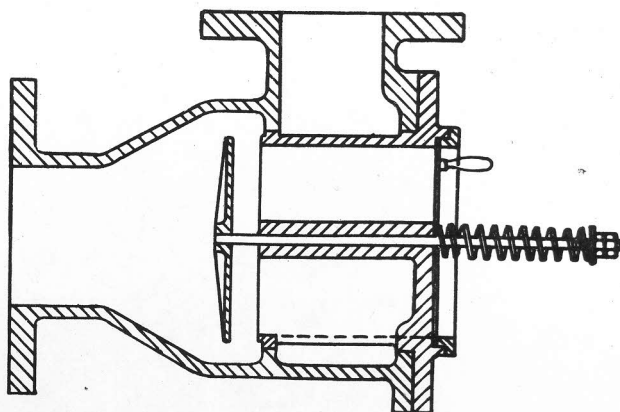
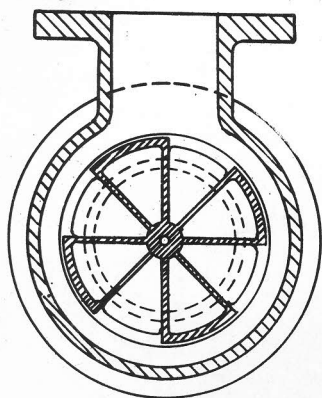
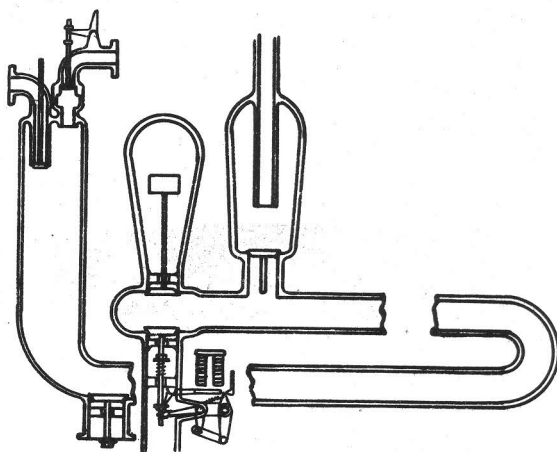
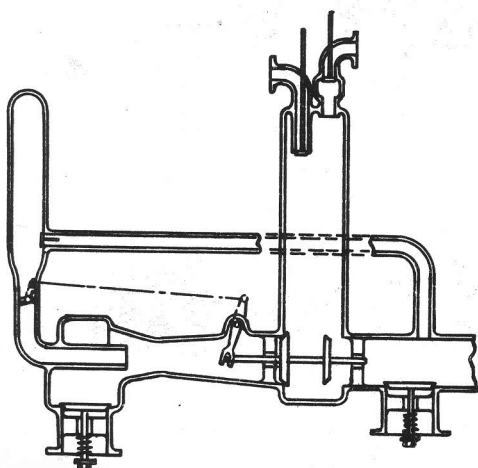


LIST OF THE PAPERS OF H.A.HUMPHREY
IN THE IMPERIAL COLLEGE ARCHIVES
compiled by Jeanne Pingree and Denis Smith



IMPERIAL COLLEGE
OF SCIENCE AND TECHNOLOGY
University of London

HERBERT ALFRED HUMPHREY
ACGI, FCGI, M Inst C E, M I Mech E, MIEE

List of his papers
in the Imperial College Archives
compiled by Jeanne Pingree
and Denis Smith, M Sc, M I Mech E



L. A. Humphrey

CONTENTS

Frontispiece: photograph of Herbert Alfred
Humphrey, reproduced from 'The Central',
vol. VI, 1909

Introduction	i
Abbreviations and symbols	ii
Herbert Alfred Humphrey: details of his career	iii
List of papers and drawings, etc., of Herbert Alfred Humphrey, A - X	1
Appendix: notebooks made while H. A. Humphrey was a student at the Finsbury and Central Technical Colleges	33
Index	34

INTRODUCTION

In 1885 H. A. Humphrey was one of the first students at the new Central Institution, now one of the constituent colleges of Imperial College. He was later one of the first Fellows of Imperial College. He retained his interest in his old college as a member of the 'Old Centralians', and contributed articles to 'The Central', the journal of the Old Students' Association. At some time in the early thirties, when it was decided to establish a Muniment Room at Imperial College, he must have presented his notebooks, made when a student. These are now in the archives.

Dr. J. Humphrey, FRS, gave the collection of his father's papers, listed here, to Imperial College in 1970. They fortunately survived the general destruction of his personal papers which H. A. Humphrey described in a letter to Professor Hutton, on 12 September 1948, from his new home in South Africa: " All my data and records, and the contents of box files occupying 36 feet of shelves, all my drawings and 100 volumes of my private diary, have been burnt in an incinerator. It took my gardener 3 weeks to do the job... So here I am, without any records..."

The papers were arranged in packets or folders. An alphabetic system of reference has been used to identify particular items in the present list.

Mr. Denis Smith, who is preparing a detailed study of Humphrey's work for the Newcomen Society, most kindly listed the engineering drawings, and has also provided much useful information.

Jeanne Pingree
College Archivist
January 1971

ABBREVIATIONS AND SYMBOLS

* An asterisk indicates that the material described is a carbon copy of a typewritten original.

B. A. & S. F.	Badische Anilin - und Soda Fabrik
C G L I	City and Guilds of London Institute
Proc. I.E.E.	Proceedings of the Institution of Electrical Engineers
Proc. I.M.E.	Proceedings of the Institute of Mechanical Engineers
F C G I	Fellowship of the City and Guilds of London Institute
* HAH	Herbert Alfred Humphrey

Herbert Alfred Humphrey: details of his career

- | | |
|-----------|---|
| 1868 | Born at Gospel Oak, London, on 2 December. |
| 1883 | Became a student in the Mechanical Engineering Department of the Finsbury Technical College. |
| 1885 | Became a student in the Civil and Mechanical Engineering Department of the Central Institution, later the City and Guilds College. |
| 1887 | Awarded the ACGI (Associateship of the City and Guilds Institute: the diploma of the Central Institution). |
| 1888 | Appointed as Manager of the Engine and Electrical Department at the Newton Heath Iron Works, near Manchester, of Heenan and Froude Ltd. |
| 1889 | Appointed, in addition to the above, as Manager of the Birmingham branch of Heenan and Froude. |
| 1891 | Appointed as Manager of the Refined Bicarbonate and Crystal Department, Messrs. Brunner, Mond, Northwich, Cheshire. |
| 1893 | Elected a Fellow of the City and Guilds of London Institute. |
| 1901 | Started practice as a consulting engineer. |
| 1906 | Patented the 'Humphrey Pump'. |
| 1909 - 10 | President of the 'Old Centralians'. |
| 1913 | Official opening of the Metropolitan Water Board installation of the pump at Chingford, by HM King George V. |
| 1914 | Work carried out for Admiralty; elected a member of the Royal Institution. |
| 1915 | Appointed a member of the Department of Explosives Supplies, Ministry of Munitions. |
| 1917 | Joined the Munitions Inventions Department of the Ministry. |
| 1919 | Director and Consulting Engineer to Synthetic Ammonia and Nitrates Limited (a subsidiary of Brunner, Mond) at Billingham. |
| 1926 | Consulting Engineer to Imperial Chemical Industries, until retirement, 1931. |
| 1928 - 29 | Construction of boiler and power plant at Billingham. |
| 1930 | Received the Paris Premium of the Institution of Electrical Engineers for joint paper on power plant at Billingham. |
| 1932 | Elected Fellow of Imperial College. |
| 1939 | Awarded Melchett medal of the Institute of Fuel. |
| 1945 | Retired to Hermanus, Cape Province, South Africa. |
| 1951 | Died in South Africa on 9 March. |

A

ALBUM, black half leather, containing mounted letters, etc. 43 x 32 cms.

- 1a PERRY, John. 28 July 1887. Technical College, Finsbury. Testimonial for HAH's work as student. 'almost the best student I have ever had'.
- 1b ARMSTRONG, Henry Edward. 5 December 1890. Central Institution, Exhibition Road. Testimonial for HAH's work as student at the Finsbury Technical College and Central Institution.
- 2a AYRTON, William Edward. 2 January 1890. Central Institution. Testimonial for HAH's work at the College.
- 2b PERRY, John. 9 July 1885. 10 Penywern Road, South Kensington. Letter of introduction for HAH.
- 3a UNWIN, William Cawthorne. 20 July 1887. 7 Palace Gate Mansions, Kensington. Testimonial for HAH's work at the Central Institution. 'In the examinations he has been placed first of all the students'.
- 3b From the same, to HAH. 8 February 1889. Congratulations on promotion. Advice in answer to an enquiry about a transmission dynamometer; recommends 'Emerson's power scale'.
- 4 List, in HAH's handwriting, of his complete examination results at the Finsbury Technical College and Central Institution Engineering Departments, 1884 - 1887, in which he always achieved first place.
- 5a MAGNUS, Sir Philip. 17 February 1886. Central Institution. The Committee of the City and Guilds of London Institute will remit HAH's fees at the Central Institution.
- 5b CITY AND GUILDS OF LONDON INSTITUTE. From A. L. Soper, Assistant Secretary. 2 January 1893. Gresham College, London, E.C. Notification that the Executive Committee of the Institute have recommended to the Council that Fellowship of the Institute be conferred on HAH. Typewritten.
- 6 From the same. 8 April 1893. Unofficial notification that the Council of the Institute will definitely confer the Fellowship on HAH. 'I may also add that you will stand as the first Fellow elected'. Typewritten.
- 7 The same. From Sir John Watney, Honorary Secretary. 18 April 1893. Official notification of election as Fellow of the Institute. Signed only.
- 8 HAMMERSLEY - HEENAN, 2 January 1891. Newton Heath Iron Works, Manchester. Expressions of regret at losing the services of HAH as manager of his Birmingham works 'which you have ably conducted for the past two years ... I have always felt that you would make a name for yourself in the engineering world'.

- 9 From the same. January 1891. Testimonial for HAH's four years' service with his firm, the first two being at the Manchester Works. Signed only
- 10a INSTITUTION OF MECHANICAL ENGINEERS. From the Secretary, Edgar Worthington. 3 October 1899. Storey's Gate, SW. Letter of introduction to 'Engineers in the United States'. Signed only.
- 10b INSTITUTION OF CIVIL ENGINEERS. From the Secretary, J.H.T. Tudsbery. 30 September 1899. Great George Street, SW. Letter of introduction for visit to the US. Typewritten.
- 11a - 11d Printed syllabi, etc., for lectures or papers by HAH on the steam engine, gas engine, etc., including paper read at the British Association meeting, Belfast, 1902. Printed
- 12a - 12b LIVERPOOL UNIVERSITY. Engineering Society. Session 1911 - 1912. Year card and invitation to lecture by HAH on 'Types of Humphrey Pumps' on 20 February 1912. Printed
- 12c - 12d Syllabi of courses of lectures at Bradford Engineering Society, 1911 - 1912, and the University of Manchester (n.d.) with lectures on the Pump by HAH. Printed.
- 13a INSTITUTION OF MECHANICAL ENGINEERS. Cambridge meeting, 1913. Detailed programme. Printed.
- 13b ROYAL INSTITUTION OF GREAT BRITAIN. Printed notice of lectures by HAH on Humphrey internal combustion pumps, 10 and 17 May 1913.
- 14a INSTITUTION OF MECHANICAL ENGINEERS. From the Secretary, Edgar Worthington, 27 March 1914. Hopes that HAH will be able to write a paper for the International Engineering Congress San Francisco, September 1915, where it is not necessary for the author of a paper to be present. Typewritten.
- 14b From the same. 30 March 1914. Is sure the organisers of the Congress will be pleased that HAH will prepare a paper on the 'Humphrey gas pump'. Typewritten.
- 14c INTERNATIONAL ENGINEERING CONGRESS. 1915. Member's card.
- 15 FINSBURY TECHNICAL COLLEGE. Magazine of the Old Students' Association. Vol.II, no.6. August 1913. Article on HAH, President of the Association. Printed. Portrait (frontispiece).
- 16a The same. 8th Annual Dinner, 1913. Menu. (HAH Chairman).
- 16c TENNANT, William John. 4 June 1913. Boulton Wade and Tennant, International Patent Agents, Hatton Garden, London, EC. Invitation to be President of the Association of Old Students of the FTC, 1913 - 1914. Typewritten. 2 ff.

B

' Selection for further insertions in HAH's album of records '. One packet.
27 items, including the following letters, etc:-

- 2 THRELFALL, Sir Richard. 11 November 1900. 259 Hagley Road, Birmingham. Arrangements to visit HAH to hear about engines with view to further purchases for his firm.
- 6 From the same. 18 October 1909. Church Road, Edgebaston. Congratulations on Professor Unwin's test of the pump. ' If you can get a fair plant output you should have the ball at your feet '.
- 7 CLERK, Sir Dugald. 20 October 1909. Lincoln's Inn Fields. Congratulations on Unwin's report on the pump. Typewritten.
- 9 CHATTERTON, Sir Alfred. 9 November 1909. 35 Mundania Road, London, SE. Acceptance of dinner invitation. ' I have got a copy of your paper ... I doubt if there has ever been a paper read at the Institution which opened out so entirely novel a field for mechanical engineers '. [See Proc. IME, 1909, pp.1075 - 1200].
- 10 ALLEN, Percy R. 30 November 1909. Ferncliffe, Runcorn, Cheshire. Comments on ' epoch making paper describing the Gas Pump '; interested in application of the principle to the production of motive power; enquiry about commercial production of the pump with view to purchase for his firm. 2 ff. Typewritten.
- 13 ROBINSON, Frank. August 1910. Parliament Chambers. ' Will make it my business to see that you get the biggest award they will agree to for yours is the British invention of the day '. [Probably referring to the awards at the Brussels Exhibition where the pump was exhibited; see infra, U 11].
- 15 23 November 1914. HAH to Winston S. Churchill, The Admiralty. Outlines suggestions for a one man torpedo. ' Although it also means certain destruction to the Torpedo and man as well as the Dreadnought, yet I would willingly be the first to put the idea into practice '. 2 ff. *
- 17 THE ADMIRALTY. 2 December 1914. Printed communication from W. Graham Greene, with thanks for HAH's proposals which the Admiralty are not prepared to adopt.
- 18 5 December 1914. Reply from HAH to above. Observes that the Germans are contemplating a machine on very similar lines to his and refers to entry in the ' Vossische Zeitung ' of 2 December.*
- 19 PALL MALL GAZETTE. 3 December 1914. Press cutting about a ' One man submarine ' which refers to the ' Vossische Zeitung '.

- 21 MOULTON, Lord. 4 July 1917. Ministry of Munitions. Appreciation of HAH's services to the Department of Explosives which he understands will soon terminate. [See infra G 85, 87]
- 22 BRUNNER, MOND and Co. Engineering Department. 1 August 1917. Northwich Letter from John [illegible] Appreciation of HAH's references to his share of work for the Ministry of Munitions; good wishes for success in work with the Munitions Inventions Board. Typewritten.
- 23 MINISTRY OF MUNITIONS, Munitions Inventions Department. 8 November 1917. Minute paper (for use in connection with File No. S 1777) from Colonel H.E. Gould-Adams, Comptroller of Munitions Inventions. Asks HAH, as an officer of the Department to undertake the preparation of plans for the layout and necessary constructional work for a projected cyanamide factory, for a possible period of twelve months, working in cooperation with Mr. J.H. Rider and Dr. Harker; no promise being made of further employment after the completion of this task. Typewritten.
- 24 10 November 1917. Reply from HAH to the above. Acceptance of the terms of the Minute, with the proviso that his present conditions of work, which involve occasional attendance at the meetings of the three companies of which he is a director, are continued. By this means he has been able to accept 'my present nominal salary'. *
- 25 MINISTRY OF MUNITIONS, Nitrogen Products Committee. Processes Sub-Committee. 15 March 1918. Minute paper for use in connection with File No. P 1336 from R.T.G. French, Secretary to the Committee. Forwards the thanks of the Sub-Committee for HAH's memorandum on the Häusser process, which 'offers the prospect of obtaining nitric acid at very low cost'. The Sub-Committee has recommended in its final report that estimates be made for plant of the smallest size sufficient to test this modified form of the process and, if these are favourable, trials are to be carried out by a 'company possessing a coke oven installation of the necessary capacity'. Typewritten. [See infra, H 44]
- 26 THE CATALYSTS. Dinner at the Florence Restaurant, 1 November 1918. Printed notice of the dinner, with list of members, who included Professor H.E. Armstrong, and an account of the dining club. 'It is believed that Professor Armstrong intended the word 'Catalyst' to mean a firebrand of a peaceful nature, who after his labours takes his rest in an inn. The learned Professor divides chemists into three classes, Analytic, Catalytic and Paralytic'.

C

Correspondence with Brunner, Mond and Co. I. One file. 36 items.

- 1 BRUNNER, MOND. Northwich. 16 December 1890. Letter to HAH from Gustav Jarmay, Managing Director, accepting HAH's application for the post of a departmental manager.
- 2 2 April 1897. Note from HAH to Jarmay. Formal application for permission to obtain figures, other than cost figures, for the projected study in his spare time of the ammonia soda process.
- 3 MOND, Ludwig. 28 February 1899. Via Sistina 64, Rome. Expresses agreement with HAH's application to Mr. Jarmay which has been forwarded to him; asks HAH to await his return to England and after consultation with colleagues. 'You may rest assured that I shall continue to do all I can to further your interests and to promote the progress of your career in the future as I have done in the past'.
- 4 14 June 1899. Notes by HAH of a meeting with Dr. Mond the previous evening, Mr. R. Mond being present. He accepted Dr. Mond's offer to make up his salary to the required level out of his own pocket, as remuneration for past and potential future services. 2 ff.
- 6 JARMAY, Gustav. 26 June 1915, Northwich. Covering letter for copies of a series of reports by F.A. Freeth. Typewritten.
- 6a - 23 FREETH, Francis Arthur. 14 to 21 June 1915. Carbon copies of typewritten reports on experiments with TNT; cooling by evaporation, washing, etc; note on the principles of recrystallisation, cooling, etc. 18 ff.
- 24 JARMAY, Gustav. 19 July 1916, Brunner, Mond, Northwich. Asks HAH to instruct that various qualities of crude TNT should be sent to facilitate washing processes. 2 ff. Typewritten.
- 26 GLENDINNING, Henry 9 August 1916, Winnington. Description of sketch of plant for converting calcium nitrate into ammonium nitrate. 3 ff. *
- 29 BRUNNER, MOND, Northwich. 23 March 1917. Covering letter from [signature illegible] and cost statements for phenol and ammonium nitrate for the month of January 1917. 3 ff. Typewritten.
- 33 5 November 1919. Typewritten messages to and from HAH about the death of Dr. Harold Cecil Greenwood and the possible need for a post mortem. *

D

Correspondence with Brunner, Mond and Co. II. One folder: Notes on the manufacture of calcium nitrate, by H. GLENDINNING, January 1916. 33 ff. 4 diagrams.

- 1 11 January 1916. Report on the manufacture of calcium nitrate as carried out at the works of the Ammonia Soda Company, Lostock. 10 pp. *
- 11 11 January 1916. Conference at Storey's Gate. Quantities and plant units for the manufacture of calcium nitrate at the Victoria Works of the Salt Union Ltd. Endorsed in pencil ' Copy sent to Mr. Malcolm, 11/1/16'. 2 ff. *
- 13 - 16 August 1916. Winnington. Further notes on calcium nitrate manufacture: Plumbley pans required, capacity of plant units, etc. *
- 17 Data: yields of calcium nitrate, sulphuric acid, etc.
- 18 20 January 1916. Winnington. Description of the process for the preparation of calcium nitrate from sodium nitrate and calcium chloride. 6 pp. *
- 24 24 January 1916. The calcium nitrate plant at the Ammonia Soda Works, Plumbley. From information supplied by Mr. Stanley Smith. 10 pp. *
- 34 10 January 1916. Plan; calcium nitrate plant at Plumbley. Diagram explaining process. Scale one sixteenth inch to one foot. 72.5 x 38 cms.
- 35 Date stamped 17 June 1916. Calcium nitrate manufacture. Table of volumes and weights of liquors, etc, ' Compiled from information supplied by Mr. Stanley Smith '. 74 x 61.5 cms.
- 36 Date stamped 17 June 1916. Plan, Victoria Works (diagram of calcium nitrate plant). Vertical scale, one eighth of an inch to one foot. 86.5 x 31 cms.
- 37 24 March 1916. Diagram: Victoria Works, Northwich. Vertical scale one eighth of an inch - one foot. 73 x 22 cms.

E

Correspondence at Imperial Chemical Industries, etc. One file. 39 items

- 1 ATMOSPHERIC NITROGEN CORPORATION. 6 August 1920, 110 Fulton Street, New York. Letter from the Chief Engineer [W.H. Krisken ?]. Information about a duplicating machine; congratulations on his election to the Board of Directors of Synthetic Ammonia and Nitrates Ltd. Typewritten.
- 2 POLLITT, George P. 29 August 1920. Petty Pool House, Sandiway, Cheshire. Asks HAH's considered opinion ' of the value to us today of whatever we could get from [an arrangement with] B. A. and S. F. ignoring the commercial agreement sales, etc , and thinking solely of the technical side ' and also what should be paid for the remainder of information from the firm, its current value, etc.
- 3 30 August 1920. Office copy of the reply to the above. Values information to be obtained from B. A. and S. F. at between £50,000 - £100,000; with stated reasons; information about mechanical grates on gas generators, CO converters, compressors, CO2 removal ammonia converter, gas circulation, etc. 5 ff. Typewritten. Endorsed ' I have read this letter and agree with the views expressed by Mr. Humphrey. A.V. Cowap '.
- 8 HARKER, J. A. 28 January 1921, Ministry of Munitions. Sends report on the cost of production of combined nitrogen in Germany compiled by Dr. Watts and asks for HAH's views on it. Advises that the official reply to an enquiry about the sufficiency of information at Billingham ' is undoubtedly to say you have not, and that you believe a mission to Merseburg would be really useful. I may tell you, for your private information, that the Premier's Conference in Paris is going to put the screw on with regard to getting further information if we feel so disposed. ' Typewritten.
- 9 29 January 1921. Office copy of the reply to the above, for Synthetic Ammonia and Nitrates Ltd. Will delay considered reply to report; observations on output of the Merseburg and Oppau plant. 2 ff. Typewritten.
- 11 21 March 1921. Abstract of letter from the Chairman to HAH, on the scope of his position as Director, Consulting Engineer and member of the Executive Committee of the Company. Typewritten.
- 15 POLLITT, George P. 19 April 1923, 5 Cleveland Road, Ealing.

- Report on his health: 'I shall eventually be absolutely all right, there being no disease anywhere only toxicaemia'. 2 ff.
- 17 From the same. 14 March 1923. Has been forbidden any excitement whatever; arrangements for possible meeting. In pencil.
- 18 From the same. 16 May 1923. 4 Dorset Square. Regrets at not seeing HAH; health forbids any technical discussions. Glad that HAH is getting his engineering research men; 'these men should be, must be, highbrow, nothing else is any use'; gives further details of type of man required, of training similar to that of HAH; will be potential future chief engineers, etc. 'don't turn a man down because he wants a decent screw. It will pay us to give it to him'. In pencil.
- 19 7 July 1923. Office copy of letter from HAH to G. P. Pollitt. Has been charged with the care of GPP on his return; description of some photographs. 3 ff. Typewritten.
- 24 TRUMP, Edward N. 28 June 1924. Atmospheric Nitrogen Company, Syracuse, New York. Enquiry about depth of wells, etc. 2 ff. Typewritten.
- 27 28 February 1935. Departmental memorandum from HAH to G. P. Pollitt. Importance of knowledge of the costs of manufacture of sulphate of ammonia at Merseburg and Oppau; believes that Koebel and Adler should be asked to collect this data. Comments on the drop in the price of sulphate in Germany, and that country's present advantages in manufacture of synthetic ammonia. 2 ff. Typewritten.
- 29 2 June 1925. Billingham. Memorandum. Facts relating to the Billingham factory. 3 pp. Typewritten. An account of the government negotiations with Brunner, Mond and Co., which led to the purchase of the Billingham factory.
- 33 18 October 1926. Memorandum from HAH to all members of the Executive Committee. 'Colonel Pollitt has now taken charge of the Central Administration Offices of the Brunner, Mond and Company Group of Companies, and will shortly be residing in London. As a consequence he has asked me to carry on at Billingham in his place'. Synthetic Ammonia and Nitrates are to experiment to produce an alternative to the Bergius process; close cooperation required between the laboratory and engineering departments. Typewritten.
- 35 BRADLEY, F. 30 May 1939. Imperial Chemical Industries Limited, Patent Section, Millbank. Gives list of HAH's patents, 1925 - 1935. Typewritten.

- 36 MELCHETT, Lord. 31 March 1941. Imperial Chemical Industries House, Millbank. Sends copy of an article from 'US NEWS' on the development of the relations between government and industry in America, with brief comment. Typewritten.
- 37 2 April 1941. Copy of the reply to the above. Comments on trusts, proceedings against labour unions, remarks on present difficulties and financial success of the Mond Gas Company. 2 ff. *
- 38 COLES, S. 24 June 1946. Imperial Chemical Industries Ltd. Reminds HAH of his promise to present a bottle of whisky to the winner of the 'Shack Cup' for golf as long as he lived; details of the forthcoming competition and good wishes for a very long life. Typewritten.

F

Further papers relating to Brunner, Mond and Co. One file. 53 ff.

- 1 History of the works at Billingham and their subsequent development, with special reference to all matters relating to the supply of electric energy to those works. n.d. [1930 c.] 35 pp. Typescript draft, with emendations in pen and ink.

A detailed account of the establishment of the works, beginning with HAH's work at the Ministry of Munitions on the production of ammonium nitrate in 1915. He describes the scheme for a government factory for the production of synthetic ammonia, at Billingham, and the subsequent negotiations, when the scheme was turned down, for the purchase of the site and its buildings, etc., by Brunner, Mond; the formation of the company of Synthetic Ammonia and Nitrates Limited; details of the early agreement for 15,000 KW with the North Tees Power Company; the expansion of original production plans to include manufacture of methanol, acetic acid and the consequent erection of a power station for the firm; effects of the slump in trade, and the difficulties with the Power Company over the terms of the original agreement for the supply of power, which S.A. and N. interpreted to mean as referring to the manufacture of sulphate of ammonia only, disregarding power required by subsequent products, which were supplied by the private power station; whilst 'with the Power Company there is no question of what is just or equitable but instead the endeavour to interpret this working of the original agreement of 1919 as if it had been made today when all relevant circumstances have completely changed'.

- 36 HAH to the Directors of the South Staffordshire Mond Gas Company. 31 January 1940. Covering letter for memorandum which submits 'reasons why our capital expenses should be kept down to a minimum while the war lasts. They also outline a scheme for increasing the efficiency, capacity and security of our works which may become possible when the war is over'. *
- 37 Note on capital expenditure. January 1940. Refers to imminent danger of enemy attack from the air, and need to husband resources; need to eliminate consumption of gas which at present prices is uneconomic; need to calculate expenses of installations for generation of electricity, etc., by 'raising steam at medium high pressure and passing it through steam turbines... and exhausting into mains at low pressure for air heating'. 2 ff. *
- 39 SOUTH STAFFORDSHIRE MOND GAS COMPANY. 1 February 1940. Letter from G.W. Dennis. Gives details of cash reserves, total capital expenditure, running cost of gas, details of gas driven plant, electricity generated and total stock and share capital, etc.; 3 ff. Typewritten.
- 42 The same. The Chairman's notes for the Technical Committee meeting on 27 February 1940. Observations on running costs, etc., of high pressure boiler which HAH suggested should replace gas engine. Signed by HAH, 28 February, and endorsed 'Suggestion of modified scheme for raising permissible boiler pressure'. 4 ff. Typewritten.
- 46 16 March 1940. 'S. S. M. G. Comment on Mr. Pinnock's notes'. Calculations roughly worked out on the cost of foundation of 'low press turbo-generator' etc.
- 47 22 May 1940. HAH to Mr. Pinnock. Recommends 'getting a quotation for a 350 or 400 KW turbo-generator', with detailed reasons. 2 ff., with another page of rough notes.
- 50 3 October 1943. 30 Frant Road. Tunbridge Wells. Letter from HAH to Professor R. S. Hutton. Comments on higher technical education, with observations on his own experience and the importance of a grasp of the financial affairs of a company.
- 51 12 September 1948. Chenies, Westcliff Road, Hermanus, Cape Province. To the same. Thanks for memoranda: 'you could not have guessed how completely I have cut myself off from my professional past'; description of the destruction of most of his personal records, etc., before leaving England for South Africa; observations on technical education; research an indispensable part of industry; detailed description of experience designing plant for the Synthetic Ammonia Company. 3 ff.

G

MINISTRY OF MUNITIONS. Department of Explosives Supplies. Memoranda, reports and some correspondence about HAH's work for the Department, 1915 - 1917. One file. 112 ff, 5 diagrams, including the following:

- 1 ' O B Meeting, 6 January 1915. Conclusions from Colonel Craig's report on 80/20 Amatol experiments '. 2 ff.
- 3 29 June 1915. ' Proposed method of treating crude TNT at Cheshire Central Station.' Memorandum. 2 ff. Typewritten.
- 5 22 July 1915. Minute sheet. Report to Lord Moulton on experiments with TNT. 3 pp. *
- 7 21 October 1915. ' Messrs. Brunner Mond and Co Ltd.' Endorsed ' Notes prepared at the request of Sir Alfred Mond by H. A. Humphrey'. A detailed account of the war work of the company and its freedom from German elements. 3 ff. Typewritten.
- 11a 9 December 1915. Memorandum to Lord Moulton on the concentration and supply of ammonia liquor in place of sulphate of ammonia. 2 ff. *
- 12 18 December 1915. Meeting of Ordnance Board. 2 ff. *
- 15 3 January 1916. Minute. High explosives trials on Messrs. Vickers range. Endorsed in pencil 'Altered'. A description of the shells required. Typewritten.
- 20 10 January 1916. Memorandum to Mr. Henriques on 'Supplies of Nitrate of Ammonia '.
- 23 11 January 1916. Memorandum. ' Difficulties encountered in the production of Nitrate of Ammonia by the Ammonia Soda process at Messrs. Brunner, Mond and Co's works'. 3 ff. Typewritten.
- 28 24 January 1916. Memorandum, reference RCF / MJ. ' Fuze graze no. 100, Mark 1. Failure of Amatol 80/20 in firing trials' 8 pp.
- 36 25 January 1916. Report of the Ordnance Committee held on 20 January 6 pp. *
- 44 FREETH, Francis Arthur. 19 February 1916. Letter on the manufacture of ammonium nitrate from ammonium sulphate and sodium nitrate; references to joint experiments with Cocksedge. 2 ff. Typewritten.
- 50 1 August 1916. Department of Explosives Supplies. Memorandum, stating HAH's responsibilities for all matters relating to the

- manufacture of ammonium nitrate and purification of TNT. *
- 51 14 August 1916. Progress report to Lord Moulton on the manufacture of ammonium nitrate at Lostock. 9 pp. *
- 59a FREEETH, Francis Arthur. 8 February 1917, Wheatsheaf Hotel, Sandbach. 'Thanks for your kind letter. Squeeze me and I will squeak, in other words, I, of course, will be only too glad to do anything I am told to do.'
- 62 13 June 1916. Minute to Mr. Henriques. Spirited defence of the Brunner, Mond company and its contribution to the war effort, in response to some slighting remark. Typewritten, with an MS note in reply by Mr Henriques regretting his words used in chaff.
- 64 August 1916. Copy. Record and origin of the work of the Ministry of Munitions by Heads of Departments, as required by Departmental Minute No. 18. Manufacture of ammonium nitrate. 9 pp. Typewritten.
- 75 30 August 1916. Memorandum. Manufacture of ammonium nitrate, ammonia soda process. 2 pp.
- 77 May 1917. Local administration. MS notes on the main and intermediary products and estimated capacity of a number of Government explosives factories, with notes on, management. 7 pp.
- 85 25 June 1917. Letter from HAH to Lord Moulton. He understands that Lord Moulton considers his work for the Department to be at an end; he had hoped to continue with this until the end of the war; recapitulates his contribution to the work of the Department, particularly his close association with the manufacture of ammonium nitrate and explains the difficulties of resuming his prewar work. *
- 87 28 June 1917. Lord Moulton to HAH. Thanks for HAH's services to the Department, which he understands will soon terminate. *
[For original letter, see supra B 21]
- 88 2 July 1917. Copy of a letter from Brunner, Mond to Sir Keith Price, Explosives Department, Ministry of Munitions, about the financial arrangements of HAH's secondment from the services of the company to work in the Department. *
- 92 Undated report on 'Drying fine pellated TNT received from Read Holliday in a gun cotton drying pan at Kynoch, Stanford-le-Grand, Essex'. 5 ff. *
- 97 Undated. 'Summary of ideas on mixtures of explosives used for

- cast charges ' Endorsed in pencil, ' Dr. Farmer. French visit ' 5 pp. *
- 102 French translation of the above.
- 108 Undated. Notes on the recovery of potassium nitrate from nitrate of soda. 3 pp. *
- 113 Calcium nitrate plant. Diagram explaining process. 10 January 1916. Scale One sixteenth of an inch - one foot. Signature illegible. Copy. 72.5 x 36 cms.
- 114 Calcium nitrate manufacture (Victoria works and Plumbley); ammonium nitrate manufacture from calcium nitrate (Lostock and Sandbach); ammonium nitrate manufacture direct from sodium nitrate (Lostock works). 3 diagrams on one sheet. August 1916. Same signature as (109). Copy. 77.5 x 22.5 cms.
- 115 H.M. Factory, Stratton. Layout plan. No. 2. Scale 300' - 1". n. d. 47.5 x 24 cms. Written on the back of the plan in HAH's handwriting: ' H. A. Humphrey (Technical Director of H.M. Explosives Supply Dept.) requested the Office of Works to erect the Swindon Works to the Designs of his Department. HAH chose the site & supervised the work. '

H

WAR SERVICE, 1914 - 1919. Three sets of reports. 126 items.

- 1 - 20 MUNRO, L. A. Purification of TNT. No. II. H M Rainham Works. June 1915. 18 pp. Typewritten. A note on the cover of the report says under the author's name ' Co-opted to HAH's staff '. It gives a detailed account of the crystallising process for the manufacture of TNT, descriptions of plant used, method of working, etc., with criticisms and suggestions for improvement. The cold washing process is also briefly dealt with.
- 21 - 25 Five diagrams: plan of the buildings, vessels used in crystallising, pipe connections, etc.

- 26 - 42 Folder. Marked ' Confidential '.
- 27 ' Present position of shells, gaines and fuses. Notes of interview with Colonel Craig at Lord Moulton's office. Dr. Farmer and the writer being present. 3 February 1916. 3 pp. Signed by HAH. *

- 30 - 36 Seven pencil and pen and ink diagrams of fuses, etc.
- 37 16 February 1917. Copy of Minute from J. Bryn, on the filling of shells, and official approval of various methods.
- 38 - 42 Five diagrams in pen and ink and pencil illustrating different methods of filling shells.

- 43 - 100 ' Hausser Process Final ' Folder.
- 44 HUMPHREY, H.A. N.P.C. Doc. No. 116. Munitions Inventions Department. Nitrogen Products Committee. An investigation of the possibilities of the Hausser process. February 1918. 40 pp. Duplicated. Typewritten. Marked ' Confidential '. [See above, B 25].
- 81 Appendix to Hausser. Doc. No. 116. 6 pp. *
- 87 - 99 Hausser process. Thirteen tables.

- 101 - 126 Envelope, endorsed ' Hausser Doc. No 116 ' in ink, and on the back in pencil ' Lent complete to Mr. R.T. Elworthy, Department of Mines, Ottawa. 15 Jan. 1926 ... '.
- 102 N.P.C. Doc. No. 116A. Memorandum on modified Hausser process outlined in N.P.C. Doc. No. 116, by G.S. Albright, MA. February 1918. 2 pp. Duplicated. Typewritten.
- 105 N.P.C. Doc. No. 116B. The possibilities of the Hausser process .. questions raised by Sir Richard Threlfall and answers by Mr. Humphrey. March 1918. 5 pp. Duplicated.
- 111 SCOTT, E. Kilburn. 14 May 1923. 38 Claremont Square, London. Letter, returning the MSS and all the drawings: ' your idea is very clever and it should have been tried ere this. It would have been in any other country... I am giving your idea a good boost in my printed Cantor lectures '.
- 112 5 April 1918. Appendix to Hausser Doc. No. 116, signed by HAH, with diagram dated 21 May 1918. 6 ff.
- 119 Combustion temperature. Notes and calculations on coke given gas and Mond gas. 8 ff.

K

WAR SERVICE, 1914 - 1919, 1938 - One packet. Correspondence, and printed papers relating to war service and inventions. 47 items, including the following:

- 1 - 5 Papers about service with the London National Guard, 1916; official credentials as war worker, etc.
- 6 - 9 Correspondence with the Town Clerk, Tunbridge Wells, 1939, about service as Deputy Controller, etc.
- 12 9. August 1939. Chenies, Frant Road, Tunbridge Wells. Letter to the Secretary, Offices of the Committee of Imperial Defence, about a scheme for placing sea mines by aeroplane. Copy.
- 14 27 August 1939. To the same: letter describing a scheme for the destruction of enemy aeroplanes flying in formation.
- 16 THE ADMIRALTY. 7 September 1939. Letter from the Secretary, with thanks for the letter dated 9 August, which has been referred to the Lords Commissioners; the idea is already known to the Department. Typewritten.
- 17 AIR MINISTRY. 11 September 1939. Thanks for the suggestions in letter dated 27 August, which had been forwarded to them, and which did not add to knowledge already existing in the Department. Typewritten.
- 19 26 November 1939. Letter to the Secretary to the Admiralty, describing a method of sweeping magnetic mines by electro-magnets towed by wooden boats. 2 ff. *
- 21 THE ADMIRALTY. Department of Scientific Research and Experiment. 31 January 1940. Letter from the Director of Scientific Research stating that the ideas described by HAH have already been received from various sources. Typewritten.
- 23 8 May 1940. Letter to the Director of Contracts, Air Ministry, enclosing a provisional specification for 'an invention which opens the way to the use of much larger guns in aeroplanes than has hitherto been possible. It removes the two difficulties of excessive weight and of recoil stresses...'
- 24 7 May 1940. Provisional specification: Improvements for guns in aeroplanes. 2 ff. *
- 26 12 October 1940. Chenies. Letter to Professor A.V. Hill, describing a scheme for tracing enemy aircraft with sound detectors with visible indicators. 2 ff. *

- 28 - 33 Correspondence about appointment as Regional Adviser on the Central Register of National Service, with the Ministry of Labour, and Institutions of Electrical and Mechanical Engineers, 1939 - 1940, mostly on pre-printed letters.
- 34 9 July 1944. Chenies Letter to the Secretary, Office of the Cabinet and Committee of Imperial Defence, describing a method of destroying flying bombs by cutting off the wings with metal knives hung from trapeze ropes attached to slow heavy aeroplanes. 2 ff. *
- 36, 37 Two pen and ink sketches illustrating this invention.
- 39 ' Trapeze carrying plane '. Pen and ink sketch.
- 40, 41 Robot destruction. Notes on velocities.
- 45 16 July 1944. Chenies. Further letter to the Secretary, Office of the Cabinet, with remarks on relative velocities, etc. 2 ff. *
- 47 HILL, Archibald Vivian. 25 July 1944. The Royal Society. Does not know people to whom HAH's suggestions can be put; emergency would probably be over by the time these devices were perfected; difficulties of interception of robots, etc.

L

Correspondence with professional institutions. One packet. 42 ff.

- 1 - 5 INSTITUTE OF FUEL. Correspondence and papers, 1938 - 1941. Includes two letters about HAH's obituary notice of Sir Robert Mond for the Journal of the Institute, 1938.
- 6 - 26 INSTITUTION OF CIVIL ENGINEERS. Correspondence, and various printed items, 1887 - 1913, including papers relating to HAH's election as a student member, 1887; associate member, 1894, when he was proposed by W. C. Unwin, and others; full membership, 1903; the award of the Telford medal and premium, 1897, and the Watts gold medal, 1913.
- 27, 28 INSTITUTION OF ELECTRICAL ENGINEERS. Letters of recommendation of HAH as a member of the Institution, 29 October 1898, signed by W. E. Ayrton, John Perry, Silvanus Thompson, etc., and a printed form of election to the Institution, 8 December 1898.
- 29 - 37 INSTITUTION OF MECHANICAL ENGINEERS. Correspondence, and some printed items, 1898 - 1906. It includes papers relating to HAH's election as a member, 1899, and the award

of the Willans prize, 1907 - 1908.

- 38 - 41 LONDON CHAMBER OF COMMERCE. Scheme for higher commercial education. Two posters and invitations for HAH's lecture on ' Producer gas and its relation to industry ' on 21 January 1903 at the Drapers' Hall, and a reprint of the lecture.
- 42 SOCIETY OF CHEMICAL INDUSTRY. 23 April 1896; letter from the Secretary, Charles G. Cresswell, on HAH's election as a member of the Society.

M

Miscellaneous papers and reports, including the following:

- 3 Compressors. Notes, fastened together, on 'Runcorn compressor, Billingham circulators, compressors general.' 6 ff.
- 5 Passport No. 95569, issued 26 May 1914. Printed.
- 6 Preliminary report on visit to United States of America, 9 April to 28 May 1927. 97 pp. Duplicated typescript, with printed cover. An account of visits to various power plants, etc., with sections on coke ovens, large gas engines, etc.
- 7 ' Visit to Ammoniawerk Merseburg, G.m.b.H., in connection with the World Power Conference at Berlin. Technical data given by Direktor Dr. Schneider, when addressing the visitors.' Leunawerk, 25 June 1930. 11 pp., with small photograph [aerial view of works ?] on first sheet. Typewritten. A brief account of the factory with descriptions of photographs (not attached).
- 8 'Leverkisen photo'. Large group photograph, 1930 c. 8 x 4 1/2".
- 9 ' The Association of Scientific and Technical Institutions. Dinner at Guildhall, London, on Thursday, November 13th, 1930. Honoured by the presence of His Royal Highness the Prince of Wales. Chairman: Sir Ernest Rutherford, OM, PRS '. Plan of seating arrangements. 24 pp. Printed.
- 10 - 14 Rough notes, and script [?] for a talk on ' Nature's building bricks ' and a small notebook of notes on S. Tolansky's ' Atomic physics '.
- 15 Royal Tunbridge Wells Civic Association. July 1945. Music in Tunbridge Wells. Report of past activities. 5 p. Printed. A letter of explanation by HAH is printed on the first page.

N

Miscellaneous correspondence. One packet. 40 ff. Including the following:

- 1 BRUNNER, Sir John Tomlinson. 13 July 1901. 9 Ennismore Gardens. Consents to the publication of HAH's name as Consulting Engineer to the Power Gas Corporation; thanks for valuable services in the past and best wishes for the future.
- 2 CITY AND GUILDS OF LONDON INSTITUTE. Central Institution. Final examination. First to third year marks.
- 3 The same. Letter from John Watney, Hon. Secretary, 26 March 1901, Gresham College. Thanks for donation to the Central Institution of two models of steam engines. Dictated.
- 4 [1897] Draft of letter from HAH to Professor W.E. Ayrton, on the value of his training in the various aspects of engineering at the Central Institution, with examples of its practical use in his career. ' I desire to prove that the College training, followed by close observation and the reading of current technical literature, will enable any student to copy with almost any work '.
- 6, 7 CITY AND GUILDS OF LONDON INSTITUTE, Central Technical College Old Students' Association. Menus for tenth and eleventh annual dinners, Balmoral Room, Trocadero Restaurant, 1909, 1910. Chairman: HAH.
- 8 The same. Menu for dinner to Professor W.C. Unwin, 10 February 1912, Criterion Restaurant.
- 9 FREETH, Francis Arthur. 18 August 1915, Winnington. Regrets delay in returning loan of five pounds; forecasts ' terrific success ' of the ammonia soda ammonium nitrate process ; 'chemically speaking it is absolutely right '.
- 11 - 35 IMPERIAL COLLEGE. Chemical Engineering Society. 2 March 1936. Inaugural address by HAH. 23 pp. MS. , with letter from Sir Henry Tizard, 2 March 1936, Imperial College: regrets that he cannot hear the address that evening; ' I know that everyone appreciates your action in becoming the first President '.
- 36 NICHOLSON, Sir John Gibb. 22 May 1944. Nobel House, Buckingham Gate. Thanks for news of HAH's family, information about his own. Typewritten.
- 37 PERRY, John. 3 May 1886. 10 Penywern Road, South Kensington. Glad that HAH appreciated the teaching at Finsbury Technical

College; expects great success from one or two of his old students.

- 39 POWER GAS CORPORATION. Letter from the Secretary, 14 June 1904, 39 Victoria Street. Letter of introduction for HAH to D. and W. Henderson Ltd., Glasgow. ' Mr. Humphrey is an authority on all questions of gas-firing '. Typewritten.

P

PATENTS. Collection of patent specifications, some letters patent, copies of drawings, etc. One box.

- 1 Patents. Numbers and dates. A folder containing the following items:
- 2 British cases. 18 September 1906 to 30 September 1911. Cases 1 - XXII. A list giving dates of applications, numbers, subjects, etc. 2 ff.
- 3 ' List of British, United States and German patent cases '. 18 September 1906 to 23 August 1913. Cases I - XXVIII.
- 4 ' Recent British applications '. 22 March 1910 to 2 June 1911.
- 5 - 44 English provisional and complete specifications, printed, unless otherwise described.
- 5 No. 347, 1895. Improvements in gas or oil motor engines.
- 6 Letters patent for above, 5 January 1895.
- 7 Letters patent, No. 21,720, 29 October 1901. Improvements in the purification of gases.
- 8 No. 22,131, 1901. Improvements in centrifugal apparatus for purifying gases.
- 9 Letters patent for above, 2 November 1901.
- 10 Abel and Imray, Chartered patent agents: Complete specification. Improvements in operating the valves of internal combustion engines. No. 20,468, 19 September 1902. Carbon copy of typescript. 5 ff.
- 11 No. 20,468, 1902. Printed version of the above.
- 12 - 15 Nos 20, 736, 1906; 18,595 and 19,341, 1907. Improvements in methods of raising and forcing liquids and in apparatus therefor. [Items 13-15 have a pencilled emendation: Cases I - III].

- 16 No. 22,646, 1907. Improvements relating to compressing air or gases and apparatus therefor. [Note in pencil: Case IV]
- 17 No. 25,638, 1907. Improvements in methods of raising or forcing liquids and in apparatus therefor. [Note in pencil: Case V]
- 18 No. 8,966, 1908. Improvements in and relating to ignition arrangements for internal combustion engines and other purposes. [Note in pencil: Case VI]
- 19 No. 12,565, 1908. Improved method of compressing air or gases and apparatus therefor. [Note in pencil: VII]
- 20 No. 7,152, 1910. Improvements in methods of raising or forcing liquids and in apparatus therefor. [Note in pencil: VIII]
- 21 No. 15,820, 1910. Improvements in methods of raising or forcing liquids and in apparatus therefor.
- 22 No. 1,241, 1911. Improvements in methods of compressing gases and utilising the expansive force thereof. [Note in pencil: Case XIII]
- 23 No. 11,527, 1911. Improvements in methods of raising or forcing liquids and apparatus therefor. [Note in pencil: Case XIII]
- 24 No. 11,817, 1911. Improvements in methods of raising or forcing liquids and compressing elastic fluids and in apparatus therefor. [Note in pencil: Case XV]
- 25 No. 11,818, 1911. Improvements in methods of raising or forcing liquids and in apparatus therefor. [Note in pencil: Cognate. Case XVI / XIX]
- 26 No. 12,055, 1911. Improvements in apparatus for raising or forcing liquids and compressing gases. [Note in pencil: Cognate Cases XVII / XVIII]
- 27 No. 18,464, 1911. Improvements in operating gear for internal combustion pumps and compressors.
- 28 No. 18,465, 1911. Improvements in methods of raising or forcing liquids or compressing gases and in apparatus therefor.
- 29 No. 21,609, 1911. Improvements in methods of and apparatus for raising or forcing liquids.
- 30 No. 28,187, 1911. Improvements in apparatus for pumping elastic fluids.
- 31 No. 28,187, 1911. Amended specification. [Note in pencil: Case XIXa]

- 32 No. 26,829, 1911. Improvements in raising or forcing liquids and in apparatus therefor. [Note in pencil: Case XXIV]
- 33 No. 15,585. 1912. Improvements in methods of and apparatus for raising or forcing liquids or compressing elastic fluids.
- 34 No. 23,173, 1912. Improvements in and relating to internal combustion engines. [Note in pencil: Case XXVII]
- 35 No. 8,890, 1915. Improvements in apparatus for raising or forcing liquids or elastic fluids. [Note in pencil: Case XXX]
- 36 No. 17,622, 1915. Improvements in valves for pumps for liquids. [Note in pencil: Case XXXIII]
- 37 No. 103,357, (1917). Improvements in valves for liquids or gases. [Note in pencil : Case XXXV]
- 38 No. 291,543 (1918). Improved process for the production of coke in shaped or briquette form and apparatus therefor.
- 39 Complete specification. No. 34,923 of 1929. Dated 15th November 1929. Improvements in or relating to apparatus for the transmission of power. Carbon copy of typescript. 11 ff.
- 40, 41 Covering letter from F. Bradley, Imperial Chemical House, Millbank, 8 March 1934, and set of copies of 12 drawings ' filed at the Patent Office in respect of your application, No. 16,891 / 33 '.
- 42 No. 412,407 (1934). Improvements in apparatus for extracting weeds, roots or the like from the ground.
- 43 No. 449,583 (1936). Improvements in apparatus for extracting weeds, roots or the like from the ground.
- 44 Patents form No. 3. No. 10,397. 1 May 1936. Complete specification (stamped). Improvements in corner joints for furniture or the like. 7 ff. 2 original drawings.
- 45 German letters patent, ' Patent - Urkunde No 150,218, 25 December 1902 ' corresponding to the English patent No. 20,468, 1902. With two additional sheets of drawings.
- 46 Covering letter from F. Bradley, Imperial Chemical Industries Limited, 25 September 1937, with the German letters patent, 650,117, 1934, and other papers corresponding to the English patent No. 412,407, 1934.
- 47 United States letters patent, No. 611,125, 1898, corresponding to the English patent No. 347, 1895.

- 48 United States Patent Office. Apparatus for purifying gas. Specification forming part of letters patent No. 709,772, 23 September 1902.
- 49 United States letters patent No. 737,932, 1903, corresponding to the English patent No. 22,131, 1901.
- 50 United States Patent Office. Method of raising or forcing liquid. Specification of letters patent. No. 1,037,009, 1912. [Endorsed on paper cover: Humphrey. 1st U.S.A. Patent]
- 51 United States Patent Office. Method of utilizing an expansive force. Specification of letters patent. No. 1,084,340, 1914. [Pencilled note on paper cover: ... Corresponding to English Patent No. 15,820 / 10. Case X ' Method ']
- 52 United States Patent Office. Apparatus for utilizing an expansive force. Specification of letters patent. No. 1,084,341. [Pencilled note on paper cover: ' Corresponding to English Patent No. 15,820 / 10 Case X ' Apparatus ']
- 53 United States Patent Office. Method of raising or forcing liquids. Specification of letters patent. No. 1,085, 1914. [Pencilled note on paper: ... Corresponding to English patent No. 19,341 / 07 Case III. ' Method ']

Some of the above patents were taken jointly with other persons or institutions as follows:

- 12 jointly with Alberto Cerasoli, 18 Avenue Road, Regent's Park.
- 14, 25, 27, with William Joseph Rusdell, 45, Waterloo Road, Wolverhampton.
- 28, 30 - 37
- 38 with Synthetic Ammonia and Nitrates Limited.
- 39 with Imperial Chemical Industries.

R

METROPOLITAN WATER BOARD. Various papers. One packet, 30 ff.

- 1 8 November 1909. Particulars of Pump. Endorsed 'Calculations for Water Board'. 3 ff. MS and typewriting. Two copies.
- 4 METROPOLITAN WATER BOARD. Reports of committees to be considered at a meeting of the Board to be held on Friday, 4th

November 1910. 29 pp. Printed. The report of the Works and Stores Committee (11 and 26 October 1910) recommended the installation of Humphrey Pumps at the Chingford Reservoir.

- 5 RUSDELL, William Joseph. 14 November 1910. 14, Bean Road, Dudley, Worcs. Letter on 'Water Board Calculations', with pen and ink sketch of scavenging water apparatus. 4 ff.
- 9 'Particulars of Water Board Pump (working on Dowson Gas)'. Endorsed 'For calculations see Book II, pp. 20 - 27. E. A. Allcutt' and in red ink 'B1'. 2 ff. MS.
28000-3
- 11 'Particulars of Water Board Pump (working on Dowson Gas) (30 ft. lift)'. Endorsed 'For calculations see Book II, pp. 28 35. E. A. Allcutt' and in red ink 'B1'. 2 ff. MS.
28000-4
- 13 9 May 1911. 'Pumps for Metropolitan Water Board (Chingford scheme). Water to be pumped 165.600 galls. per min.' Calculations. 1 ff. Two blueprints: Reference no. B30 ; B30.
18650-1 B 6800-1
- 16 12 February 1912. 'List of engineers whom the Pump and Power Company would be glad to see invited to the opening ceremony of the Chingford Pumping Station.' 3 ff. Typewritten.
- 19 12 February 1913. 'Particulars of Water Board Pump. Four stroke cycle type'. Endorsed in pencil 'May 9th 1911. For calculations see Book 23, p. 23. Reference no. B30'. Copy sent to E. Noack.
36800-1
- 21 'Particulars of small Water Board Pump. Four stroke cycle type'. 2 ff. Endorsed in pencil 'May 12, 1911. For calculations see Book 24, p. 6. Reference no. B30'.
18650-1

- 23 Invitation card to demonstration of the Pump, 17 March [1913].
- 24 Demonstration of Humphrey Pumps at Chingford, March 17th 1913. Printed programme.
- 25 Tests of Humphrey Pumps, King George V Reservoir, Enfield Lock, Middlesex. 3 ff. * Includes a summary of results.
- 28 3 July 1913. Tests of Humphrey Pumps at the King George Reservoir, Enfield Lock, Middlesex. Summary of results. 3 ff. *

S

ENGINEERING DRAWINGS. A list compiled by Denis Smith.

A collection of drawings, showing various pump schemes which were never built, with detailed arrangements of the only moving parts of the pump, namely the mixture-inlet, water-intake and exhaust valves.

Code used in the following descriptions:

- (a) Original: indian ink on cartridge paper.
- (b) The same, on tracing linen.
- (c) Copy: black and white.
- (d) Copy: blueprint.
- (i) Foolscap.
- (ii) Double foolscap (folded sheet).

- 1 Drawings 12 055 and 12 449. Figs. 1, 7 amd 8. (a i).
- 2 Drawing 1 241 / 11. Figs 1, 2 and 3. 2 ff. (a i, b i).
- 3 Drawing $\frac{431}{LO}$. Pump for deep suction; marked in pencil 'Siemens, Stafford'.
- 4 Drawing 15 820 $\frac{10}{10}$. Fig. 1. In pencil 'sheet I' (2 copies) (d ii and b ii).
- 5 Drawing 15 820 / 10. Fig. 2 (a i and b ii).
- 6 Drawing 15 820 / 10. Fig. 2 (2 copies) (d i and b ii).
- 7 Drawing 15 820. Fig. 3 (b i and d i).
- 8 Drawing 15 820 / 10. Fig. 4 (2 copies) (b ii and d ii).

- 9 Drawing 19 617 / 10. Figs. 1 and 2 (b i and c i).
- 10 Drawing 19 617 / 10. Figs. 3 and 4 (b i and c i).
- 11 Drawing 19 617 / 10. Fig. 5 (c i).
- 12 Drawing 19 617 / 10. Fig. 6 (c i and c i).
- 13 Drawing 19 617 / 10. Figs. 1 and 2 (c i).
- 14 Drawing 19 617 / 10. Figs. 3 and 4 (c i) pencilled note by HAH. Dated on back: 9 March 1911.
- 15 Drawing 19 617 / 10. Fig. 5 (b i and c i); original, not annotated.
- 16 Drawing 19 617 / 10. Fig. 6 (c i); numbered print.
- 17 Drawing 19 617 / 10. Figs. 3 and 4 (c i).
- 18 Drawing 19 617 / 10. Fig. 6 (a i).
- 19 Drawing 21 609 / 11. Figs. 1, 2, 3, 4, 5, 6, 7, 8, 9, and 14 (d i).
- 20 Drawing 21 609 / 11. Fig. 10 (d i).
- 21 Drawing 21 609 / 11. Figs. 11, 12, 13 and 15 (d i).
- 22 Drawing 21 609 / 11. (c i).
- 23 Drawing 21 609 / 11. (c i).
- 24 Drawing 21 849 / 10. Fig. 1 (c i); not annotated.
- 25 Drawing 21 849 / 10. Fig. 1 (c i); annotated.
- 26 Drawing 21 849 / 10. Fig. 1 (c i); pencilled note: 'add hinged valve'.
- 27 Drawing 21 849 / 10. Figs. 2 and 3 (c i).
- 28 Drawing 21 849 / 10. Fig. 4 (c i); not annotated.
- 29 Drawing 21 849 / 10. Fig. 5 (c i); annotated.
- 30 Drawing 21 849 / 10. Fig. 5 (c i).
- 31 Drawing 21 849 / 10. Fig. 6 (c i and b i); not annotated. Original with pencilled notes by HAH.
- 32 Drawing 21 849 / 10. Fig. 6 (c i); annotated.
- 33 Pump and horizontal water valve box. Marked 'superseded'. (c i).
- 34 Pump and horizontal water valve box. (c i).
- 35 Pump with vertical water valve box. (c i).

- 36 Twin barrel pump with varying play-pipe arrangements.
(b i and c i).
 - 37 Diaphragm valve arrangement and butterfly valve. (ai and
b i).
 - 38 Diaphragm valve arrangement and butterfly valve. (a i).
 - 39 Seven various pump arrangements. (ai and b i).
 - 40 Valve arrangements. (c i).
 - 41 Valve arrangement: marked sheet 3. Fig 3. Fig. 4 (c i).
 - 42 Triple barrel pump with horizontal water valve box.
Marked on back ' Return to Pump and P Co. ' and
signed ' H. A. Humphrey ... ' (a ii and b ii).
 - 43 Twin barrel pump. (b ii and c ii); not annotated.
Marked 'superseded'.
 - 44 Twin barrel pump (c i); annotated.
 - 45 (a i).
 - 46 Twin barrel pump with closed vessel (c i).
 - 47 Marked 'sheet 5'. Figs. 10, 11, 12, 13, 14, 16, 17, 19.
(c i).
 - 48 Triple barrel pump. Marked in pencil 'Fig. 4'. (c i).
 - 49 Pump with Y suction and hinge valve. (c i).
 - 50 Twin barrel pump 'Fig 17'. Marked in pencil on back:
'The Pump and Power Co.'. (c i).
 - 51 Twin barrel pump. (c i).
 - 52 Valve arrangements. (a i and b i).
 - 53 Submerged pump (similar to drawing No. 2) (a i).
 - 54 Hinge-valve pump with play-pipe arrangements. (c i).
 - 55 'Figs. 9, 10 and 11 '. (a i and b i).
 - 56 Pump / play-pipe arrangement (similar to fig. 3, 1909,
I. Mech. E. paper). (a i and b i).
- HUMPHREY 'S' SERIES OF DRAWINGS.
- 57 Pump and valve arrangements. Figs 1 to 10. Dated on back
21 April 11. (b i and c i) Ref: S K3
2

- 58 As 57 but dated on back 4 May 11. (c i). Ref: S K3 .
2
- 59 2 and 4 stroke cycle pump arrangements with forced scavenging. Figs. 1, 2 and 3. Dated on back Apr. 11. (d i). Ref: S K-9.
1
- 60 2 and 4 stroke pumps with forced inlet and scavenging. Figs 4, 5, 6 and 7. The Pump and Power Co. Ltd. Dated April 11. (d i). Ref: S K-9.
2
- 61 As 60 but dated 21 Feb. 11. (d i). Ref: S K-9.
2
- 62 As 60 and 61 but undated. (c i). Ref: S K-9.
2
- 63 Valve arrangements. Figs. 1 - 8. Dated on back May 11. (b i and d i). Ref: K-10.
1
- PATENT DRAWINGS.
- 64 U. S. Application No. 438427. Case 3. Dated June 22 1910. Stamped 'Abel A. Imray'. (d i).
- 65 American Patent. Fig. 1. Case 3. Dated June 22 1910. Stamped 'Pump and Power Co Ltd.' (c ii).
- 66 Pump arrangements. Figs. 1-7. Stamped 'Abel A. Imray'. (c ii).
- 67 Pump arrangements. Figs. 8-12. Stamped 'Abel A. Imray'. (c ii).
- 68 German Patent. Fig. I. Case I. (c i).
- 69 Crossdale's Case 428. Date July 17 1911. (b i and c i). Ref: 17B .
3
-
- 70 Titled in pencil 'still engine' (crankshaft engine). (b).
- 71 'Pilot Diagram' Siemens Schuckert two cycle blowers. (b i).
- 72 Siemens Schuckert design for Mixture Valve . (b i).
- 73 Siemens Schuckert two cycle pump. Dated Jan. 2 1912.

- 73 Ref: 'sheet 21'.
- 74 Twin barrel pump with valve arrangement. (b i). Ref: 7152/0.
- 75 'Revised Fig. 7' and 'Revised Fig. 8'. (b i).
- 76 Suction pump marked 'Addition to Fig 1. Case 409'. (b i).
- 77 Valve arrangement. (b i).
- 78 Marked 'Fig. 1, 2, 3, 4 and 5'. (b i).
- 79 Marked 'Fig. 6, 7, 8, 9 and 10'. (b i).

T

Projected installation of Humphrey pumps at El Mex, near Alexandria, Egypt.
Calculations, drawings, etc. One packet.

- 1 THE PUMP AND POWER COMPANY, 38 Victoria Street, SW.
24 July 1911. 'Calculations for Humphrey four stroke cycle
suction gas pump'. 22 ff. Pencil diagrams. *
- 23 HUMPHREY PUMP COMPANY. Dudley Port, Tipton, Staffs.
27 October 1913. Covering letter with copies for the London
office, of correspondence with Mr Noack, from W.J. Rusdell.
- 24 RUSDELL, William Joseph. 23 October 1913. Copy of letter to
W.G. Noack, c/o Brown Boveri, Switzerland. Calculations
for the El Mex installation; revision of previous figures. 4 ff. *
- 28 Further enclosures: 'Four stroke 'Humphrey' pumps for El
Mex'. (Calculations by Mr. W.G. Noack) Revised by the Humphrey
Pump Co. Ltd., from velocity curves direct'. 3 ff. *
- 31 Further enclosure: 'Comparison of El Mex calculations.
No K37/2'. Copy: blueprint.
- 32 Telegram, with cover, sent from Cairo Station to 'Gazonner,
London'. 'Interview Lord Kitchener satisfactory but business
complicated staying over Christmas'. (n.d.).
- 33 10 February 1914. Humphrey pump calculations. Description
of engineering drawings and further calculations. 13 ff. *
- 46 10 February 1914. Humphrey pump calculations. 4 ff. *
- 50 - 57 11 February 1914. Eight engineering drawings (copies:
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- 2 UNWIN, William Cawthorne. Report on the official test of the Humphrey Pump carried out ... at Dudley Port, Sept. 21st and 22nd, 1909. Brochure. 21 pp. Plan.
- 3, 4 French and German translations of the report by Professor Unwin.
- 5 ENGINEERING, 15 October 1909. The Humphrey Pump: an internal combustion water pump. Reprint. 8 pp.
- 6, 7 INSTITUTION OF MECHANICAL ENGINEERS. Printed notice, 4 November 1909, for HAH's paper ' An internal combustion pump, and other applications of a new principle ', and advance copy of the paper (50 pp.) which was read on 19 November 1909. See the Proc. IME, 1909, pp. 1075 - 1200, where the paper and the subsequent discussion meeting are printed in full.
- 8 ENGINEERING, 11 February 1910. The Humphrey gas - pump. Revised reprint. 4 pp.
- 9, 10 THE MANCHESTER ASSOCIATION OF ENGINEERS. Printed notice of meeting on 12 November 1910, and reprint of paper read on that date by HAH, ' Humphrey pumps and compressors '. pp. 85 - 156.
- 11 ALLEN, Percy R. Internal combustion engines at the Brussels Exposition. Reprinted from Cassier's Magazine, February and March, 1911. See pages 21 - 24 for an account of the Humphrey Pumps exhibited, with illustrations.
- 14 Description of the Humphrey Pump. An internal combustion water pump. The patent rights are held by the Pump and Power Company Limited ... Leaflet. 2 pp. n.d.

- 15 CAMBRIDGE UNIVERSITY ENGINEERING SOCIETY. Michaelmas term. 1913. Programme. (HAH spoke on ' The Humphrey Pump: its principles and applications ' on 18 October).
- 16 ENGINEERING, 14 February 1913. The Humphrey pumps at Chingford. Constructed from the designs of the Pump and Power Company Limited. London. Reprint, 4 pp.
- 17 THE ENGINEER, 14, 21 and 28 March 1913. Humphrey pumps at Chingford. Constructed from the designs of the Pump and Power Company Ltd. London. Reprint. 8 pp.
- 18 BIRKETT, H. de P. (of the Humphrey Pump Co., Ltd.) The Humphrey pumps at Chingford. A paper read .. before the Woolwich Polytechnic Engineering Society, November 6th, 1913. 16 pp.
- 19 INTERNAL COMBUSTION ENGINEERING. The journal of the industry. Vol. IV, no. 63, 14 January 1914. Test of Humphrey pumping plant, pp. 39 - 42.
- 21 ENGINEERING AND CONTRACTING, 27 January 1915. Irrigation by pumping at Del Rio, Texas. Detailed description of plant with special reference to design and operation of first large American Humphrey gas explosion pump. Reprint.
- 23 PRACTICAL ENGINEER, 15 February 1915. Humphrey gas pump for irrigation project. Operation and construction of pump and auxiliaries; high thermal efficiency, low initial and operating costs. By Alexander Potter and C. C. Trump.
- 22 ENGINEERING NEWS, 28 January 1915. The first large American Humphrey pump, by C. C. Trump, the Humphrey Gas Pump Company, Syracuse, NY. pp. 154 - 158. Reprint.
- 24 ENGINEERING NEWS, 15 March 1915. A Humphrey direct-acting explosion pump for irrigation service at Del Rio, Texas.
- 25 WONDERS OF LAND AND SEA, part 5. Kicking a river upstairs, by Ernest Bligh, pp. 207 - 210. Illustrated. Published by Cassell, n. d.

Reprints of other papers.

- 26 HUMPHREY, Herbert Alfred. Recent progress in large gas engines. Paper read before the Engineering Section of the British Association at Belfast, on September 11th, 1902. Partly reprinted from

- ' Engineering ', Bedford Press, 1902. 32 pp. Illustrated.
- 27 HUMPHREY, Herbert Alfred, and others. The steam and electric power plant of Imperial Chemical Industries, Ltd., at Billingham. (Paper first received 18th November, 1929, and in final form 29th January, 1930.) Institution of Electrical Engineers. Proof. 43 pp.
- 28 Discussion on ' The steam and electric power plant of Imperial Chemical Industries, Ltd., at Billingham.' The authors' reply to the discussions at London, Newcastle, Leeds, Manchester, Middlesbrough, Glasgow, Birmingham and Liverpool. Reprint from the Journal of the Institution of Electrical Engineers, vol. 69, no. 411, March 1931. pp. 419 - 426.
- 29 THE INSTITUTE OF FUEL. Presidential address by Sir Hugo Hirst, Bart., 19 October, 1932. Reprinted from the Journal of the Institute of Fuel, October 1932. Endorsed in ink ' This address was entirely written by HAH '.
- 30 HUMPHREY, Herbert Alfred. The Institute of Fuel. The history and development of Mond gas for industrial purposes in South Staffordshire. Uncorrected advance copy of a paper to be presented to the members of the Institute of Fuel ... on December 9, 1936. 12 pp.

X

Photographs and other material relating to the Humphrey Pump.

- 1 The Humphrey Pump Company Limited. Prospectus (proof), London, 1913. 3 pp. Printed.
- 2 The Humphrey Pump Company, Limited. Extracts from leading journals and technical papers. n.d. 5 pp. Printed.
- 3 Figures for No. 2 example of E type gas pump. n.d. 2 ff. Typewritten.
- 5 Album, 39 x 27, 5 cms. 57 mounted photographs of the Chingford installation of the pump machinery, buildings, etc. 1911 - 1913.
- 6 Collection of newscuttings on the opening of the Chingford installation, 15 March 1913.

- 7 Box of fifty photographic slides, 6.5 x 4.5 cms. , used to illustrate the lectures by HAH on the Humphrey Pump at the Royal Institution, 10 and 17 May 1913.
- 8 Eleven postcards, 14 x 9 cms. , of the Humphrey Pumps at the King George V Reservoir. [1913] Presented by Dr. Edith Humphrey.

ADDENDA

- X 9 TRUMP, C.C. Report on visit to Berlin at the experimental plant of Messrs . Siemens Schuckertwerke. 10 January 1912. 7pp. With three blueprints, pilot diagram, arrangement of two-cycle " Humphrey Pumpe: electric stearing", and Siemens-Schuckert design for mixture valve.
- X 10 List of Humphrey Pumps. 8 November 1912. 2 ff.*

APPENDIX

Student notebooks.

The following notebooks are in the archives; they were probably presented by H. A. Humphrey himself, at some date between 1933 - 1939.

FINSBURY TECHNICAL COLLEGE: notebooks made while a student, 1883 - 1885.

Mechanical engineering and applied mathematics. Three notebooks of lectures by Professor Perry, with the following dates:

10 October [1883], 5 December 1884, - June 1885. They include notes on gas engines, engine log book, etc.

Electrical engineering and applied physics. Two notebooks, one dated 10 October 1883. Lectures by Professor Ayrton on physics, electricity, etc. The undated volume contains a printed copy of the laboratory regulations of the Physical Department, pasted in, and much other printed matter; details of experiments, etc.

CENTRAL INSTITUTION, later CENTRAL TECHNICAL COLLEGE: notebooks made while a student, 1885 - 1887.

Lectures by Professor Ayrton on electricity and physics. 8 October 1885 - Physics laboratory. Notebooks of experimental work, etc. 22 October 1885.

Lectures on engineering by Professor Unwin, October 1885. The end of the notebook contains engineering examples.

Machine design, 9 October 1885. The end of the book contains notes on design of a rolling mill; - design of a turbine; - design of a bridge.

Lectures on the steam engine by Professor Unwin. 20 January 1887.

Experiments at the CGLI Central Institution. Boiler testing. Undated but one experiment is dated 1887.

Lectures by Professor Olaus Henrici, 1885 - 1886.

Mathematics, summer term, 1885. Unnamed but in HAH's hand.

INDEX

Abel and Imray: patent agents, P 10

Admiralty: correspondence about inventions, B 15 - 17, K 16, 19, 21

Air Ministry: correspondence on invention, K 17, 23

Albright, G.S.: memorandum on Hausser process, H 102

Allen, Percy R.: letter, B 10
article, U 11

amatol: experiments with, etc.
G

Ammonia Soda Company: manufacture of calcium nitrate at Lostock, D 1, G 51; and at Plumbley, D 24, 34, G 114

ammonia, synthetic, manufacture of: E

ammonium nitrate, manufacture of: G

Andrews, L, and Porter, R.:
article on pump, U 1

Armstrong, Henry Edward, 1848 - 1937: letter, A 1b; interpretation of 'Catalyst', B 26

Association of Scientific and Technical Institutions: dinner, 1930, M 9

Atmospheric Nitrogen Corporation:
letter from Chief Engineer, E 1;
letter from E.N. Trump, E 24

Ayrton, William Edward, 1847 - 1908, letters, etc, A 2a, L 27, N 4

Badische Anilin -und Soda Fabrik:
references to, E 2, 3, 8, 9, 27;

Merseburg Ammonia werk, M 7

Billingham, works at: history, E 29, E 8; F 1; paper on power plant, U 27

Birkett, H de P., article on pump, U 18

Bligh, Ernest: article on pump, U 25

Bradford Engineering Society: lecture by HAH, A 12c

Bradley, F. (ICI): letters, E 35, P 40, 41, 46

Brunner, Sir John Tomlinson, 1st Bart. 1842 - 1919: letter, N 1

Brunner, Mond and Company: correspondence with firm, C, E; manufacture of calcium nitrate, D; of nitrate of ammonia, G 23; secondment of HAH by, to Ministry of Munitions, G 88; war work of 1914 - 1919, G 7, 62

Cabinet, Offices of: correspondence about inventions, K 34 - 45

calcium nitrate, manufacture of: D, G

Cambridge University Engineering Society, U 15

Catalyst Club: notice of dinner, B 26

Central Institution: see under City and Guilds of London Institute

Cerasoli, Albert: joint patent with HAH, P12

Chatterton, Sir Alfred, 1866 - 1958; letter B 9

Chingford Reservoir: see Metropolitan Water Board

City and Guilds of London Institute: letters, A 5a, 5b, N 3; Central Institution: value of

training at, N 4; Old Students' Association dinners, N 6, 7 and 8

Clerk, Sir Dugald, 1854 - 1932: letter, B 7

Cocksedge, H.E.: experiments with F.A. Freeth, G 44

Coles, S.: letter, E 38

compressors, notes on: M 3

Cowap, A.V.: E 3

Craig, Colonel: G 1, H 27

Dennis, G.W.: letter, F 39

explosives, government manufacture of: TNT, at H.M. Rainham Works, H 1; layout plan of H.M. Factory, Stratton, G 115; output, etc., G 77

Farmer, Robert Cecil, 1877 -, references to, G 97; H 27

Finsbury Technical College Old Students' Association: dinner, A 16a; magazine, A 15; offer of presidency to HAH, A 16c

Freeth, Francis Arthur, 1884 - 1970: letters, G 44, 59a; N 9; reports by C 6a - 23

French, R.T.G.: letter, B 25

Germany: patents, P 45, 46

Glendinning, Henry, 1863 - 1938: memorandum, C 26

Gould - Adams, Col. Sir Henry E.: letter, B 23

Greenwood, Harold Cecil, d. 1919: death of, C 33

Hammersley - Heenan: letters, A 8, A 9

Harker, John Allen, 1870 - 1923:

letter, E 8; reference to, B 23

Hausser process: B 25, reports on, H 43

Henriques, Sir Philip Gutierrez, 1867 - 1950; memoranda to, G 20, 62

Hill, Archibald Vivian, 1886 - letters, K 26, 47

Humphrey, Herbert Alfred: award of FCGI, A 5b; examination results, A 4; engineering drawings, S; inventions: torpedo, etc., B 15 - 19, K; appointment to Brunner, Mond, C; work as Regional Adviser, K 28 - 33; patents, P; student notebooks, Appendix, p. 33; testimonials, A 1 - 3, 9

Humphrey Pump: lectures on, by HAH, A 12; articles on, U; Chingford installation of, R, X; projected Mex installation, T

Humphrey Pump Company Limited: prospectus, X 1 : list of pumps, X 9

Hutton, Robert Salmon, 1876 - 1970: letters to, from HAH, F 50, 51

Imperial Chemical Industries: correspondence, E; Billingham works, history of, F 1; HAH's joint patent with, P 39; power plant, U 27, 28

Imperial College Chemical Engineering Society: inaugural address by HAH, N 11

Institute of Fuel: correspondence with, L 1; papers read at, U 29, 30

Institution of Civil Engineers: letter, A 10b; election of HAH as member, etc., L 6 - 26

Institution of Electrical Engineers: election of HAH as member, L 27, 28

Institution of Mechanical Engineers: Cambridge meeting, 1913, A 13a; election of HAH, etc., L 29 - 37;

letters, A 10a, 13a, 14a, 14b
 International Engineering Congress, 1913: correspondence, A 14a - 14c
 Jarmay, Sir John Gustav, 1856 - 1944: letters, C 1, 2, 24
 Leverkusen (Bayer Works): photograph, M 8
 Liverpool University Engineering Society: lecture by HAH, 1912, A 12a, 12b
 London Chamber of Commerce: lecture by HAH, 1903, L 38 - 41
 London, City: National guard; war service of HAH with, K 1 - 5
 Magnus, Sir Philip, 1842 - 1933: letter, A 5a
 Manchester: the university: lecture by HAH, A 12d; Association of Engineers, paper, U 10
 Melchett, Lord: letter E 36
 Merseburg Ammoniawerk: M 7
 Metropolitan Water Board: papers on installation of Humphrey Pumps at Chingford, R; newscuttings, photographs, X
 Mex, El: projected installation of Humphrey Pumps at, papers, T
 Ministry of Munitions, Department of Explosives Supplies: memoranda and reports, G; Munitions Inventions Department, correspondence on cyanamide factory, B 23; Nitrogen Products Sub-Committee: letter on Hausser process, B 25; HAH's report on the process, H 44
 Mond, Dr. Ludwig, 1839 - 1909: letter, C 3; report of interview with, C 4
 Mond, Sir Alfred, 1st Baron Melchett, 1868 - 1930: letter, E 36
 Mond, Sir Robert Ludwig, 1867 - 1938: reference to HAH's obituary notice of, L 1
 Moulton, 1st Baron, Sir John Fletcher Moulton, 1844 - 1921: letters, B 21, G 85, 87; reports to, G 5, 11a
 Munro, L. A. : report on purification of TNT, H 1
 Nicholson, Sir John Gibb, 1879 - 1959: letter, N 36
 Noack, W.G. : R 19; letters to, T 23, 24; calculations by, T 28
 North Tees Power Company; agreement with Brunner, Mond, history of, F 1
 Oppau: see Badische Anilin -und Soda Fabrik
 Ordnance Board: G 1, 12, 36
 Patents taken out by HAH: P
 Patent drawings, S 64 - 69
 Perry, John, 1850 - 1920: letters, A 1a, 2 b; B 4; N 37; recommendation of HAH, L 27
 Pollitt, George Paton, 1878 - 1964: letters, E 2, 15, 17, 18; reference to, E 33
 potassium nitrate: recovery from sodium nitrate, G 108
 Potter, Alexander: joint article on Humphrey Pump, U 23

- Power Gas Corporation: letter, N 1, 39
- 'Practical Engineer': reprint, U 23
- Rider, J.H.: B 23
- Robinson, Frank: letter, B 13
- Royal Institution: lectures by HAH, A 13b, X 7; election of HAH as member, B 14
- Rusdell, William Joseph: letters, R 5, T 23, 24; joint patents with HAH, P 14, 25, 27, 28, 30 - 37
- Salt Union Limited, Victoria Works, Northwich: manufacture of calcium nitrate, D 11, 36, 37, G 114
- Schneider, Direktor, Ammoniawerk, Merseburg, M 7
- Scott, E., Kilburn: letter, H 111
- shells, methods of filling, H 37
- Smith, Stanley: D 24, 35
- Society of Chemical Industry: election of HAH, L 42
- Soper, A.L.: letters, A 5b, 6
- South Staffordshire Mond Gas Company: correspondence, F 36 - 47; paper on U 30
- Synthetic Ammonia and Nitrates Limited: formation of, F 1, 51; memorandum on experiments, E 33; HAH's designs for plant at, F 51. See also Imperial Chemical Industries
- Telford Medal, Institution of Civil Engineers: award to HAH, L 6
- Tennant, William John: letter, A 16c
- Thompson, Silvanus Phillips, 1851 - 1916
recommendation of HAH, L 27
- Threlfall, Sir Richard, 1861 - 1932: letters, B 2, 6; queries on Hausser process, H 105
- Tizard, Sir Henry, 1885 - 1959: letter, N 35
- Tolansky, Samuel: notes by HAH on 'Atomic physics', M 10
- TNT (trinitrotoluene): reports on experiments, C 6a - 23; G; manufacture of, H 1
- Trump, C.C.: articles by U, 22, 23; X 9
- Trump, Edward N.: letter, E 24
- Tunbridge Wells: Town Clerk; correspondence, K 6 - 9; Civic Association: report on musical activities, M 15
- United States of America: report of visit to power plants, by HAH, M 6; patents, P 47 - 53; Humphrey pumps, U 21 - 24; comments on labour, position of, E 37
- Unwin, William Cawthorne, 1838 - 1933: letters, A 3a, 3b; recommendation of HAH, L 6; menu for dinner for, N 8; printed reports of Humphrey Pump, U 2 - 4
- Vickers: high explosives trials, G 15
- Watney, Sir John: letter, A 7
- Watts medal, award to HAH, L 6
- Willans prize, award to HAH, L 29
- 'Wonders of land and sea': article on Humphrey Pump, U 25