

CONTEMPORARY SCIENTIFIC ARCHIVES CENTRE

Supported by the Royal Society and the Council of Engineering Institutions

Report on the papers of  
Professor Harold Heywood  
(1905-1971)

Compiled by: Jeannine Alton  
Harriot Weiskittel

Description of the collection

The papers were received from Dr. Frances Heywood (widow), who retains a small amount of personal material.

Heywood's collection of early microscopes was purchased for the Whipple Museum of the History of Science (address: Free School Lane, Cambridge) and is displayed there.

Heywood's two principal scientific interests: particle characterisation and solar energy, are both represented in the collection in Sections B, C and D. Mrs. Heywood's 'Reminiscences' (A.2) are also of interest in describing her husband's researches as well as their life together.

All items are manuscript unless otherwise indicated. Titles and descriptions in inverted commas are those which appear on the files or documents.

The help of Mr. J.D.L. Harrison of the Energy Technology Support Unit, Harwell, in identifying, selecting and describing the items in Section D, Solar Energy, is very gratefully acknowledged.

Summary of the career of Harold Heywood

|         |   |
|---------|---|
| 1905    | b. Manchester.  |
| 1910-19 | educated Alleyn's School, Dulwich.  |
| 1920-25 | Apprentice, Robey & Son, Lincoln.   |
| 1925    | Whitworth Scholarship.  |
| 1925-28 | City and Guilds College, Imperial College, London.  |
| 1929    | M.Sc., London.  |
| 1931-36 | Lecturer, Department of Mechanical Engineering, Regent Street Polytechnic, London.                |
| 1932    | Ph.D., London.  |
| 1936-57 | Department of Mechanical Engineering, Imperial College, London.<br>Lecturer 1936.<br>Reader 1940. |
| 1938-40 | Senior Research Officer, British Coal Utilisation Research Organisation.                          |
| 1946    | D.Sc., London.  |
| 1957-67 | Principal, Woolwich Polytechnic, London.  |
| 1967-71 | Loughborough University of Technology.<br>Senior Research Fellow 1967.<br>Professor 1968.         |

A full account of Heywood's career can be found in the biographical material in Section A.

Contents of the handlist

|    | <u>Items</u>                                      | <u>Pages</u> |    |
|----|---|--------------|----|
| A. | Biographical (including bibliographic)            | A.1-A.3      | 2  |
| B. | Notebooks   | B.1-B.36     | 2  |
| C. | Working papers on particles and pulverisation     | C.1-C.27     | 5  |
| D. | Working papers and correspondence on Solar Energy | D.1-D.68     | 8  |
| E. | Lectures and papers                               | E.1-E.9      | 14 |
| F. | Miscellaneous correspondence                      | F.1-F.4      | 15 |
| G. | Publications                                      | G.1-G.6      | 15 |
| H. | Index to principal correspondents                 |              | 16 |

A. Biographical (A.1-A.3)

- A.1. Misc. biographical notes, tributes and memorabilia; includes programme of Harold Heywood Memorial Symposium, held at Loughborough University of Technology 17-18 September 1973.
- A.2. 'Reminiscences' by Frances Heywood.
- A.3. Bibliographies of Heywood's publications.

B. Notebooks (B.1-B.36)

The early notebooks (B.1-B.6) cover Heywood's undergraduate career at Imperial College, and are dated. They contain careful notes, experiments, drawings and diagrams in colour.

The later research notebooks are carefully kept, with descriptions of the experiments, materials and results, but they are rarely dated. An approximate date has been given where possible from internal evidence of the work recorded in the books, or from loose papers, letters, etc. included with them.

- B.1. Imperial College notebook, signed, and dated 9.10.'25, 'Physics Lab. Notes'. Includes marked class exercises 1925-26.
- B.2. Imperial College notebook, signed, and labelled 'City & Guilds Electrical Lab.' with dated index of contents 1926-27; includes marked class exercises 1926-28.
- B.3. Imperial College notebook, signed, dated 1927, 'Hydraulics Lab.' with dated index of contents 1927-28; includes marked class exercises 1927-28.

- B.4. Imperial College notebook, signed, dated 1927 'Heat Engine Lab.' with dated index of contents 1927-28.
- B.5. Imperial College notebook, signed, dated 1927 'Materials Lab.' with dated index of contents 1927-28; includes marked class exercises.
- B.6. Imperial College notebook, signed, dated 1928, 'Heat Engines', with dated index of contents 1928.
- B.7. Notebook of experiments on types of coal and anthracite (by Heywood and another) described and numbered but not dated. Sieving analyses, Impact tests, etc. (perhaps done at Grimethorpe). 1929.
- B.8. Notebook dated 1932-1935, and titled 'Frequency Curves and Characteristic Curves of Sieved and Elutriated Fractions'; misc. experiments on compression, abrasion, impact, etc. on fuels. (Work done at Polytechnic, Regent Street, London.)
- B.9. Notebook titled 'Measurements of Sieved Particles'. n.d. but includes note of meeting to be chaired by Heywood 1932.
- B.10. Imperial College notebook, signed and titled 'Photo-Extinction. Book I. General Analyses'. n.d. but includes some pages of diary 1939 and 1940.
- B.11. Imperial College notebook, as above, 'Book 2', dated '1944 Jan.'.
- B.12. Imperial College notebook, as above, 'No.3', n.d. ?1945.
- B.13-B.16 Notebooks of work on dusts and sedimentation undertaken during Second World War (see also B.20-B.22, and C.17-C.21)
- B.13. 'Distribution Curve Data', n.d. (c) 1942 'Egyptian sands' and other work.
- B.14. 'Egyptian and Libyan sands' etc. (c) 1942.
- B.15. 'Mass Sedimentation', (c) 1944.
- B.16. 'D.T.D. Research Book II 1944 Nov.', Indian dusts, Arizona Dusts, etc.
- B.17-B.24 Imperial College notebooks, numbered, dated and usually bearing indication of contents on cover. (N.B. no.1 in sequence is missing.)
- B.17. 'No.2 1944' on Sieving.
- B.18. 'No.3 1944'. Drafts of papers on sieving; outline for book. Later note 'General paper outline worth reading for consideration 1968'.

- B.19. 'No.4 1944' on Shape Factors (of particles).
- B.20. 'No.5 1945'. Dusts and particles, related to B.16 above.
- B.21. 'No.6 1945'. Desert sands and air cleaners for Tanks.
- B.22. 'No.7 1946'. DTD Samples, Sphere packing (draft for paper).
- B.23. '1948-1949'. Misc. work on particles and densities.
- B.24. '1951'. Ditto (includes letter on copper powder analysis).
- B.25. Notebook 'Particle Size Analyses' 1949-54 (includes some correspondence on analyses undertaken by Heywood for industrial firms).
- B.26. Notebook, n.d., misc. particle analyses.
- B.27. Small notebook listing articles of interest to Heywood in technical journals, listed by month, year and vol.no. from c.1925.
- B.28-B.35 Travel diaries, kept during conferences, consultative travels abroad etc. Includes some personal and social matters as well as notes of discussions, visits to labs., papers heard, etc. Some loose papers are included, and some entries are in Mrs. Heywood's hand. B.28 refers to sedimentation, B.29-B.35 all to Solar Energy.
- B.28. 1956. ?In USA. Notes of discussions with colleagues, apparatus seen, etc.
- B.29. 1955. USA.
- B.30. 'Arizona Trip 1955'.
- B.31. 'Arizona 1955', notes of lectures given, discussion with colleagues.
- B.32. 'France 1956, 1958'.
- B.33. 'Egypt 1956'; see also D.42, D.48.
- B.34. 'Egypt 1956'.
- B.35. 'Malta 1957'; see also D.49.

C. Working papers on particles and pulverisation (C.1-C.27)

See also G.1, misc. reports on pulverisation and sieving, prepared by Heywood for Combustion Appliance-Makers' Association and British Coal Utilisation Research Organisation.

- C.1. Work on pulverisation of coals, at Grimethorpe Collieries, Barnsley, 1929-1930.  
Graphs and observations of Ball Mill tests on Barnsley Soft Coal. n.d. (c) 1929.
- C.2. Similar notes and observations, preceded by note on 'Research on the Mechanical Properties of Coal' outlining scheme of work.  
n.d. (c) 1929.
- C.3. Small notebook of pulverisation work at Grimethorpe, with notes and photographs, 1929-32, some dated.
- C.4. Similar, inscribed on cover 'Pulverised fuel plants, test results', (c) 1931.
- C.5. 5 Envelopes of photographs of pulverisation and impact tests on various coals.
- C.6. Bound volume, 'Researches on Pulverized Coal 1933-1936'.  
Contains typescripts of Heywood's published papers (beginning 1932), his contributions to discussion meetings, his replies to questions and discussions arising from his own papers, photographs, diagrams, etc., and press-cuttings or contributions by others (some loose pages).
- C.7. Spring-back folder (inscribed 'Researches on the production of pulverised coal') mainly relating to Heywood's 'Apparatus for measuring the fineness of powdered materials', exhibited at Physical Society Exhibition Jan. 1937, and his article 'Development of a centrifugal ball mill, 1941' (some loose papers).
- C.8. Ms. 'The Measurement of the fineness of grinding of pulverized fuels', 8pp., with diagrams and photograph. n.d. ?1938.
- C.9. Misc. patents, 1941 and 1944-45, for 'Photo-extinction sedimentometer', with specifications and related correspondence.
- C.10. Work on 'Explosive shattering of sandstone blocks', graphs, diagrams, description of experiments 1944, with some later notes dated 1968 (probably for book on particles which Heywood was hoping to write during retirement; see also C.26-27).
- C.11. Work on 'Various coals', misc. notes and diagrams, 1936 and other dates.

- C.12. Report on the calculation of the specific surface of sodium metasilicate pentahydrate crystals (carried out for Alcock (Peroxide) Ltd.), with related notes and correspondence 1959.
- C.13. Longer drafts for work on particles, some dated 1969.
- C.14. Misc. notes and graphs on particles, shape co-efficients, etc.
- C.15. Heywood's report on 'Development of Apparatus for Particle Size Measurement', work carried out at Imperial College for Ministry of Supply. 1946-47.
- C.16. Misc. notes and drafts on atmospheric dust, particle packing, sieves and sieving, etc., includes some published work or contributions to discussions by Heywood; various dates from 1927.
- C.17-C.21 Work on Desert Sands
- Much of this work was undertaken for the Ministry of Supply as a result of the problems caused by dust during military operations in desert warfare. Heywood analysed particle sizes in various sand and dust samples with reference to engine air-cleaners (see also B.13-B.16, B.20-B.22).
- C.17. Heywood's typescr. reports to Ministry of Supply on size analyses of sands and dusts 1942-1948, and Report 82 of Power Plant Branch, Dept. of Tank Design 1945, acknowledging his work.
- C.18. Copy of paper by Francis W. Oliver, FRS, 'Some remarks on desert dust storms' and Heywood's note in Nature 1942.
- C.19. Misc. printed papers on particles used by Heywood for his work.
- C.20. Misc. material on sands: photographs of tanks, map of Libyan desert showing sources of samples, misc. figures and diagrams.
- C.21. Misc. correspondence and reports to manufacturing firms on dust analyses: Coty 1943; Messrs. Vokes Ltd. 1943; Vauxhall Motors Ltd. 1943.
- C.22. Ms. of 'Filter Efficiency and Standardization of Test Dust' (Proc. Inst. Mech. Eng.) with correspondence, 1952.
- C.23. Institution of Chemical Engineers: Working Party on Comminution, 1969-71.  
Misc. papers, including Heywood's 'Proposed procedure for the graphical expression of sizing analyses', Oct. 1969, abstracts of his published papers and reports on Comminution; misc. addresses, including 'Communications and definitions in particle technology research', March 1969.

- C.24. Work on Lunar fines from Apollo 12 mission, 1971.  
Notebook of experiments, pages numbered 1-118 by Heywood.  
A reprint of Heywood's report 'Particle size and distribution for lunar fines sample 12057, 72' (Proc. Second Lunar Conference, 3, M.I.T. Press 1971) is included.
- C.25. Contribution to the discussion on 'A photographic study of fluid flow between banks of tubes' 1939, with misc. notes and graphs of various oils.
- C.26,C.27. Ms. and typescr. drafts for book on 'Particle Characterization', left incomplete at Heywood's death. Includes plan of book for submission to publisher, drafts of Sections B, C, D, and other notes. 2 folders.

D. Work on Solar Energy (D.1-D.68)

Heywood's research on Solar Energy began in 1946 (though see D.45), when he was at Imperial College, and continued during his years as Principal of Woolwich Polytechnic and his work in the Chemical Engineering Department of Loughborough University of Technology. He published many papers on the subject (see G.5), attended conferences and acted as adviser, notably to the Governments of Egypt (see D.48) and Malta (see D.49). The travel diaries B.29 - B.35 also refer.

The work is presented as follows:

D.1 - D.47 Working papers, methods and results.

D.48 - D.54 Conferences and Consultancies.

D.55 - D.68 Correspondence, selectively indexed.

D.1 - D.47 Working papers

D.1 - D.27 consist of working notes, observations, calculations, diagrams etc. chronologically presented as far as possible. The notes are, except when otherwise indicated, kept in London University students' examination answer books, which usually bear a brief description by Heywood of the contents; many of the books have additional loose pages of notes and diagrams interleaved. The work is entirely manuscript, and almost wholly in Heywood's hand.

|      |              |  |                    |
|------|--------------|--|--------------------|
| D.1  | (begun) 1946 | Tests on flat plate collectors                               |                    |
| D.2  | (begun) 1946 | " " " " " " "  |                    |
| D.3  |              | loose pages of misc. observations on absorption rates        | 1947, 1948, 1949   |
| D.4  |              | '1sq. ft. water-cooled absorber I'                           | 1947               |
| D.5  |              | '1sq. ft. water-cooled absorber II'                          | 1947               |
| D.6  |              | '10 sq. ft. absorber. General data'                          | 1948 - 53,<br>1959 |
| D.7  |              | '10 sq. ft. absorber. Output tests (1)'                      | 1948               |
| D.8  |              | ' " " " " " " " " " " (2)'                                   | 1948               |
| D.9  |              | '10 sq. ft. absorber. Daily absorption'                      | 1948               |
| D.10 |              | '10 sq. ft. absorber. Review of charts. Scheme for Kew data' | 1947, 1948         |

- D.11 'Abstracts' (notes on the literature) ? 1948
- D.12 Notes & diagrams, perhaps for publication, on heating rates with 1, 2 and 3 glass covers.
- D.13 'Kew Observatory': calculations of insolation periods 1948, 1949
- D.14 'General paper on Solar Energy', includes notes for 'Lecture to Radio Society 5th Dec.1949' c. 1949
- D.15 'Sun Hours 1949' 1949
- D.16 'Calculations of Solar Incidence' ? 1949
- D.17 Corresp. with D.Gabor and Lord Halsbury, including Heywood's 'memorandum on Utilization of Solar Energy' 12 Jan 1950, and other notes prepared by him: 1949 - '50  
'Memorandum on Solar Water Heaters'  
'Memorandum on the possibilities of direct utilization of Solar Energy'  
'Notes on the Constructional Features of the Solar Heat Absorber...Pat. no. 28966/50'
- D.18 '15 sq. ft. absorber. 1955,1957,1958,1959 Tests'
- D.19 'Solar Calculations. 1955 efforts'
- D.20 'Capacity Radiometer (Thermo-flask)' 1957
- D.21 'Solar Calculations 1958'
- D.22 'Solar Incidence Angles 1959'
- D.23 '1959 - 60 Kipp Solarimeter...at various attitudes I'
- D.24 '1960 Kipp Solarimeter...at various attitudes II'
- D.25 'Reduction of data on incidence at various angles. Aug.1960'
- D.26 'Reduction of data on incidence at various angles. Sept.1960'
- D.27 Misc. solarimeter calculations 1961 - 64
- D.28 Observations taken on the roof of Woolwich Polytechnic while Heywood was Principal. 1963
- Heywood used the standard 'System of Dates for Standard Declination Periods' and kept the daily observations for each period in individual envelopes labelled 1A...1B to 8A...8B. Each envelope contains the daily charts with Ms graphs and notes, and on the outside a note of the work recorded. The original observations extended 1961 - 64. The complete tally of 16 envelopes for the year 1963 is retained as a sample.

- D.29 - D.31 Books of graphs and calculations of work on Kew data. Heywood used these to assist him in his systematic analysis of the radiation climate at Kew. Examples from the same period 1961 - 63 have been retained wherever possible.
- D.29 'Hourly radiation values for  $E_h$ ,  $E_h/E_h^*$ ,  $D_h$  &  $D_h/E_h$ , Kew 1961 - 63. Periods 1 to 5'
- D.30 Ditto. Periods 6 to 8
- D.31 'Distributions and Means for  $E_h$ ,  $E_h/\bar{E}_h$  &  $D_h/E_h$  Whole-day basis. Kew data' 1961 - 64
- D.32 Envelope 'Kew Data 1961 - 63.  $D_h/E_h$  against  $E_h/E_h^*$  Daily basis' (tables of calculations prepared for Heywood but not all in his hand)
- D.33 Envelope ' $D_h/E_h$  and  $E_h/E_h^*$  on Hourly basis' (graphs and scatter diagrams 1961 - 62 - 63)
- D.34 Envelope 'Hourly values all conditions' (graphs and experimental measurements of solar energy intensity 1961 - 62)
- D.35 Calculations of altitudes and intensity factors for misc. selected declination periods 1961 - 63 (prepared for Heywood, with some notes in his hand)
- D.36 'Bright sun results on surfaces of different inclination': notes, graphs and calculations, with Heywood's note on 'Procedure for derivation of bright sun results' 1961 - 63
- D.37, D.37a, D.38, D.38a. 4 notebooks numbered Bks 1 - 4
- D.37 (Bk.1) has pages numbered 1 - 123, and Heywood's index of contents
- D.37a (Bk.2) 'Half-day totals...1962, 1963, 1964 (part), 1961 (part)'
- D.38 (Bk.3) 'Half-day totals...1961 (part)'
- "Heat recovered by Calorimeter' (work continues to July 1969)
- D.38a (Bk.4) Radiation measurements 1967 - 69
- D.39 large notebook of Solar Calorimeter readings 1959 - 61
- D.40 (enclosed with above) small notebook of design sketches and early measurements for solar calorimeter 1956
- D.41 Notebook of misc. observations: 'Sieving Experiments' and 'Calor Gas', but mainly 'Tests on horizontal trough collector 1968' 1968

- D.42 'Air Vapour distillation system': notes and graphs on the expected performance of a solar distillation unit incorporating a separate condensing tower. Work done under Heywood's direction but not all in his hand. Perhaps part of advisory work undertaken for Egyptian Government 1956, see D.48.
- D.43 List of corresponding members (? of Solar Energy Assn) 1955 - 59
- D.44 Misc. diagrams & drawings, including:  
  
Measurement of spectral transmittance of various glass samples, prepared for Heywood 1966  
  
Graph '97½ & 95 percentile values of total radiation on horizontal surface Kew 1961 - 63', drawn by Heywood  
  
Drawings & diagrams for publication, with photograph of inflated plastic concentrating collector, probably that designed by Dr. H.Tabor, 1961
- D.45 Drawings by Heywood of the position of the planets as seen from his house, March 1940, with various calculations and a note on 'Solar Radiation at high level e.g. Mount Wilson' (This is probably the earliest example of his interest in the the subject, on which he did not begin formal experiments until 1946)
- D.46 Misc. observations, calculations & working papers on Solar Energy.
- D.47 Misc. drafts & comments on some of Heywood's publications on Solar Energy.

D.48 - D.54 Conferences and Consultancies

- D.48 Heywood's visit to Cairo under auspices of UNESCO to advise on Solar Energy research, with particular reference to water distillation: includes corresp. with Imperial College re leave of absence, & copy of Heywood's Report to UNESCO Technical Assistance Department Aug.7, 1956  
  
(see also travel diaries B.33 and B.34, and D.42)
- D.49 Malta 1957 - 59 and 1964, (see also B.35), includes:  
Corresp. 1957 - 58, invitation from Government of Malta to advise on applied Solar Energy, programme of Heywood's visit, acceptance of his final Report;  
  
misc. information on insolation etc. obtained by Heywood 1957;  
  
copy of his 'Report on the Utilization of Solar Energy in Malta' 1957;

continued.....

- D.49 continued  
2 Memoranda by Heywood 'Simple Instruments for measuring Solar Radiation' and 'Construction of Solar water-heaters';  
Report on Solar Energy in Malta by P.C.Spensley 1959;  
Misc. notes on Solar Altitude in Malta 1964
- D.50 COMPLES (Coopération méditerranéenne pour l'énergie solaire) 1964 - 65  
Corresp. 1964 re Election of Heywood as Associate Member of COMPLES;  
programme of conference at Istanbul April 1965, with typescr. account of Heywood's research on Solar Radiation at Woolwich (11pp), a note of his contribution on 'Solar Radiation Calculations' given at Istanbul conference, with a letter from G.B.Bathurst on his Solar Energy projects.
- D.51 CENTO (Central Treaty Organisation) 1965 - 69  
Invitation to Heywood to present a paper at CENTO conference 1965  
Misc. Cttee papers on Solar Energy and Rural Power Supplies, submitted to Heywood for information by CENTO scientific secretary 1966 - 69
- D.52 - D.54 CSIRO (Commonwealth Sci. & Indust. Res. Organisation) 1965 - 70
- D.52 D.52 Corresp. with staff & officers at Highett, Victoria, Australia on research, exchange of data etc., & arrangements for Heywood to attend and speak at International Solar Energy Conference, Melbourne, 2 - 6 March 1970
- D.53 Drafts for papers presented by Heywood at Melbourne Conference 1970, incl. some earlier work used as background material;  
'Reports on Solar Radiation Research' May 1970, describing work done at CSIRO Mechanical Engineering Division March - April 1970;  
'Solar Energy, research and applications' (Heywood's report on the conference, 3pp.)  
Ms. of paper 'Operating Experiences with Solar Water-heaters', based on CSIRO work and given at conference of Institution of Heating and Insulating Engineers, Newcastle Co. Down 24 June 1970
- D.54 Comparative tables & diagrams of insolation at Woolwich (London), Highett and Mawson(Australia), Niamey (Nigeria) (material used by Heywood for papers presented at CSIRO conference)

continued.....

D.54 continued

Misc. tables & data on radiation prepared at Highett by D.Norris 1966, 1967, and sent by him to Heywood for comparative study.

D.55 - D.68 Correspondence on Solar Energy

The correspondence is presented chronologically, and is selectively indexed.

- D.55 H.C.Hottel, on flat-plate collectors, July 1946  
(Heywood was then beginning his formal investigations of solar heat absorbers)
- D.56 Misc. corresp. with firms and suppliers re equipment for Solar Energy, esp. for Malta 1957 - 58
- D.57 re sun drying of sisal 1958 - 59
- D.58 with Ministry of Supply re design of Solar Heaters 1958 - 59
- D.59 from Admiral Sir Reginald Plunkett-Erle-Drax re solar heated swimming pools 1959 -63
- D.60 With Ministry of Ag. Fish & Food re solar energy for hay drying 1960
- D.61 B.J.Brinkworth 1961  
Gunnar Pleijel 1961  
P.S.Westwood 1962
- D.62 John Yellott Engineering Associates Inc. Arizona 1963 - 64
- D.63 Ministry of Aviation, on solar heaters 1963
- D.64 Solar Energy Society 1964 - 67  
General corresp. re papers submitted to Heywood for reference or by him for publication in Solar Energy, meetings and conferences of the Society, Heywood's nomination as International Secretary for Great Britain (1965), arrangements for visits by Executive Secretary F.E.Edlin 1967
- D.65 Building Research Station (radiation calculations) 1964 - 65  
P.A.Sheppard 1964  
HMS Fisgard, Cornwall 1964
- D.66 Stephen R.Landor (Sierra Leone data) 1966  
B.J.Garnier 1966  
G.T.Ward 1966  
(in both these letters Heywood explains the bases of his radiation calculations)

D.66 continued

- re Heywood's lecture to Society of Engineers. 1966
- Misc. requests by Heywood for comparative data on solar radiation. 1966  
envelope 'Arizona Data', Yuma. 1967
- D.67. Reed Paper Group Ltd. 1968-70
- Misc. correspondence on feasibility studies on solar heating; projects carried out by G. Hassan under Heywood's direction, including reports on solar heating of outdoor swimming pool, and on hot water for touring caravan using a flat plate solar heat collector.
- D.68. Misc. shorter correspondence. 1957-69

E. Lectures and Papers (E.1-E.9)

- E.1. 'The Mechanical Testing of Materials', Ms. essay written while Heywood was an evening student at Lincoln Technical College, 1924. The cover bears a note, '2nd prize', by Mrs. Heywood.
- E.2. 'Some Modern Developments in the Mechanical Transmission of Power and Variable Gears', paper read by Heywood to the Engineering Society, City & Guilds College, February 1926.
- E.3. 'The effect of varying the spacing of a nest of copper tubes on the heat transfer therefrom', thesis submitted for M.Sc. Engineering, London. 1928-29.
- E.4. 'Flow of Oil and Pressure Drop in Pipes.'
- E.5. Texts of 3 lectures given at Royal Institution Feb-March 1952:  
(i) Occurrence and properties of particulate materials.  
(ii) Relative motion of particles and fluids.  
(iii) Industrial applications of particle technology.
- E.6. Ms. and typescr. notes for course of lectures on particle technology 1953 and 1956, and other teaching materials.
- E.7. 4 lectures given at Loughborough University of Technology, 1967-71.  
typescr.:  
(i) Size, shape and size distribution of particulate materials.  
(ii) Particle size measurement by microscope, and addendum.  
(iii) Particle size analysis by sieving.  
(iv) The graphical presentation of sizing analyses.

E.8. 'The Origins and Development of Particle Size Analysis',  
Plenary Lecture, Soc. Anal. Chem. Conference on  
Particle Size Analysis, Bradford, 1970.  
Printed text. Photographs for illustrations.

E.9. Ms. short talk on China Clay, given at St. Austell, n.d.

F. Correspondence (F.1-F.4)

F.1. Correspondence with Clarence Seyler (Public Analyst, Swansea)  
on coals. 1933-39

F.2. Misc. correspondence with individuals and firms re tests on  
dusts and powders carried out by Heywood, and his  
reports on them: includes 1945-57

|                                 |         |
|---------------------------------|---------|
| Rolls Royce Ltd.                | 1950    |
| De Haviland Propellers Ltd.     | 1950    |
| Davidson & Co. Ltd.             | 1950    |
| Bound Brook Bearings Ltd.       | 1951    |
| The Old Delabole Slate Co. Ltd. | 1951-57 |
| Visco Engineering Co. Ltd.      | 1954    |
| Aero Research Ltd.              | 1955    |
| Oslo Clay                       | 1952    |

F.3. National Research Development Corporation; misc. corres-  
pondence 1957-60 on patents; includes short corres-  
pondence with Lord Halsbury 1944 and 1958.

F.4. Report on article submitted for publication.

G. Reports and Publications (G.1-G.6)

G.1. 9 Reports prepared for CAMA (Combustion Appliance-  
Makers' Association). 1937-38

G.2. 6 Reports prepared for BCURC (British Coal Utilisation  
Research Council). 1939-40

G.3. 1 Report for Ministry of Supply. 1946-48  
(All these reports are on grinding and pulverisation.)

G.4. Set of Heywood's publications on Particle Characterisation.

G.5. Ditto, on Solar Energy.

G.6. Ditto, on Early Microscopes.

H. Index to principal correspondents

|  |      |
|--|------|
| Dunkle, R. V.  | D.52 |
| Edlin, Frank   | D.64 |
| Fleming, P. M.   | D.52 |
| Halsbury, John Anthony Hardinge<br>Giffard, Earl of      | F.3  |
| Morse, Roger   | D.52 |
| Norris, David J.   | D.52 |
| Perrot, M.   | D.50 |
| Plunkett-Ernle-Earle-Drax, Admiral<br>Sir Reginald A. R. | D.59 |
| Read, Walter R.  | D.52 |
| Selçuk, M. Kudret  | D.50 |
| Seyler, Clarence   | F.1  |
| Sheppard, Percival Albert                                | D.65 |
| Smith, M. L.   | D.50 |
| Yellott, John I.   | D.62 |