was 2 to 8 hours, and the rapidity of passage 1.43 to 2.50 cubic centimeters per second. It was demonstrated that cooling aids the absorption of benzol by paraffin oil.

36. Muspratt, —. Theoretische praktische Chemie. Aufl. 4, 1905, Bd. 8, pp. 17–50. Contains a chapter on light oil and its products that treats of manufacture, uses, and tests of benzol, toluol, and xylol. The distillation method of Kraemer and Spilker is described, and use of the Le Bel Henninger fractionating column. Boiling-point curves for mixtures of benzene hydrocarbons are included.

37. Norton, T. H. Dyestuffs for American textile and other industries. Bureau of Foreign and Domestic Commerce. Special Agents Series No. 96. 1915. 57 pp. A long report on the dyestuff situation in the United States in 1915. Outlines the coal-tar chemical industry, the German coal-tar dyestuff industry, processes of manufacture, products, consumers, etc. Diagrams illustrate the derivation of coal-tar colors from other coal-tar products.

38. O'Neil, J. G. Raw benzol from coke-oven gas. Prog. Age, vol. 29, Oct. 16, 1911, pp. 860–861. By American improvements, all the light oil and the heavier oil vapors can be obtained from coke-oven gas, free from traces of the absorbing oil. Ninety per cent of this raw benzol will distill over at 120° C., and contain every trace of the benzene oils in the coke-oven gas. The quality of the raw benzol, whether from coal of 19 or of 30 per cent volatile matter, does not vary much , but the yield varies. English practice is poor, as only 55 to 60 per cent of the raw product distills over at 120° C. Raw benzol works well as a motor fuel, and dissolves carbon in the combustion cylinders.

39. Porter, H. C. Coal-tar products and the possibility of increasing their manufacture in the United States, with a chapter by C. G. Storm on coal-tar products used in explosives. Tech. Paper 89, Bureau of Mines, 1915, 89 pp. Contains statistics on coal-tar by-product recovery in the United States, and briefly discusses various coal-tar products. In 1913 the United States produced 150,000,000 gallons of coal tar and 7,500,000 gallons of "gas benzol." More than 100,000,000 gallons of benzol might have been obtained from the coal made into coke and gas. A table showing the fractions of average coal tar and their uses is given.

40. Puning, Franz. Benzol and its recovery from coal gas. Gas Record, vol. 7, 1915, pp. 173–179. The average benzol recovery from American coals is 2 gallons per net ton. From 1,000 cubic feet of gas produced from average coal about 0.18 gallon of benzol can be recovered. Author discusses characteristics of benzol, uses of benzol, method of recovering benzol, light-oil recovery plant, apparatus of light-oil plant, crude benzol recovery plant, purification of the crude benzol, apparatus of purifying plant, and profits of a benzol plant. Properties of "Types of benzol," including boiling points, color, reactions with sulphuric acid, and specific gravity, are included.

41. ———. Benzol—how it is recovered from coal gas. Iron Trade Rev., vol. 53, 1913, pp. 625–632, 653. Describes work done abroad in recovering benzol and what can be done here. Charts show the profits to be derived, production in European countries, proportionate constituents of light oil, boiling points and relative amounts of pure benzol in distillates, boiling points and relative amounts of toluol. Details are given of operation of a light-oil recovery plant and of a benzol rectifying and purifying plant.

42. Rau, O. Ueber die Fortschritte in der Gewinnung der Nebenprodukte beim Kokereibetriebe. Stahl und Eisen, Jahrg. 30, Bd. 2, July 20, 1910, pp. 1235–1247, 1282–1297. Reviews development of by-product coking in Europe, but contains little on benzol.

43. Rollason, A., and Taylor, A. W. The production of motor spirit from coal. Coll. Guard., vol. 106, Sept. 16, 1913, pp. 577–578. Discusses low temperature (400°–500° C.) carbonization of coal in the presence of carbon dioxide. By this process the average yield of motor spirit per ton of coal is 18 gallons. Costs and profits are shown.

44. Rumber, —. Die wirtschaftliche Bedeutung der deutschen Benzolgewinnung, insbesondere für die Motorenindustrie. Bergbau, Jahrg. 26, 1913, pp. 689–691. Describes commercial benzol and the process of its recovery, economics of benzol production in Germany, and the use of benzol as a motor fuel. Curves show imports and exports, 1891 to 1912.

45. Runkel, —. Fortschritte auf dem Gebiete der Nebenproduktengewinnung. Glückauf, Jahrg. 48, Nov. 9, 1912, pp. 1833–1836. Gives a general key to the methods devised for tar recovery, washing, and purifying during 1911 and 1912. Analyses of several German coke-oven tars are included.

46. Sadler & Co. Manufacture of benzene compounds from the benzene of coal gas. Jour. Soc. Chem. Ind., vol. 4, Aug. 29, 1885, pp. 475–476. Sadler & Co. manufactured nitrobenzenes by Kendall's process, coal gas being superheated in red-hot retorts, to increase the amount of benzene, and passed into a sulphuric-nitric acid mixture. Reference is made to the processes of Leigh (1863) and of Caro (1869).

47. Say, Adrien. La fabrication du coke. Paris, 1912, pp. 169–198. Describes up-to-date methods of benzol recovery, rectification, and use. The methods of Mallet, Still, Peters, are given in detail with many illustrations.

48. Scheur, W. Gewinnung und Verwertung von Nebenerzeugnissen bei der Verwendung von Stein- und Braunkohle. Ann. Gewerbe u. Bauwesen, Glaser, Bd. 76, June 1, 15, 1915, pp. 209–223, 239–251. Little space given to benzol, but the production of coal-tar distillates in Germany for 1911, and imports and exports for 1912, are recorded. Discusses cost of a by-product plant, the cost of production of coal-tar products in general, and the economic side of the industry in Germany.

49. Schreiber, F. Fortschritte in der Destillationskokerei. Ztschr. angew. Chem., Jahrg., 25, Bd. 2, Nov. 8, 1912, pp. 2289–2296. Describes the method of recovery and the uses of benzol hydrocarbons. Discusses details of the washing towers, the distillation apparatus, the purification process, and the uses of these hydrocarbons. The light oil obtained contains 55 to 60 per cent of benzol, 11 per cent of toluol, 9 per cent of xylol, 6 per cent of solvent naphtha, 10 to 20 per cent of residue boiling over 180° C. The use of dry superheated steam in working up the light oil is important.

50. Schulz, R. Ueber Nebenproduktengewinnung aus Generatorgas. Stahl und Eisen, Jahrg. 33, Bd. 2, July 24, 1913, pp. 1221–1225. For large central plants the Mond process is most suitable, but not when the producer is close to the furnace. The recovery of ammonia and tar from Mond gas is greater than from other recovery processes. The recovery of tar and ammonia is profitable in most cases; it does not affect the calorific power of the gas, and purified gas is less likely to foul pipes and checkerwork.

51. Simmersbach, Oskar. Benzolfabrikation. Ztschr. Ver. deut. Ing., Bd. 54, Jan. 8, 1910, pp. 70–71; Jour. Gasbel., Jahrg. 54, June 17, 1911, pp. 581–582. Gives diagram of a benzol plant, and describes washing and rectification. Discusses production and price of benzol in Germany, 1900 to 1907.

52. Simon, H. Recent results and further development of the Simon-Carves coking process. Jour. Iron and Steel Inst., vol. 26, 1885, pt. 1, pp. 108–119. Recovery of benzol described. Preferable absorbent liquids are the heavy oils obtained by distilling tar. The scrubbers are upright cylinders, high in