugar.	Total in Raw Sugar (including Crystallised).
	Tons.	Tons.	Tons.
1899—1900	1,576,673	1,212,471	1,791,252
1898–99	1,521,716	1,185,922	1,722,429
1897–98	1,664,263	1,207,350	1,844,100
1896–97	1,659,055	1,004,954	1,821,223
1895–96	1,467,437	1,084,395	1,637,057
1894–95	1,692,011	989,862	1,827,974

Accordingly, the raw-sugar production was 54,957 tons and the refined sugar was 26,549 tons greater last year than in the preceding, while the increase in crystallised sugar, which is computed in the last column of raw sugar (nine parts of crystallised sugar being reckoned as 10 parts raw

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sugar), was 68,823 tons, or almost 4 per cent. better than last year. The years 1894–95, 1896–97, and 1897–98 produced certainly considerably greater quantities of raw sugar; but the production in refined sugar was in no former year so great as this season. The total production of raw sugar averaged in the five preceding years 1,770,621 tons; consequently, the production last year exceeded the average by 20,631 tons. For the production of 1 kilo. (2·2046 lb.) of raw sugar, 6·96 kilos. (15·3 lb.) of raw beets were, on the average, necessary last year, while in the year 1898–99, 7·05 kilos. (15·5 lb.) of raw beets were necessary. In the year 1897–98, 7·43 kilos. (16·4 lb.), and in the year 1896–97, 7·53 kilos. (16·6 lb.) were required. The results were more favourable than in any of the previous years, not excepting the unusually warm year 1895–96, during which 7·13 kilos. (15·7 lb.) of beets were required for the production of 1 kilo. of sugar. The Strontium process played an important part in the extraction of sugar. By means of this process, 91½ per cent. of sugar was extracted, as compared with 89 per cent. in the year 1898–99.

In spite of the increase in the production of sugar, the export during the last business year has been less than in the preceding year. There was exported the following quantity:—

Year.	Raw Sugar.	Loaf Sugar.	Total.
	Tons.	Tons.	Tons.
1899–1900	485,935	417,408	924,562
1898–99	499,603	436,785	956,214
1897–98	478,941	478,812	982,869
1896–97	760,657	405,114	1,186,962

According to this, the export of raw sugar decreased about 13,700 tons, and that of loaf sugar 19,000 tons, and the total export, accordingly, decreased 31,700 tons. The figures for the year 1899—1900 include the exports during the five last months of 1899 and the first seven months of 1900. The following table shows the export of sugar to the different countries during the last three official years:—

Country.	1899—1900.	1898–99.	1897–98.
	Tons.	Tons.	Tons.
Great Britain	521,981	607,595	628,367
United States	218,540	188,852	142,434
British North America	40,500	51,474	38,474
Free harbour of Hamburg	27,541	9,105	43,292
Japan	20,392	16,074	31,326
Norway	20,233	17,681	17,328
Switzerland	12,654	12,127	12,925
Denmark	11,845	13,004	7,358
Portugal	8,262	7,778	6,765
Uruguay	7,412	1,056	399
Netherlands	6,200	6,801	9,636
Sweden	5,459	8,569	359
Chile	4,024	3,932	5,426
British East Indies	2,557	1,135	20,239
British Australia	1,793	549	2,628

According to this, the export of sugar to Great Britain was 85,614 tons, or 14·1 per cent. less last year than in the preceding. Great Britain received, in the year 1898–99, 63·5 per cent. of the total export of German sugar; in the year 1899—1900, only 56·6 per cent. On the contrary, the export to the United States increased during last year almost 30,000 tons. In the year 1897–98, the United States took 14·5 per cent. of the total German export; in 1898–99, 19·7 per cent.; and in 1899—1900, 23·6 per cent. This is so much the more remarkable as the increase was during the period in which new tariff rules were prescribed, which increased the duty on sugars exported from premium-paying countries. Consequently an additional duty was imposed upon sugar exported from Germany in proportion to the premium paid, and thereby the market for raw sugar, as well as for sugar exported from countries which paid no premium, was favoured. The export to British North America decreased during last year because the tariff by which Canada favours the mother country and its colonies has gone into effect. Also the export to Sweden, Denmark, and the Netherlands has decreased. On the other hand, the export to Japan, British East Indies, and Australia has increased considerably, in comparison with the great falling off in the year 1898–99. The export to Norway has also increased.

Beet-Sugar Industry of France.

U.S. Cons. Reps., Dec. 1900, 452.

"Beet Sugar in France from 1800 to 1900" is the title of a quarto volume of 220 pages and 15 engravings, recently brought out by M. Jules Helot. It is a complete history of the sugar industry in this country, and a review of the legislation and the inventions that have aided or retarded its progress since the first protective decree under Napoleon I. up to the ninety-eighth law enacted during the presidency of the late Félix Faure.

The beginning of the industry in France was really under Napoleon I., in 1810–12, when he established five great schools for study and instruction in "sugar chemistry," and four large imperial sugar mills, exempt from all taxation.

M. Helot follows the discoveries and inventions by which the yield of the beet has been increased from 2 per cent. in 1810 to 12 per cent. in 1900.

There are now in France 340 sugar factories, the average production of which has increased threefold in 18 years. They consume 540,000 lb. of beets every 24 hours. The average daily consumption of Germany is 860,000 lb. Since 1888 the consumption of coal in the sugar mills of France has fallen from 442 lb. to 286 lb. per ton of beets.

The following table gives the product of raw sugar for the countries named:—

Country.	1869–70.	1879–80.	1889–90.	1899—1900.
	Met. Tons.	Met. Tons.	Met. Tons.	Met. Tons.
Germany	217,000	415,000	1,261,000	1,790,000
Austria-Hungary	180,000	420,000	799,000	1,200,000
Russia	130,000	300,000	526,000	900,000
France	289,000	478,000	755,000	805,000
Belgium	46,000	75,000	173,000	300,000
Holland	13,000	24,000	56,000	180,000
Other countries.	3,000	8,000	87,000	275,000
Total	878,000	1,720,000	3,657,000	5,450,000

Although France has almost trebled her production in the last 30 years, she has fallen from the first place in 1870 to the fourth place in 1900, and to-day there is a difference of 120 per cent. between her and Germany. In France 255,000 hectares (630,105 acres) are devoted to the cultivation of the beet, against 427,000 hectares (1,055,117 acres) in Germany. The product of beets per hectare in Germany is nearly 30,000 kilos., and in France it is 28,000 kilos. Moreover, in France the yield is 12 per cent., while in Germany it is over 13 per cent.

Since 1896, while there has been a very high protective tariff on sugar—in fact, an increasing tariff—the price has been steadily declining.

Starch Industry in Germany.

Bd. of Trade J., Dec. 27, 1900, 715.

The German Government have recently collected statistics showing the production in various branches of industry in the Empire, and figures showing the quantity and value of different kinds of starch (exclusive of rice starch) produced in Germany have recently been published in the *Nachrichten für Handel und Industrie*, issued by the German Home Office. Although relating to the business year 1897–98, the figures may be of interest as showing the annual output of this branch of German industry. The

———	Quantity.	Value.
	100 Kilos.	Marks.
Potato starch	1,344,578	20,666,820
Wheat „	121,291	4,591,219
Maize „	85,076	2,236,896
Potato sago	4,158	110,734
Starch sugar	71,733	1,749,362
Starch syrup	348,021	8,293,456
"Couleur"	48,113	1,556,593
Dextrin and starch gum	189,588	5,338,069

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quantities and value of the principal products of the starch industry are given in the foregoing table.

XVII.—BREWING, WINES, SPIRITS.

Royal Commission on Beer Poisoning.

Standard, Jan. 11, 1901.

We are officially informed that a Royal Commission has been appointed to make investigations respecting the beer-poisoning epidemic.

The Commissioners are Lord Kelvin, Sir W. Hart Dyke, Sir W. S. Church, President of the Royal College of Physicians; Professor T. E. Thorpe, Government Analyst; Mr. H. Cosmo Bonsor; and Dr. B. A. Whitelegge, Her Majesty's Chief Inspector of Factories. Dr. G. S. Buchanan, one of the Medical Inspectors of the Local Government Board, is the Secretary to the Commission. The instructions to the Commissioners are—

To ascertain with respect to England and Wales :—

1. The amount of recent exceptional sickness and death attributable to poisoning by arsenic;

2. Whether such exceptional sickness and death have been due to arsenic in beer, or in other articles of food or drink, and, if so,

(*a*) To what extent;

(*b*) By what ingredients, or in what manner, the arsenic was conveyed; and

(*c*) In what way any such ingredients became arsenicated; and,

3. If it is found that exceptional sickness and death have been due to arsenic in beer, or in other articles of food or drink, by what safeguards the introduction of arsenic therein can be prevented.

BOARD OF TRADE RETURNS.

Summary of Imports.

Articles.	Year ending 31st Dec.	
	1899.	1900.
	£	£
Metals	28,304,450	33,186,303
Chemicals and dyestuffs	5,768,374	5,559,037
Oils	9,690,576	11,016,595
Raw materials for non-textile industries.	56,777,299	8,277,124
Total value of all imports	485,035,583	523,633,486

Summary of Exports.

Articles.	Year ending 31st Dec.	
	1899.	1900.
	£	£
Metals (other than machinery)	40,307,079	45,422,986
Chemicals and medicines	8,854,813	9,271,510
Miscellaneous articles	34,872,251	36,565,410
Total value of all exports	264,492,211	291,451,306

Imports of Oils for Year ending 31st Dec.

Articles.	Quantities.		Value.	
	1899.	1900.	1899.	1900.
			£	£
Cocoa-nut ..... Cwt.	458,297	552,743	545,642	667,207
Olive ..... Tuns	15,939	12,046	553,286	461,084
Palm ..... Cwt.	945,472	938,350	1,937,265	1,086,555
Petroleum ..... Gall.	240,147,367	255,852,261	4,574,989	5,574,533
Seed ..... Tons	46,416	41,225	879,171	1,036,564
Train, &c. ..... Tuns	20,358	21,324	346,996	389,712
Turpentine ..... Cwt.	495,808	595,420	809,906	978,943

Imports of Miscellaneous Articles for Year ending 31st Dec.

Articles.	Quantities.		Value.	
	1899.	1900.	1899.	1900.
			£	£
Cement ..... Tons	..	104,768	..	211,532
China and earthenware. Cwt.	..	361,871	..	932,070
Drugs ..... Value £	..	..	1,078,537	1,198,950
Glass :—				
Sheet ..... Cwt.	1,301,881	1,165,979	672,553	650,251
Plate ..... „	359,154	316,094	390,828	354,679
Flint ..... „	..	487,731	..	900,948
Bottles ..... Gross	1,266,959	1,591,213	527,534	673,429
Other ..... Cwt.	906,975	343,070	1,617,895	617,185
Glue and gelatin. „	..	212,063	..	463,867
Leather, unmanufactured. „	1,354,186	1,408,923	8,582,379	8,792,234
Oil seed cake .... Tons	441,934	394,889	2,648,184	2,547,535
Paints and pigments. Value £	..	..	..	1,349,164
Paper, pasteboard Cwt.	5,365,399	6,332,573	3,723,094	4,411,557
Scientific instruments. Value £	..	..	..	648,817
Soap and soap powder. Cwt.	..	191,214	..	244,345
Zinc manufactures. „	423,736	434,960	593,930	559,705

Imports of Metals for Year ending 31st Dec.

Articles.	Quantities.		Value.	
	1899.	1900.	1899.	1900.
			£	£
Copper :—				
Ore ..... Tons	125,202	101,453	1,130,528	1,173,042
Regulus ..... „	82,179	87,720	2,512,572	3,517,506
Unwrought ..... „	59,550	71,086	4,313,455	5,276,859
Lead, pig and sheet „	198,377	195,380	2,883,837	3,319,574
Pyrites ..... „	701,174	740,753	1,164,667	1,236,841
Quicksilver ..... Lb.	3,877,184	2,454,433	415,430	297,243
Silver ore ..... Value £	..	..	1,032,590	1,022,886
Tin ..... Cwt.	543,478	662,360	3,298,182	4,359,133
Zinc ..... Tons	69,949	69,536	1,663,381	1,442,032

Imports of Raw Material for Non-Textile Industries for Year ending 31st Dec.

Articles.	Quantities.		Value.	
	1899.	1900.	1899.	1900.
			£	£
Bark, Peruvian .. Cwt.	33,579	41,108	77,469	92,177
Caoutchouc ..... „	449,651	514,226	5,923,897	6,987,113
Gum :—				
Arabic ..... „	67,926	82,995	168,510	177,063
Lac, &c. ..... „	108,758	113,074	372,587	363,609
Gutta-percha .... „	82,497	126,059	1,965,966	1,685,568
Hides, raw :—				
Dry ..... „	446,725	751,504	1,148,189	1,996,743
Wet ..... „	763,548	634,375	1,639,898	1,467,750
Ivory ..... „	9,939	9,887	404,063	398,551
Manure :—				
Bones ..... Tons	68,915	68,737	313,659	301,803
Guano ..... „	26,911	33,636	140,075	178,009
Nitrate of soda... „	140,851	141,155	1,069,771	1,153,462
Phosphate of lime „	420,168	355,430	682,940	588,789
Paraffin ..... Cwt.	1,077,003	984,571	1,011,067	1,337,261
Linen rags ..... Tons	20,426	16,612	174,801	161,861
Esparto ..... „	207,604	200,280	806,354	800,498
Pulp of wood..... „	415,113	488,827	1,989,703	2,633,789
Rosin ..... Cwt.	1,708,630	1,802,098	399,656	461,426
Skins :—				
Goat ..... No.	..	14,876,710	..	1,413,070
Sheep ..... „	..	15,045,195	..	1,600,723
Tallow and stearin Cwt.	2,031,137	2,177,991	2,380,033	2,835,208

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Imports of Chemicals and Dyestuffs for Year ending 31st Dec.

Articles.	Quantities.		Value.	
	1899.	1900.	1899.	1900.
			£	£
Alkali..... Cwt.	237,761	322,051	133,878	168,158
Borax..... „	60,566	308,407	30,815	155,409
Brimstone..... „	431,218	450,661	101,615	109,048
Nitrate of potash.. „	248,717	251,928	204,485	214,975
Chemicals, other Value £	..	..	1,464,817	1,498,624
Cutch and gambier. Tons	21,526	19,496	347,025	386,099
Dyes:—				
Alizarin.....Value £	..	..	215,228	186,264
Aniline and other „	..	..	493,569	533,824
Indigo ..... Cwt.	58,977	33,518	986,090	543,089
Bark..... „	324,725	293,755	136,971	109,724
Valonia..... Tons	24,333	32,663	281,471	313,656

Exports of Metals (other than Machinery) for Year ending 31st Dec.

Articles.	Quantities.		Value.	
	1899.	1900.	1899.	1900.
			£	£
Brass..... Cwt.	113,920	120,698	562,783	631,525
Copper..... „	997,647	748,627	3,746,880	2,931,793
Lead..... Tons	40,289	36,269	635,997	690,310
Plated wares... Value £	..	..	420,869	460,471
Tin..... Cwt.	93,908	112,462	586,850	763,340
Zinc..... „	132,701	153,402	153,748	166,970

Exports of Drugs and Chemicals for Year ending 31st Dec.

Articles.	Quantities.		Value.	
	1899.	1900.	1899.	1900.
			£	£
Alkali..... Cwt.	3,808,800	3,657,154	1,030,871	1,120,862
Bleaching materials „	1,300,100	1,270,101	321,157	370,784
Chemical manures Tons	440,138	400,384	2,427,046	2,411,444
Copper sulphate .. „	40,193	42,914	855,225	1,013,594
Medicines..... Value £	..	..	1,155,637	1,263,913

Exports of Miscellaneous Articles for Year ending 31st Dec.

Articles.	Quantities.		Value.	
	1899.	1900.	1899.	1900.
			£	£
Gunpowder..... Lb.	7,923,600	7,021,000	180,366	155,857
Candles..... „	27,733,300	22,583,100	412,181	397,982
Caoutchouc..... Value £	..	..	1,388,805	1,423,413
Cement..... Tons	352,358	359,982	690,835	673,062
Products of coal. Value £	..	..	1,543,942	1,812,174
Earthenware ... „	..	..	1,871,531	1,854,147
Stoneware ..... „	..	..	170,345	184,647
Glass:—				
Plate..... Sq. Ft.	1,764,100	2,165,072	100,030	135,426
Flint..... Cwt.	88,401	101,742	216,000	245,038
Bottles..... „	794,650	861,398	377,855	428,965
Other kinds ... „	240,229	225,629	222,463	233,153
Leather:—				
Unwrought.... „	157,437	136,458	1,483,114	1,449,537
Wrought.....Value £	..	..	429,637	481,698
Seed oil ..... Tons	38,174	42,690	758,657	1,112,660
Floorcloth.....Sq. Yds.	26,887,500	27,848,200	1,164,267	1,311,464
Painters' materials Val. £	..	..	1,833,937	2,052,392
Paper..... Cwt.	930,014	1,066,848	1,423,924	1,649,188
Rags..... Tons	64,993	62,282	341,629	375,682
Soap..... Cwt.	932,700	872,610	941,575	929,647

Monthly Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

Applications.

23,032. I. C. McClenthen. Improvements in smoke-consuming apparatus. Dec. 17.

23,051. K. E. Markel and J. J. Crosfield. Improvements in or relating to apparatus for separating solid matters from liquids. Dec. 17.

23,052. J. M. Gibson and The Buckley Brick and Tile Company, Ltd. Improvements in packing material for Gay Lussac, Glover, and the like towers. Dec. 17.

23,109. H. de Witt. Improvements in continuous kilns. Complete Specification. Dec. 18.

23,244. L. Kaufmann. Improved process for effecting rapid crystallisation. Complete Specification. Dec. 19.

23,574. E. H. Stein. Improved iron shaft-furnace for burning cement, lime, and the like. Complete Specification. Dec. 24.

23,608. J. E. Bousfield.—From The Snowflake Refrigerator Company, Ltd., South Australia. Improvements in refrigerators. Complete Specification. Dec. 24.

23,754. G. W. Johnson.—From P. Naef, United States. Improvements in means to be employed in absorbing, precipitating, distilling, lixiviating, and generally for subjecting matter to the action of gases or liquids. Dec. 28.

1901.

592. W. P. Grath. Improvements in kilns. Complete Specification. Jan. 9.

654. S. J. Ingram. Improvements in apparatus for charging coal-gas and other retorts. Jan. 10.

765. A. J. Boult.—From A. Landsiedl, Austria. Improvements in and relating to distilling or condensing apparatus. Jan. 11.

826. D. W. Forbes. A conical carburettor. Jan. 12.

839. W. Reeves. Improvements in filtering apparatus. Jan. 12.

Complete Specifications Accepted.

1899.

25,640. G. N. Vis. Vacuum evaporating apparatus for separating salt from solution, especially from brine. Dec. 31.

1900.

451. F. Pinther. Apparatus for regulating the supply of air to furnaces. Jan. 16.

534. E. G. Behrend. Cooling or refrigerating apparatus. Jan. 16.

2823. J. W. Macfarlane. Weston's centrifugal machines. Dec. 31.

3080. F. Simpson and A. R. T. Woods. Evaporators. Jan. 16.

3748. E. G. Scott. Vacuum evaporators. Dec. 28.

5826. V. E. J. Durafort. Capsules or vessels for containing compressed or liquefied gas. Jan. 9.

5917. H. Schaffstädt. Surface condensers. Dec. 28.

5918. H. Schaffstädt. Condensers. Dec. 28.

17,924. S. M. Lillie. Treatment of solutions to precipitate matter contained therein. Dec. 31.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

II.—FUEL, GAS, AND LIGHT.

APPLICATIONS.

23,027. C. Carpenter. Improvements relating to the igniting of incandescent gas burners. Complete Specification. Dec. 17.

23,044. P. Naef. Apparatus for recovering products from fuel. Dec. 17.

23,116. S. Chandler, jun., and J. Chandler. Improvements in gas scrubbers and washers. Dec. 18.

23,132. C. S. Snell. Improvements in burners used for incandescent gas lighting. Dec. 18.

23,133. C. S. Snell. Improvements in burners used for incandescent gas lighting. Dec. 18.

23,136. M. E. H. Dennstedt. Improvements relating to the desulphuration of illuminating gas. Dec. 18.

23,222. W. P. Thompson.—From The Firm of S. Zielenziger, Germany. Improvements in incandescent gas lamps. Complete Specification. Dec. 19.

23,236. W. J. R. Sims and A. L. Davis. Improvements in means for extracting roots and foreign matter from peat. Complete Specification. Dec. 19.

23,237. W. J. R. Sims and A. L. Davis. Improvements in processes for treating and drying peat. Complete Specification. Dec. 19.

23,251. A. Scholl. An improved hydraulic gas-compressing apparatus. Complete Specification. Dec. 19.

23,320. W. S. Rock. Improvements in the production of oxide of iron. Dec. 20.

23,346. H. Higgins. Improvements in or relating to the treatment of peat and in apparatus therefor. Dec. 20.

23,605. The Portable Gas Fountain Syndicate Ltd.—From J. Thovert, France. Improvements in incandescent gas burners. Dec. 24.

23,615. J. B. S. MacIlwaine. Improvements in the manufacture of 'acetylene' gas for the purpose of illumination and in the apparatus used in the manufacture of such gas. Dec. 27.

23,642. O. Reitz. Improvements in appliances connected with incandescent gas lighting apparatus. Complete Specification. Dec. 27.

23,662. A. J. Boult.—From Desiderius Turk and The Actien Gesellschaft "Lauchhammer," Germany. Improved process for the production of gases of high caloric value from low-caloric fuel material. Dec. 27.

23,701. A. Rosenberg. Improvements in and connected with self-igniting incandescent gas-lights. Dec. 28.

23,742. C. G. Redfern.—From H. Collins, Belgium. The manufacture of a silicated material for use for fuel or for the production of refractory and other articles. Dec. 28.

23,765. W. Young and S. Glover. *See* Class B.

23,768. H. Oldham. Improvements in or relating to incandescent gas burners. Dec. 29.

23,813. W. Young, S. Glover, and T. Glover. Improvements in removing and preventing naphthalene deposits and in apparatus therefor. Dec. 31.

23,815. E. W. T. Richmond. An improved Bunsen or atmospheric burner. Dec. 31.

23,849. J. St. Clair Legge. Improvements in vapour incandescent lighting apparatus. Dec. 31.

23,850. A. G. Brookes.—From The Incandescent Gas Light Company, United States. Improvements in or relating to apparatus for so-called incandescent gas lighting. Complete Specification. Dec. 31.

1901.

51. M. Göhler. Improvements in gas-producing apparatus. Complete Specification. Jan. 1.

83. J. Bonnet and J. S. Muller. Improvements relating to machines for the manufacture of incandescent gas mantles. Jan. 1.

100. E. J. Duff and The United Alkali Company, Ltd. Improvements in means to be employed in the treatment of producer gases. Jan. 1.

127. F. E. Ross. Improvements in apparatus for the production of combustible gas. Jan. 2.

179. The Atmospheric Gas Company, Ltd., and H. Thornton. Improvements in producing mixtures of vaporised oil and air for heating, lighting, and motor purposes. Jan. 3.

194. J. S. Morriss. Improvements in mantles for incandescent lighting. Jan. 3.

212. T. Machin. Improvements in acetylene generators. Jan. 3.

240. J. A. Burgess. Improvements in acetylene gas generators. Jan. 3.

241. J. A. Burgess. Process or method for treating and purifying acetylene gas. Jan. 3.

243. E. Cervenka, J. Bernt, and R. Lehmann. Improvements in or relating to incandescent burners for liquid fuel. Jan. 3.

405. G. Daubenspeck and O. H. Smith. Improvements in and relating to refractory incandescent mantles. Jan. 7.

415. J. A. Ageron, C. E. Baumes, and E. Delcourt. A new or improved process and apparatus for producing a new kind of gas for illuminating, heating, or motive purposes. Jan. 7.

478. T. Kautny and R. W. Lotz. Improvements relating to acetylene gas generators. Complete Specification. Jan. 8.

571. C. Clamond. An improvement in incandescence mantles. Jan. 9.

572. J. H. Calkins. Improvements in apparatus for generating acetylene gas. Filed Jan. 9. Date applied for June 9, 1900, being date of application in United States.

645. R. Beese. Self-igniting attachment for gas burners. Complete Specification. Jan. 10.

697. J. Radcliffe. Improvements in the manufacture of gas and in apparatus therefor. Jan. 10.

763. W. Hooker. Improvements in incandescence gas burners. Jan. 11.

781. P. Naef. Improvements to be employed in connection with the production of gas in gas producers, and its treatment and utilization in internal combustion engines. Filed Jan. 11. Date applied for June 14, 1900, being date of application in United States.

798. W. H. Sherburn. Improvements in Bunsen burners. Jan. 12.

827. G. Kohl. Improvements in incandescent bodies, and in the method of manufacturing same. Complete Specification. Jan. 12.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

410. E. J. Duff. Gas producers. Dec. 28.

905. A. Graetz. Blue burners for light carburetted hydrogen gas. Jan. 16.

1037. J. West. Charging machine for gas retorts. Jan. 9.

1336. B. R. Chicken, A. G. Smith, and The Bon-Accord Acetylene Gas Company. Method of purifying acetylene gas, with the necessary apparatus connected therewith. Dec. 28.

1959. A. J. Boult.—From E. Fleischer, Germany. Process for the production of water-gas. Jan. 9.

2005. A. Holstein and A. O. Teschich. Vaporising or evaporating device for generating gas from dense hydrocarbonic substances for oil, gas, and hot-air motors. Jan. 9.

2063. W. T. Sugg. Apparatus to be used for incandescent gas lighting. Dec. 31.

2855. Sir C. S. Forbes, Bart. Acetylene gas generators. Jan. 16.

3631. E. J. Duff. Gas producers. Dec. 28.

3745. A. Messer. Acetylene gas generators. Dec. 31.

4134. C. B. Tully. Processes for enriching or carburetting coal and other gases for illuminating purposes, and appliances connected therewith. Jan. 9.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

11,979. M. Graham. Hot coke conveyers. Dec. 28.

14,553. G. C. Dymond.—From The Firm of S. Zeilenziger, Germany. Incandescent gas lamps. Jan. 16.

17,025. J. Predmerszky and G. Predmerszky. Acetylene gas generator. Dec. 31.

18,499. F. Deimel. Self gas-lighter. Jan. 16.

18,839. A. J. Boult.—From A. Exbrayat, France. Manufacture of coal briquettes and the like, and of agglutinant material for the same. Jan. 16.

19,016. L. D. Railsback. Acetylene gas generator. Dec. 31.

19,337. D. McDonald. Acetylene gas-generating apparatus. Jan. 9.

20,947. K. G. Gustafsson. Apparatus for generating acetylene gas. Jan. 16.

21,890. W. P. Thompson.—From Boguslaw Jolles and the Firm of Zietz and Brune Gesellschaft mit beschränkter Haftung, Germany. Burners for incandescent gas light. Jan. 9.

21,974. C. A. Bronder. Machinery for discharging gas retorts. Jan. 9.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, Etc.

Application.

279. F. Rauch. Improvements in the manufacture of tar. Complete Specification. Jan. 4.

Complete Specifications Accepted.

1900.

408. J. Beveridge and the Linlithgow Oil Co., Ltd. Retorts for distilling shale and like minerals, and for dealing with the burnt or spent shale. Dec. 31.

19,406. S. Fränkel and A. König. Process to render sulphurished hydrocarbons soluble in water. Jan. 16.

IV.—COLOURING MATTERS and DYES.

Applications.

23,231. The British Oil and Cake Mills, Ltd., and A. G. Wass. Improvements in or applicable to the manufacture of printing ink. Complete Specification. Dec. 19.

23,338. B. Willcox.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the conversion of indigo leuco compounds into indigo, and the application thereof to colouring textile fibres. Dec. 20.

23,419. R. B. Ransford.—From L. Cassella and Co., Germany. Improvements in the manufacture of hydroxylated acridines. Dec. 21.

23,548. J. Levinstein, H. Levinstein, and Levinstein, Ltd. Improvements in the manufacture of naphthoacridine derivatives, and of colouring matters therefrom. Dec. 24.

23,600. A. Allers. Improved method of manufacturing a brown and dark brown colouring matter. Dec. 24.

23,687. G. W. Johnson.—From C. F. Boehringer and Sochne, Germany. Improvements in the manufacture of triphenylmethane colouring matters. Complete Specification. Dec. 27.

23,858. H. J. Haddan.—From A. S. Ramage, United States. A new or improved process of obtaining colour substance from ferrous liquors. Complete Specification. Dec. 31.

23,859. H. J. Haddan.—From A. S. Ramage, United States. *See* Class VII.

23,887. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in or connected with the manufacture and production of naphthalene compounds and their employment in dyeing and printing. Dec. 31.

23,902. F. Kehrmann. Manufacture of colouring matters of the thiazine series and of intermediate products therefor. Dec. 31.

1901.

274. A. Zimmermann.—From The Chemische Fabrik auf Actien vorm. E. Schering, Germany. The manufacture of ortho-oxycarbonic acids. Jan. 4.

295. A. G. Green, R. J. Lévy, and The Clayton Aniline Company, Ltd. Improvements in the manufacture and production of colouring matters of the thiazol series. Jan. 4.

330. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of a black colouring matter directly dyeing cotton. Jan. 5.

392. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of a blue-grey dyestuff for cotton. Jan. 7.

751. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of a dyestuff from 1:5 dinitronaphthalene. Jan. 11.

Complete Specifications Accepted.

1900.

530. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. *See* Class XX.

1094. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of hydrogenised oxybenzylamine and hydrogenised benzylamine bases, and transformation of the latter into hydrogenised cylic aldehydes or terpenaldehydes. Dec. 31.

1760. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of transformation products of coal-tar colours. Dec. 28.

2683. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of new azo-dyestuffs for cotton. Dec. 28.

2772. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of a violet-black azo-dyestuff for wool. Jan. 16.

2784. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of azo-colouring matter, and of lakes from azo-colouring matters. Jan. 16.

3208. R. B. Ransford.—From L. Cassella and Co., of Frankfort, Germany. Production of dyestuffs deriving from $\beta_1\beta_2$ amidonaptholdisulpho acid. Dec. 28.

3615. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of new azo-colouring matters and of new intermediate products for the production of such colouring matters. Dec. 28.

3673. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of new tri-azo colouring matters. Dec. 28.

4175. G. W. Johnson.—From C. F. Boehringer und Soehne, Germany. Production of amines from the corresponding nitro compounds. Jan. 9.

4792. A. G. Green, A. Meyenberg, and The Clayton Aniline Company, Ltd. Preparation of intermediate products for colouring matters. Dec. 31.

5122. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Berlin, Germany. Manufacture of new organic bromo compounds. Jan. 16.

5123. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Berlin, Germany. Manufacture of new organic iodo compounds. Jan. 16.

13,664. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of new intermediate products of new azo-colouring matters, their use in dyeing and treatment of the fibre. Jan. 9.

20,864. O. Imray.—From The Basle Chemical Works, Switzerland. Manufacture of aromotic sulphinic acids. Dec. 31.

Ze zbiorów Biblioteki Głównej Politechniki Łódzkiej

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Applications.

23,157. C. F. Topham. Improvements in apparatus for use in the production of textile fibres or filaments from solutions of cellulose or of other material from which fibres or filaments can be formed. Dec. 18.

23,636. G. Mitchell. Improvements in the treatment of cellulose. Dec. 27.

23,722. H. H. Lake.—From National Package Company, United States. Improvements relating to the manufacture of fibrous compositions. Complete Specification. Dec. 28.

1901.

273. W. A. E. Crombie. A process for the manufacture of artificial threads or fibres. Jan. 4.

Complete Specifications Accepted.

1900.

2157. L. Schreiner. Machine for use in connection with mercerising and similarly treating yarn in hanks under tension. Jan. 9.

10,438. A. J. Boult.—From F. Wislicki, Belgium. Treatment of wool and other animal or vegetable fibrous materials. Dec. 31.

11,055. E. Maertens. Machines for washing, rinsing, or chemically treating wool and other animal fibres. Dec. 28.

11,426. A. Goldzweig. Process and apparatus for purifying fibrous materials from grease, mineral oil, and other impurities. Dec. 31.

21,397. F. Simons. Mercerising or silk finishing cotton. Jan. 16.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, and BLEACHING.

Applications.

23,110. A. J. Boult.—From A. Gagedois, France. Improvements in or relating to the bleaching of vegetable fibres and fabrics. Dec. 18.

23,400. W. Mather. Improvements in apparatus for bleaching, dyeing, and otherwise treating fabrics. Complete Specification. Dec. 21.

23,401. W. Mather. Improvements in bleaching and dyeing, and in apparatus therefor. Complete Specification. Dec. 21.

23,663. P. Schirp. Improvements in apparatus for dyeing, washing, and bleaching textile materials. Complete Specification. Dec. 27.

1901.

228. C. Rigamonti and G. Tagliani. Improvements in kiers for bleaching cotton fabrics. Complete Specification. Jan. 3.

838. R. B. Ransford.—From L. Cassella and Co., Germany. Improvements in dyeing mixed fabrics. Jan. 12.

Complete Specifications Accepted.

1900.

379. O. Hoffmann. Process for producing repetitions of long suites of colours upon threads. Dec. 28.

509. J. Major and T. J. Wood. Apparatus for dyeing, bleaching, or otherwise treating cops of spun yarn. Dec. 28.

3288. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik. Discharging of dyed textile fabrics. Jan. 16.

5065. H. Hadfield. Process and apparatus for bleaching textile fabrics. Jan. 16.

5409. C. L. Jackson and E. W. Hunt. Method of and means for scouring, bleaching, dyeing, mercerising, or otherwise treating piece goods in the open state. Jan. 9.

14,229. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Production of discharge effects on indigo-dyed silk and woollen goods. Dec. 28.

VII.—ACIDS, ALKALIS, and SALTS.

Applications.

23,207. W. Eschweiler and H. C. Woltereck. Process of producing hydrocyanic acid and cyanides. Dec. 19.

23,493. U. Alvisi. Improved process for chlorinating natural or artificial sulphides by means of free chlorine. Filed Dec. 22. Date applied for, June 11, 1900, being date of application in Italy.

23,678. W. P. Thompson.—From G. Flick, Germany. Improvements in the manufacture of nitrites. Complete Specification. Dec. 27.

23,781. E. W. Engels. Improved process for the production of carbonic oxide. Complete Specification. Dec. 29.

23,811. J. G. Lorrain.—From G. Thomson, United States. Improvements in or connected with the treatment of liquids containing copper and the like. Dec. 29.

23,859. H. J. Haddan.—From A. S. Ramage, United States. Process of obtaining ferro-ferric oxide. Complete Specification. Dec. 31.

1901.

121. R. Hodgson and A. Scroxton. A new or improved invention for the manufacture of broad or common salt by steam or the like. Jan. 2.

184. F. M. Spence, D. D. Spence, H. Spence, and T. J. I. Craig. Improvements in and connected with the manufacture of sodium bichromate. Complete Specification. Jan. 3.

230. A. Cerasoli. Improvements in or relating to the production of carbon dioxide. Jan. 3.

276. G. M. Vis. Improvements in the purification of brine. Jan. 4.

284. H. A. Frasch. Improved nickel salt, and process of making same. Complete Specification. Jan. 4.

524. J. W. Woodall and F. Windham. Improvements in or relating to carbide of calcium. Jan. 8.

601. P. L. Martin. Improvements relating to the manufacture of anhydrous caustic baryta. Jan. 9.

754. R. Wolffenstein. Improvements in the manufacture of peroxide preparations. Jan. 11.

Complete Specifications Accepted.

1899.

25,077. P. Pressneck. Manufacture of acetic acid. Dec. 28.

1900.

1763. J. Imray.—From E. Bronnert, M. Frémery, and J. Urban, Germany. Manufacture of cuprammonia solution. Dec. 28.

2089. G. E. Davis and A. R. Davis. Manufacture of chloride of zinc and chloride carbonate of lead from mixed sulphide ores containing lead and zinc. Dec. 28.

2146. J. Dewrance and J. H. Paul, of the Albion Chemical Company. Means applicable for use in the desulphurisation of sulphuretted hydrogen. Jan. 9.

19,432. H. J. Haddan.—From H. Wartenberg and A. M. Miller, United States. Art of manufacturing carbon. Dec. 31.

20,144. L. Kaufmann. Crystallisation of salts. Dec. 28.

VIII.—GLASS, POTTERY, and ENAMELS.

Applications.

23,520. S. Hill. Improvements in the manufacture of glass bottles by machinery, and apparatus therefor. Dec. 22.

23,577. C. H. Thompson and J. Wilkinson. Improved manufacture of glass plates suitable for facing walls and other like purposes. Dec. 24.

23,579. W. F. Stiel. Improvements in and relating to compressing moulds for manufacturing glass or enamel facing plates. Complete Specification. Dec. 24.

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23,580. W. F. Stiel. Improvements in glass or enamel facing plates, and process of manufacturing same. Complete Specification. Dec. 24.

23,652. G. V. Jameson, R. W. Papineau, and R. T. Hollis. A glaze or varnish for protecting the polish of metallic and other surfaces. Dec. 27.

23,879. G. von dem Borne and W. von Debschütz. Improvements in the manufacture of polychrome ornamented glazed or similar ceramic ware. Complete Specification. Dec. 31.

1901.

210. R. B. Ransford.—From Société Parisienne de Céramique, France. Improvements in ornamenting ceramic ware. Complete Specification. Jan. 3.

449. C. Billington and J. Newton. Novel or improved appliance or instrument for use in decorating ceramic ware. Jan. 8.

531. C. H. Thompson and J. Wilkinson. Improved manufacture of glass plates suitable for facing walls and other like purposes. Jan. 8.

579. F. M. David. An improvement in the manufacture of window glass. Jan. 9.

628. A. Gosling. Improvements in the production of multi-coloured slabs or tiles. Jan. 10.

643. R. J. Friswell and The British Uralite Company, Ltd. Improvements in the manufacture of refractory or semi-refractory materials. Jan. 10.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

338. C. Czerny and C. Schlimp. Kilns for firing ceramic ware and the like. Jan. 16.

3611. J. H. Storey and W. E. McCalla. Manufacture of plates or tablets of glass, metal, earthenware, porcelain, and like articles of similar substances for various purposes, and having a surface capable of adhering to plaster or cement. Dec. 28.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

APPLICATIONS.

23,040. C. Krause and A. Beddies. A process for the impregnation of wood and fibrous substances. Complete Specification. Dec. 17.

23,368. T. Bradley. Improvements in the manufacture of coloured bricks, terra cotta blocks, tiles, and the like. Dec. 21.

23,375. J. Fielding. Improvements in apparatus for making concrete flags or blocks. Dec. 21.

23,572. H. C. Webb and A. A. Webb. Improvements in the production of inlaid ornamental tiles, bricks, blocks, slabs, and such like formed or plastic or mouldable substances, such as clay, and in the manufacture of certain kinds of such tiles, bricks, and slabs without inlays. Dec. 24.

23,574. E. H. Stein. *See* Class I.

23,718. W. W. Hewitt. An improvement in cement kilns and drying chambers. Dec. 28.

23,734. W. P. Thompson.—From P. J. Moran, United States. Improvements in street paving. Dec. 28.

23,851. C. Diesler. Improvements in the manufacture of cement. Dec. 31.

1901.

457. A. G. Brookes. From C. Hörisch, Germany. A new or improved process for hardening artificial stone or the like. Jan. 8.

651. L. A. Garchey. Improvements in the manufacture of glass stone and in articles made therefrom. Jan. 10.

801. J. S. Rigby. An improved kiln for the manufacture of Portland cement or lime. Jan. 12.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

791. H. Schurholz. Process for the production of artificial stones. Jan. 16.

2740. A. W. Green. Construction of fireproof floors and roofs. Dec. 22.

3262. H. H. Lake.—From American Wood Fire-Proofing Co., Ltd., United States. Treatment of wood and other combustible substances to render them fireproof, and for other purposes. Dec. 28.

21,913. A. Clemens. Presses for manufacturing facing bricks. Jan. 9.

22,015. O. Imray.—From C. F. Buente, United States. Fire-proof floors. Jan. 9.

X.—METALLURGY, MINING, ETC.

APPLICATIONS.

22,997. J. Bedford. Improved method or process for annealing self-hard steel. Dec. 17.

23,046. The Société Internationale des Usines et Fonderies d'Aluminium (Société Anonyme). A process for uniting aluminium and steel or iron. Complete Specification. Filed Dec. 17. Date applied for June 20, 1900, being date of application in Belgium.

23,303. E. H. Hopkins. Improvements in the distillation of zinc and other volatile metals. Dec. 20.

23,315. A. Reynolds. Improvements in converters. Dec. 20.

23,320. W. S. Rock. *See* Class II.

23,350. S. Cowper-Coles. Improvements in vanadium alloys. Dec. 21.

23,403. G. Huth.—From F. Pich, Germany. An improved flux for brazing. Complete Specification. Dec. 21.

23,418. The Mining Machinery Improvement Company, Ltd., and A. A. Lockwood. Improvements in extracting copper and other metals from ores. Dec. 21.

23,476. W. B. Middleton. An improvement in the treatment of zinc ores. Dec. 22.

23,477. A. J. Boult.—From E. C. Pohlé and S. Croasdale, United States. Improvements in processes for the reduction of refractory ores. Complete Specification. Dec. 22.

23,522. R. B. Ransford.—From L. W. Gans, Germany. Improvements in the manufacture of metal foil or leaf. Dec. 22.

23,652. G. V. Jameson, R. W. Papineau, and R. T. Hollis *See* Class VIII.

23,600. M. Seligsohn. A method or process of treating ores. Complete Specification. Dec. 27.

23,725. H. L. Herrenschmidt. Improvements in the treatment of nickel ores. Dec. 28.

23,803. J. E. Jasset and A. E. Cinqualbre. An improved process for depositing nickel and other metals upon metallic surfaces. Dec. 29.

1901.

12. S. E. Page.—From R. W. Davies and H. W. Hartman, United States. Improvements in and relating to apparatus for casting metal and other substances suitable for casting, especially casting iron into pigs. Complete Specification. Jan. 1.

318. D. Laird. An improved furnace for smelting ore for the recovery of metals. Jan. 5.

331. J. C. Butterfield. Improvements in or relating to obtaining antimony and separating gold from antimony ores. Jan. 5.

332. J. C. Butterfield. Improvements in or relating to the treatment of complex ores. Jan. 5.

374. J. Nicholas. Improvements in the recovery of metals from ores and other material, and in the plant employed therein. Jan. 7.

430. R. Langhans. Improved process of metallising with precious metals. Jan. 8.

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470. W. B. Middleton. An improvement in the treatment of zinciferous lead fumes (known as "sludge") and other zinc products as produced by the Ellershausen process. Jan. 8.

493. H. M. Taquet. Improvements relating to the treatment of zinc ores. Jan. 8.

510. W. J. Foster. An improved method of keeping cool the tuyeres of blast and like furnaces and forges, and of heating the air or blast used. Jan. 8.

778. W. S. Lockhart and The Automatic Gem and Gold-Separator Syndicate, Ltd. An improved apparatus for the concentration of ores, substances held in slimes, and the like. Jan. 11.

788. W. W. Slater and J. Galloway. Improvements in apparatus for the economical treatment of auriferous matters. Jan. 12.

Complete Specifications Accepted.

1900.

817. A. W. Tangye. Process of and apparatus for oxidising or roasting ores containing metallic sulphides, and for the production of gases suitable for the manufacture of sulphuric acid. Jan. 16.

1221. O. Imray.—From W. H. Rogers and J. A. Beaver, United States. Manufacture of tin-plate and apparatus therefor. Dec. 28.

1810. R. C. Baker. Obtainment of hardening and toughening compounds for alloying with steel and other metals. Jan. 16.

2089. G. E. Davis and A. R. Davis. *See* Class VII.

3421. A. James. Apparatus for precipitating gold and silver from their solutions. Dec. 28.

13,260. O. Imray.—From J. S. Hey, United States. Manufacture of tool steel and of tools therefrom. Jan. 9.

18,425. J. P. Roe. Process of puddling iron. Dec. 28.

19,863. R. W. James.—From J. H. Robertson, J. B. Campbell, and D. R. Case, United States. Process for coating fibrous material with metal. Jan. 16.

20,142. H. H. Lake.—From A. G. Betts, United States. Coating of aluminium or its alloys. Dec. 28.

XI.—ELECTRO-CHEMISTRY and ELECTRO-METALLURGY.

Applications.

23,106. C. A. Allison.—From The Waterbury Battery Company, United States. Improvements in galvanic batteries. Complete Specification. Dec. 18.

23,107. C. A. Allison.—From The Waterbury Battery Company, United States. Improvements in galvanic batteries. Complete Specification. Dec. 18.

23,309. The British Power Traction and Lighting Company, Ltd., and G. J. Gibbs. Improvements in electrical accumulators. Dec. 20.

23,310. The British Power Traction and Lighting Company, Ltd., and G. J. Gibbs. Improvements in electrical accumulators. Dec. 20.

23,314. J. MacTear. Improvements in electrolytic apparatus for production of chlorine and alkali. Dec. 20.

23,408. A. Pouteaux and A. Wolff. Improvements relating to electric accumulators. Dec. 21.

23,413. G. E. Vaughan.—From H. Koegel, Germany. Improvements in or connected with the electro-deposition of metals or metallic alloys. Dec. 21.

23,543. W. E. Ayrton and A. W. Fithian. Improvements in plates for secondary or storage cells. Dec. 24.

23,647. H. C. Harrison and J. Day. Improvements in the electrolytic deposition of metals. Dec. 27.

23,729. Baron H. F. d'Arnoult. Improvements relating to secondary batteries. Filed Dec. 28. Date applied for June 22, 1900, being date of application in France.

23,743. E. Tiquet. Improvements in battery cells. Complete Specification. Dec. 28.

1901.

56. H. C. Harrison. Improvements in the electrolytic deposition of metals. Jan. 1.

294. M. M. Bair. Improvements relating to galvanic cells or batteries. Jan. 4.

393. P. A. Newton.—From The National Electrolytic Company, United States. Improvements in electrolysis and apparatus therefor. Complete Specification. Jan. 7.

441. O. Lauckner.—From A. Vogelsang, Germany. Improvements in the electrolytic bleaching of cotton and other textile materials and in apparatus therefor. Jan. 8.

469. O. Behrend. Improvements in or connected with electrical batteries or accumulators. Jan. 8.

484. H. H. Lake.—From Globe Electric Company, United States. Improvements relating to secondary electric batteries. Complete Specification. Jan. 8.

612. R. Kennedy. Improvements in the manufacture of sulphate of ammonia from furnace gases and the like by electrolysis. Jan. 10.

624. M. Sutherland and E. Marcuson. Improvements in or relating to electric storage batteries. Jan. 10.

Complete Specifications Accepted.

1899.

22,830. S. Robinson.—From S. R. V. Robinson, United States. Primary batteries. Dec. 28.

1900.

2543. S. W. Maquay. Primary batteries. Dec. 31.

3524. W. P. Thompson.—From H. Becker, France. Features for the anodes in electrolytic apparatus. Jan. 9.

12,702. A. A. Riasse and J. J. A. Sengeisen. Accumulators. Dec. 28.

20,960. T. A. Edison. Reversible galvanic cells or so-called storage batteries. Jan. 16.

21,216. P. M. Justice.—From The International Acheson Graphite Company, United States. Method of graphitizing electrodes. Jan. 16.

XII.—FATS, OILS, and SOAP.

Applications.

23,804. A. Klumpp. Improvements in the manufacture of soap. Complete Specification. Dec. 29.

1901.

117. C. Weygang. Improvements in the treatment of oils and fats suitable for soap making. Jan. 2.

160. W. H. Power. Improvements in the manufacture of soaps. Jan. 2.

759. W. F. Haywood. Improvements in means or apparatus to be employed in the manufacture of soap. Jan. 11.

Complete Specifications Accepted.

1900.

1155. V. Camiz and A. Gobba. Apparatus for recovering oil. Jan. 9.

3363. P. Magnier, P. A. Brangier, and C. Tissier. Process for saponifying fatty substances and converting oleic acid into solid fatty acid. Jan. 16.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, Etc.

Applications.

23,603. A. J. Boult.—From P. C. Ralli, H. Mayer, and L. Toch, United States. Improved compound to be used as a substitute for gutta-percha. Complete Specification. Dec. 24.

23,909. T. H. L. Bake. Oxidised lead compounds. Dec. 31.

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1901.

50. C. O. Weber and A. Cairns. Improvements in compounded india-rubber. Jan. 1.

424. M. E. Melsom and G. H. Griffin. Improvements in or relating to the treatment of waste or scrap material manufactured from rubber and textile fabric or the like for reclaiming the rubber therefrom. Jan. 8.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

16,827. H. Lesser. Refined linseed-oil putty. Jan. 16.

17,475. C. A. R. Steenstrup. Manufacture of substances similar to india-rubber. Dec. 31.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

APPLICATION.

23,250. J. Wezel. Improvements in the preparation of a substitute for animal glue. Complete Specification. Dec. 19.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

1809. G. A. Clowes. Manufacture and treatment of leather. Dec. 28.

16,306. C. Schill and C. Seilacher. Apparatus for treating glue, gelatin, and the like. Jan. 9.

19,141. M. Dietrich and A. Langer. Production of blood albumen. Dec. 28.

21,467. R. Haddan.—From E. R. Edson, United States. Process of and apparatus for making gelatin. Dec. 31.

XV.—AGRICULTURE AND MANURES.

APPLICATION.

1901.

694. R. Hartleb. A method for producing cultures of bacteroids of micro-organisms of the leguminosæ and the permanent forms of such bacteroids and for inoculating seeds and soils with micro-organisms. Complete Specification. Jan. 10.

COMPLETE SPECIFICATION ACCEPTED.

1900.

19,574. J. Hughes. Basic superphosphate. Jan. 16.

XVI.—SUGARS, STARCHES, AND GUMS, ETC.

APPLICATIONS.

23,156. J. Robin-Langlois. Improvements in and relating to the refining of sugar. Dec. 18.

23,415. W. P. Thompson.—From H. C. P. Geerligs and K. R. Hamakers, Java. Improvements in the process of extracting sugar from beetroot-cane sugar, sorghum, and other plants. Dec. 21.

23,508. J. C. F. Lafeuille. Improvements in apparatus for the moulding and centrifugal treatment of sugar. Dec. 22.

COMPLETE SPECIFICATION ACCEPTED.

1900.

1804. C. Steffen. Process of utilising the vapours of factory plants, especially sugar factories. Jan. 16.

XVII.—BREWING, WINES, SPIRITS, ETC.

APPLICATIONS.

23,198. H. McPhail. Improvements in and relating to the treatment of pot-ales, wash liquors, sewage, and other aqueous waste or bye-products. Dec. 19.

23,634. E. S. Beaven. Improvements in the process of drying malt, hops, and other substances, and apparatus therefor. Dec. 27.

1901.

40. J. H. Brodrick. Improvements in compounds and processes for making home-made wines. Jan. 1.

377. A. Méyer. Improvements in vessels for mashing and fermenting purposes. Jan. 7.

735. J. Heaton. Improved sparger. Complete Specification. Jan. 11.

742. O. E. Nycander. Improvements in or connected with the manufacture of distillers' yeast. Jan. 11.

COMPLETE SPECIFICATION ACCEPTED.

1899.

25,418. M. P. Hatschek. Manufacture of bakers' yeast. Dec. 28.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

APPLICATIONS.

A.—Foods.

23,377. P. Mongiraud and H. Labranche. New or improved apparatus for the sterilisation and aseptic transfer or storage of milk. Dec. 21.

23,893. R. Hengstenberg. Improvements in the preservation and sterilisation of food products and other substances of all kinds. Complete Specification. Dec. 31.

1901.

647. A. Sauer. Process for producing a milk preservative affording a rich milk similar to mother's milk. Complete Specification. Jan. 10.

755. S. Székely and E. Kovács. An improved process for the separation of milk into casein and whey. Complete Specification. Jan. 11.

B.—Sanitation.

23,198. H. McPhail. *See* Class XVII.

23,412. D. Cameron, F. J. Commin, and A. J. Martin. Improvements in apparatus for purifying sewage and other liquids. Dec. 21.

23,765. W. Young and S. Glover. Improvements in methods and apparatus for the treatment of coal, town refuse, and similar substances, in producing heating gases therefrom, also by-products when desirable. Dec. 29.

1901.

30. G. D. Wild. Improvements in means or apparatus for use in the treatment of sewage and like liquid refuse. Jan. 1.

497. R. Orchard and C. E. Fox. Improvements in and relating to the purification or sterilisation of water. Jan. 8.

517. F. Candy. Improvements in the treatment of sewage and other polluted liquids, and in apparatus for use in connection therewith. Jan. 8.

607. C. N. Russell. Improved treatment and utilisation of house refuse. Jan. 9.

C.—Disinfectants.

1901.

508. A. Strandh. An improved disinfectant compound known as "Lettubrin." Jan. 8.

COMPLETE SPECIFICATIONS ACCEPTED.

B.—Sanitation.

1900.

3036. E. Springborn. Precipitation of sewage. Jan. 16.

5607. G. Green. Apparatus for filtering and purifying water. Jan. 16.

17,071. J. F. Lester and L. A. Dean. Furnaces for burning garbage, night-soil, and other refuse material. Dec. 28.

C.—Disinfectants.

19,569. R. P. Kuhn. Formaldehyde generators. Jan. 16.

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XIX.—PAPER, PASTEBOARD, Etc.

Applications.

23,379. D. N. Bertram and S. Milne. Improvements in and relating to strainers for treating pulp. Dec. 21.

23,636. G. Mitchell. *See* Class V.

23,716. R. W. Barker.—From H. G. Stripe, United States. Improvements in bordering note paper. Dec. 28.

1901.

249. F. Billing. Improvements in connection with the manufacture of paper. Jan. 4.

528. W. H. Caldwell. Improvements in the manufacture of paper pulp. Jan. 8.

536. L. Joseph. A supplementary process for the manufacture of waterproof and airtight paper impervious to fat and with glazed surface. Jan. 8.

630. L. H. A. von Giese. Process of and means for rendering non transparent or opaque paper temporarily transparent. Complete Specification. Jan. 10.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

Applications.

23,419. R. B. Ransford.—From L. Cassella and Co., Germany. *See* Class IV.

23,507. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of neutral soluble silver compounds. Dec. 22.

23,727. C. Moureu. Manufacture of useful products from heptine and octine. Dec. 28.

1901.

274. A. Zimmermann.—From The Chemische Fabrik auf Actien vormals E. Schering, Germany. The manufacture of ortho-oxycarbonic acids. Jan. 4.

526. G. W. Johnson.—From C. F. Boehringer und Soehne, Germany. Improvements in the manufacture or production of homologues of xanthin. Complete Specification. Jan. 8.

Complete Specification Accepted.

1900.

H. E. Newton.—From Farbenfabriken vormals ayer and Co., Germany. Manufacture or production chloro-carbonic ethers, and compounds therefrom. c. 28.

XXII.—EXPLOSIVES, MATCHES, Etc.

Applications.

23,064. J. Ramsden and W. R. Hirst. Improvements in matches. Dec. 17.

23,252. P. M. Justice.—From The International Smokeless Powder and Dynamite Company, United States. Improvements in smokeless powder in the process of manufacturing the same and in apparatus therefor. Complete Specification. Dec. 19.

23,414. J. von Romocki.—From W. Tettel, Germany. Improvements in the manufacture of lucifer matches. Dec. 21.

1901.

201. S. B. Earle. Improvements in or relating to explosives or explosive compounds. Jan. 3.

Complete Specifications Accepted.

1899.

23,853. F. A. Ludlow. Fog signals. Dec. 31.

1900.

214. A. C. Girard. Improvements in or relating to the manufacture of explosives. Jan. 9.

1323. F. Bale. Manufacture and production of matches, and in the substances and processes employed therein. Dec. 28.

XXIII.—ANALYTICAL CHEMISTRY.

Application.

23,737. J. Waring. Process of gaging high vacua. Filed Dec. 28. Date applied for June 4, 1900, being date of application in United States.

Complete Specifications Accepted.

1900.

618. J. Y. Johnson.—From The Chemische Fabrik vormals Goldenberg, Geromont and Co., Germany. Manufacture or production of materials with platinum surfaces for use as contact substance in chemical operations. Jan. 16.

4114. A. Denaeyer. Process for chemically agglomerating powdered materials. Jan. 9.

PATENT UNCLASSIFIABLE.

Complete Specification Accepted.

1900.

4676. M. Otto. Product obtained by the solution of ozone in petroleum. Jan. 9.

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