TRANSACTIONS

OF THE

BRIGHTON

Health Congress.

TRANSACTIONS

OF THE

BRIGHTON HEALTH CONGRESS.

1881.

PRESIDENT:

BENJAMIN WARD RICHARDSON,

M.D., LL.D., F.R.S.

WITH AUTHENTIC PORTRAITS, MAPS & ILLUSTRATIVE DIAGRAMS.

Issued on behalf of the Building Fund of the Brighton School of Science and Art.

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BRIGHTON:

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"BRIGHTON GUARDIAN" WORKS.

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PREFACE.

The circumstances under which the Brighton Health Congress was organised merit notice, as in that instance a method was adopted which may prove to be the commencement of a new era in the history of Congresses and Scientific Meetings.

Previous meetings have owed their origin to the initiation and patronage of some Metropolitan or Provincial Society, but this originated in Brighton itself at the first sitting of an Executive Committee, which had been appointed at a public meeting to carry out a projected Domestic, Sanitary, and Scientific Exhibition. With the object of assisting that movement, Dr. Richardson, F.R.S., who was then on a visit in Brighton, accepted an invitation to attend the committee for the purpose of suggesting what kind of addresses and papers could be appropriately included in the arrangements of the Exhibition, so that the contents of the Exhibition might be more thoroughly understood and Sanitary subjects better appreciated by the visitors. The hints thrown out by him for short discourses were thought by the Chairman (Mr Alderman Hallett) to be capable of a wider and more systematic arrangement in the form of a Congress.

Dr. Richardson consented to be President, and suggested that the meeting should be termed "The Brighton Health Congress." He also accepted the duty of taking such steps as were desirable for obtaining the names of Presidents of Sections, of Vice-Presidents of the Congress, and of contributions in the shape of papers.

The local arrangements for holding the Congress were undertaken by Mr Alderman Hallett, whose experience as Chairman of the Local Executive Committee for the Meeting of the British Association in Brighton, in 1872, had made him thoroughly conversant with the various requirements. The Town Council very readily entertained the proposition that such a Congress should be attempted, and granted the free use of the suites of rooms of the Royal Pavilion property for this purpose. They also invited Mr Alderman Hallett to accept the office of Mayor (which office he had held twice before), that nothing might be wanting to give weight and influence to the applications which would have to be made on behalf of the projected Congress.

The readiness with which so many distinguished men, including the Primate, the Speaker of the House of Commons, and other noblemen and gentlemen of position and influence in politics, science, and art, came forward to support the Congress, made the labour of organisation very much lighter than it would otherwise have been, and added greatly to the usefulness and effect of the effort. The acceptance of the Presidencies of Sections by Mr Edwin Chadwick, C.B., Mr J. R. Hollond, M.P.,—the Senior Member for Brighton,—and Dr. Alfred Carpenter, gave the meeting a completeness which left the Executive free from every doubt as to the success that was to be expected and which was ultimately attained.

The lists of Vice-Presidents and of Presidents of Sections show how successfully the President carried out his part of the undertaking, while the Presidential addresses and papers, which were delivered during the three days, together with the evening lectures, prove that the promoters, one and all, were justified, even beyond expectation, in their efforts to set an example of a great local meeting for the cause of the Science of Health.

THE

BRIGHTON HEALTH CONGRESS,

HELD IN THE

ROYAL PAVILION, DOME, & MUSEUM,

DECEMBER, 1881.

PRESIDENT OF THE CONGRESS:

B. W. RICHARDSON, M.D., LL.D., F.R.S.

PRESIDENTS OF SECTIONS:

A.—EDWIN CHADWICK, C.B.
B.—JOHN ROBERT HOLLOND, M.A., M.P.
C.—ALFRED CARPENTER, M.D., C.S.S.

VICE-PRESIDENTS:

His Grace the ARCHBISHOP OF CANTERBURY.
Right Hon. THE SPEAKER, G.C.B.
Right Hon. J. G. DODSON, M.P., President of the Local Government Board.
Right Hon. HENRY FAWCETT, M.P., Postmaster-General.
Right Hon. the LORD MAYOR OF LONDON.
Right Hon. the late LORD MAYOR OF YORK.
The Hon. the LORD PROVOST OF GLASGOW.

JAS. ASHBURY, D.L.
Colonel Sir W. W. BARTTELOT, Bart., M.P.
General BARTLETT,
Sir ANTONIO BRADY.
Sir THOS. BRASSEY, K.C.B., M.P.
Sir W. W. BURRELL, Bart., M.P., Prov. G.M. of Sussex.
Right Hon. Lord BRAYE.
Dr. BROWNING, S.S.C., Edin.
E. NORTH BUXTON, Chairman of the London School Board.
H. H. COLLINS, F.R.I.B.A.
ALFRED CARPENTER, M.D., C.S.S., Vice-President British Medical Association.
R. BRUDENELL CARTER, F.R.C.S.
EDWIN CHADWICK, C.B.
Right Hon. The EARL OF CHICHESTER, Lord Lieutenant of Sussex.
Major CHILDS.
Sir P. CUNLIFFE-OWEN, K.C.M.G., C.B., C.I.E.
Lord ALFRED CHURCHILL.
Sir HENRY COLE, K.C.B.
Sir WILLIAM COLLINS.
Professor CORFIELD, M.A., M.D. (Oxon), Professor of Hygeine, University College.
F. W. COSENS, F.S.A.
Alderman COTTON, M.P.
His Grace the DUKE OF DEVONSHIRE, K.G., P.C., LL.D., F.R.S.
Rev. JOSEPH R. DIGGLE, M.A.
Major ROBT. W. EDIS, F.S.A., F.R.I.B.A.
Rev. WYATT-EDGELL.
Sir HENRY FLETCHER, Bart., M.P.
Professor W. H. FLOWER, F.R.S., F.L.S., F.G.S., F.R.C.S., Professor of Comparative Anatomy and Conservator of the Museum of the Royal College of Surgeons.
WILFRID DE FONVIELLE, Redacteur en Chef de *L'Electricité*, Paris.
Captain DOUGLAS GALTON, C.B., F.R.S.
Professor GLADSTONE, F.R.S.
Sir JULIAN GOLDSMID, Bart.
G. B. GREGORY, M.P.
Major F. F. HALLETT, F.L.S
Sir JOHN HAWKSHAW, C.E., F.R.S., F.G.S., F.R.G.S.
F. J. S. HENTY, Secretary Health Department of the Social Science Association.
H. C. FLEEMING JENKIN, F.R.S., M.R.I.A., Professor of Civil Engineering, University of Edinburgh.
J. P. KNIGHT, General Manager L. B. and S. C. Railway.
S. LAING, M.P., Chairman L. B. and S. C. Railway.
G. I. LEON.
J. McMILLAN, Chairman of the Brighton Grand Aquarium.
Sir BENJAMIN PHILLIPS.
WM. TINDALL ROBERTSON, M.D.
Sir ALBERT SASSOON, C.S.I.
M. D. SCOTT, D.L., M.P.
JOHN H. SCOTT, Dep. Prov. G.M. of Sussex.
Right Hon. the EARL OF SHEFFIELD.
General CAMERON SHUTE, C.B.
Hon. LYULPH STANLEY, M.P.
HENRY C. STEPHENS, F.R.G.S., F.C.S.
G. J. SYMONS, F.R.S., President of the British Meteorological Society.
THOS. PRIDGIN TEALE, M.B., M.A., F.R.C.S.
J. W. TRIPE, M.D., President Society of Medical Officers of Health.
J. WESTLAKE, Q.C.
Sir CHARLES WHETHAM.
Rev. Canon ERNEST WILBERFORCE, M.A.
EDMUND YATES.

Alderman W. H. HALLETT, F.L.S., Mayor of Brighton.
(*Chairman of the Executive Committee*).
Alderman D. Smith, D.L., J.P., Ex-Mayor of Brighton.
P. C. GATES, Q.C., Recorder of Brighton.
Ven. Archdeacon HANNAH, D.D., Vicar of Brighton.
J. R. HOLLOND, M.P., Borough of Brighton.
W. T. MARRIOTT, Q.C., M.P., Borough of Brighton.
J. W. HOWLETT, Chairman of the Hove Commissioners.
Rev. T. PEACEY, Vicar of Hove.

CONGRESS SECRETARY:

BENJAMIN LOMAX, Curator, Free Library and Museum, Brighton.

JOURNAL

OF THE

BRIGHTON HEALTH CONGRESS,

WHICH COMMENCED ON

TUESDAY EVENING, DECEMBER 13, 1881

THE OPENING ADDRESS

WAS DELIVERED IN THE DOME BY

THE PRESIDENT,

BENJAMIN WARD RICHARDSON,

M.D., LL.D., F.R.S.,

AT EIGHT O'CLOCK.

☞ SEATS RESERVED ONLY UNTIL 7.50 p.m.

☞ A Meeting of the PROVINCIAL GRAND LODGE OF SUSSEX was held by Sir W. W. BURRELL, Bart., M.P., Prov. G.M., in the Royal Pavilion, on MONDAY EVENING (December 12th) at 7 p.m., to Welcome all Brethren attending the Health Congress. Refreshment for Visiting Brethren was provided by the W.Ms. and Lodges in Brighton. Tickets issued by Bro. V. P. FREEMAN, Brighton (Prov. G.S.), included Admission to the Opening of the Domestic and Scientific Exhibition at 2 p.m. on that day.

SECTION A.

HEALTH OF TOWNS, INCLUDING SANITARY LEGISLATION.

PRESIDENT:

EDWIN CHADWICK, C.B.

SECRETARIES:

E. B. ELLICE-CLARK, Assoc. Inst. C.E., Town Hall, Hove.
DEPUTY-SURGEON-GEN. McKELLAR, M.D., "Woodleigh," Preston Road.

WEDNESDAY, December 14th.

DOME.

11 to 12 a.m.—President's Opening Address.

12—1.30 p.m.
2.30—4 p.m.

- EDWARD EASTON, M. Inst. C.E., F.G.S.: Water Supply.
- DR. MACKEY: Geology and Climate of Brighton, from a Health point of view.
- DR. FUSSELL (Medical Officer of Health for East Sussex): Recreation Spaces in Large Towns.
- EDWARD F. GRIFFITH, C.E.: Escape of Gases from Ventilating Covers in Towns.
- E. B. ELLICE-CLARK (Town Surveyor of Hove): The Administration of the Sanitary Laws.
- DR. B. BROWNING (Medical Officer of Health for Rotherhithe): On the Correlation of Public Health and Sanitary Legislation.
- C. F. WALSH: Sanitation in Japan. A comparative Study.
- W. S. MITCHELL, M.A., LL.B.: Comparison of English and Foreign Watering Places.

(Discussions follow the reading of Papers; President's Address excepted.)

4 p.m.—H. F. LESTER, B.A.: Slaughter House Reform.

4.30—5 p.m.—Discussion on Mr. Lester's Paper.

IN THE EVENING, A SOIREE of the ASSOCIATES in the CONGRESS ROOMS, commenced at Eight o'clock.

SECTION B.

FOOD IN RELATION TO NATIONAL AND DOMESTIC ECONOMY.

PRESIDENT :

JOHN ROBERT HOLLOND, M.A., M.P.

SECRETARIES :

DR. WHITTLE, 65, Dyke Road.
EDWARD BEVES, 72, Dyke Road.

THURSDAY, December 15th.

DOME.

11—12 a.m. President's Opening Address.

12—1.30 p.m.
2.30—4 p.m.

- DR. C. DRYSDALE : Cheap Food and Longevity.
- A. FOLLETT HALCOMBE : New Zealand as a Source of Food Supply to Great Britain.
- MISS YATES : Bread Reform.
- MR. LIGHTFOOT : Preservation of Food by Cold.
- MR. WINTER BLYTH (Medical Officer of Health for Marylebone) : On Rational Feeding and Eclectic Dietetics.
- C. PARKER-RHODES : Water Reform.
- DR. WHITTLE : The Artificial Dieting of Infants.
- THOS. W. COWAN, F.G.S. : Honey as an Article of Food.
- W. S. MITCHELL, M.A., LL.B. : Lessons for Schools on Foods and their Preparation.

(Discussions follow the reading of Papers; President's Address excepted.)

4 p.m.—MAJOR F. F. HALLETT F.L.S, : On Food-Plant Improvement.

4.30—5 p.m.—Discussion on Major Hallett's Paper.

See APPENDIX.—On Vegetarianism, by Rev. Dr. DE COLLEVILLE.

Evening.—An Address was delivered by R P. B. TAAFFE, M.D. (Lond.), C.S.S. (Lond. and Camb.), Medical Officer of Health for Brighton, on the "Propagation of Disease, through Food and Drink," commencing at 8.30 p.m.

☞ SEATS RESERVED ONLY UNTIL 8.20 P.M

SECTION C.

DOMESTIC HEALTH, including Educational Training.

PRESIDENT:

ALFRED CARPENTER, M.D., (Lond.), C.S.S., (Camb.)

SECRETARIES:

BERNARD ROTH, F.R.C.S., "Rossmore," 127, Preston Road.

MAJOR-GENERAL W. R. ALEXANDER, "Drumraney," Preston Road.

FRIDAY, December 16th.

DOME.

11—12 a.m.—President's Opening Address.

12—1.30 p.m.
2.30—4 p.m.

- Sir Antonio Brady: Prevention of Smoke in Fire Places.
- H. H. Collins, F.R.I.B.A. (Secretary Health Dept. Social Science Association): Home Sanitation.
- Professor Fleeming Jenkin: House Inspection.
- Dr. Strong: Hints on Domestic Sanitation.
- Eardly Bailey-Denton: Domestic Filtration.
- Mrs. King: Health in Relation to Clothing.
- W. H. Hallett, F.L.S.,: Domestic-Softening of Water from the Chalk.
- Henry Stephens, F.C.S.: An Aspect of Public Elementary Education in Relation to Health.
- C. Cassal, F.C.S.: On Health Lessons in Schools.
- R. Scott Moncrieff, C.E.: The province of the Physician and the Engineer in the Work of Sanitation.

(Discussions follow the reading of Papers; President's Address excepted.)

4 p.m.—Major Robert Edis, F.S.A.: On Sanitation in Decoration.

4.30—5 p.m.—Discussion on Major Edis' Paper.

6.30 p.m.—Health Congress Dinner of the Associates, in the Pavilion Banqueting Room.

LECTURE TO WORKING MEN AND WOMEN.

SATURDAY, December 17th, 1881.

The Congress closes with a LECTURE on "Eyesight," to be delivered in the Dome by BRUDENELL CARTER, Esq., F.R.C.S., at Eight o'clock p.m.

Many of the Places of Interest may be visited on this day, Descents to the Sources of Water Supply in the Chalk can be made at the Goldstone Waterworks, from 11 a.m. to 3 p.m. (*Electrically Lighted.*)

ASSOCIATES' TICKETS FOR THE CONGRESS,

And Ladies' Associate Tickets (transferable to Ladies), 10s. 6d. These Tickets admit to the Congress Soiree and all Meetings of the Congress. They also serve as Season Tickets for the Domestic and Scientific Exhibition, and enable Associates to View many Places of Interest.

THE CONGRESS SECRETARY (Benjamin Lomax, C.E.) issues these Tickets at the RECEPTION ROOM. (*Entrance, Church Street.*)

A portion of the Seats in the Dome retained until Noon of Tuesday, December 13th, for the accommodation of Visitors coming from a distance.

For the convenience of occasional Visitors to Brighton, DAY TICKETS are issued. Day Ticket, for a Meeting of Sections A, B, or C, and including entrance to the EXHIBITION, 2s. 6d. The Day Ticket does *not* admit to the SOIREE OR THE EVENING ADDRESSES.

THE RECEPTION ROOM

Opened on MONDAY, December 12th, at 1 p.m., and on the following days at 8 a.m., for the issue of Associates' Tickets, 10s. 6d. each, and Day Tickets, 2s. 6d. each, closing at 6 p.m. or 7 p.m. according to the Evening's requirements.

Information supplied at the Congress Secretary's Office, in the Reception Room, and Lists of the Members attending the Congress issued there for distribution.

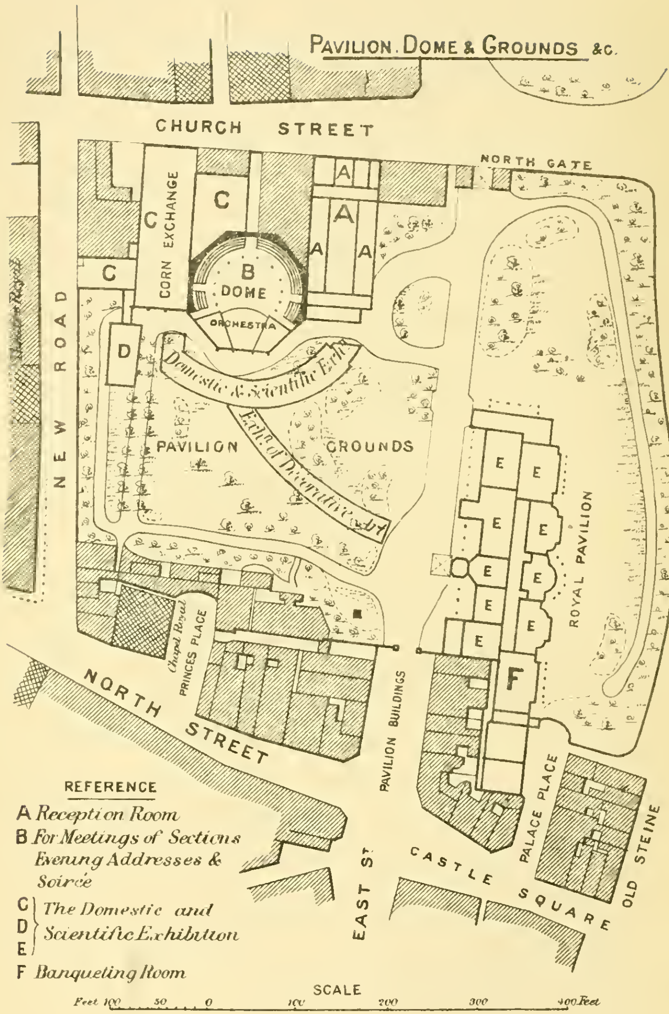
A Postal and Telegraph Office was connected with the Reception Room, and adjoining the Post Office was the Cloak and Parcels Room.

If any Surplus should remain after Payment of Expenses, it is to be applied towards reducing the Building Debt of the Brighton School of Science and Art, in which so much is taught akin to the objects of the Congress.

PLACES OF INTEREST.

Which were accessible to Associates on presenting their Tickets, from Monday, December 12th, to Saturday, December 17th.

	TIMES TO VIEW.
THE BRIGHTON GRAND AQUARIUM, which contains the best English Exhibition of Fish	Thursday and Friday, 10 a.m. to 2 p.m.
MUSEUM OF BRITISH BIRDS, in their Native Haunts.—E. T. BOOTH, Esq., Dyke Road	Daily, 11 a.m. to dusk.
GRAND HOTEL LAUNDRY, Steam and Mechanical Appliances, with all the Latest Improvements ...	Tuesday and Thursday, 2 to 4 p.m.
STEAM FLOUR MILLS.—Messrs. W. CATT and SON, Eastern Road	Wednesday and Friday, 10 a.m. to 2 p.m.
THE SYSTEM OF PRODUCING PEDIGREE CEREALS AND PEDIGREE POTATOES.—Major F. F. HALLETT, F.L.S., the Manor House, Kemp Town	Saturday, 11.30 a.m.
THE INTERCEPTING SEWER.—Outlet Works at Portobello, between Brighton and Newhaven	Daily, leave Town Hall at 10 a.m.
NEWHAVEN HARBOUR WORKS AND BREAKWATER ...	
GOLDSTONE CORPORATION WATERWORKS.—Descent to the Sources in the Chalk, if the Springs permit. (*Electric Lighting*)	Tuesday and Saturday, 11 a.m. to 3 p.m.
THE PORTER-CLARK WATER-SOFTENING PROCESS.—Messrs. HALLETT and ABBEY, Seymour Street, Marine Parade	Daily, 11 a.m. to 4 p.m.
AERATED AND MINERAL WATER MANUFACTORY.—Messrs. FRY, Middle Street...	Daily, 10 a.m. to 1 p.m.
KENT AND SUSSEX PURE ICE FACTORY.—Portslade, near Brighton	Daily, 10 a.m. to 4 p.m.
WATER MOTORS, for Driving and Lifting.—*Brighton Guardian* Printing Works, North Street	Daily, 9 a.m. to 8 p.m.
OTTO GAS ENGINE, and Improved Warehouse Appliances—Messrs. E. J. REEVES and Co., Queen's Road ...	Daily.
GAS WORKS; Latest Improvements.— Brighton and Hove Company, Portslade	Daily, 10 a.m. to 4 p.m.
THE PROCESS OF IRON CASTING.—Messrs. C. REED and SON, Foundry, North Road	Wednesday, 3 p.m. to 5.30 p.m.
STORING DOMESTIC FURNITURE; Improved Arrangements.—Alderman W. HUDSON, Queen's Road ...	Daily, 10 a.m. to 5 p.m.
INVALID CARRIAGES. — Alderman BRIGDEN, 187, Western Road	Daily, 10 a.m. to 1 p.m. and 2 p.m. to 5 p.m.
LIFE-BOAT APPLIANCES.—On Beach, near Bedford Hotel	Daily, 11 a.m. to 3 p.m.
LIFE-SAVING APPLIANCES.—Coastguard Station ...	Daily, 9 a.m. to 5 p.m.
SUSSEX COUNTY HOSPITAL & ANATOMICAL MUSEUM.—Eastern Road	Daily, 2 p.m. to 5 p.m.
THE ROYAL ALEXANDRA HOSPITAL FOR SICK CHILDREN.—Dyke Road	Daily, 10 a.m. to 4 p.m.
ST. PETER'S CHURCH (designed by Sir C. Barry.)—The Parish Church of Brighton	Daily, 10 a.m. to 2 p.m.
ST. NICHOLAS' CHURCH.—The Parish Church of Old Brighthelmstone..	Open Every Day.
THE MODEL PENITENTIARY HOME (*Mrs. Vicars'*).—Albion Hill, Finsbury Road	Wednesday, Thursday, and Friday, 3 p.m. to 5 p.m.; Wednesday, 11 a.m. to 1 p.m.
NEW WORKHOUSE, one of the best of its kind.—Elm Grove	Tuesday, Wednesday, Thursday, and Friday, 10 a.m. to 4 p.m.
INDUSTRIAL SCHOOLS.—Warren Farm	Daily, 10 a.m. to 4 p.m.
DEAF AND DUMB EDUCATIONAL INSTITUTE.—Eastern Road	Daily, 11 a.m. to 12.30 p.m.; Thursday, 3 p.m- to 4.30 p.m.
ASYLUM FOR THE BLIND.—Eastern Road	Daily, 3 p.m. to 5 p.m.
MOON'S INSTITUTION FOR EMBOSSING BOOKS FOR THE BLIND.—104, Queen's Road	Daily. 11 a.m. to 4 p.m.
RAILWAY COMPANY'S LOCOMOTIVE AND CARRIAGE WORKS	Daily, 9 a.m. to 3 p.m.
THE ATKINS WATER-SOFTENING APPARATUS; Boilers of Railway Works	Same Hours.
SCHOOL OF SCIENCE AND ART.—Grand Parade ...	Daily, 10 a.m. to 4 p.m.


PAVILION. DOME & GROUNDS &c.
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NORTH GATE
CORN EXCHANGE
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Domestic & Scientific Exh.
Exh. of Decorative Art
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ROYAL PAVILION
NEW ROAD
PAVILION PARADE
Chapel Royal
PRINCES PLACE
NORTH STREET
PAVILION BUILDINGS
EAST ST.
CASTLE SQUARE
PALACE PLACE
OLD STEINE
REFERENCE
A Reception Room
B For Meetings of Sections Evening Addresses & Soirée
C D E The Domestic and Scientific Exhibition
F Banqueting Room
SCALE
Feet 100 50 0 100 200 300 400 Feet

THE

DOMESTIC & SCIENTIFIC EXHIBITION

IN THE ROYAL PAVILION BUILDINGS & GROUNDS,

WAS OPENED

On MONDAY, DEC. 12, at 2.30 p.m.

BY THE PRESIDENT OF THE EXHIBITION,

THE RIGHT HON. THE EARL OF CHICHESTER

LORD LIEUTENANT OF SUSSEX.

EXECUTIVE COMMITTEE:

W. H. HALLETT, Mayor, Chairman. MARRIAGE WALLIS, J.P., Vice-Chairman.
R. A. BEVAN, J.P. (Union Bank), Treasurer.
DAVID SMITH, D.L., J.P., Ex-Mayor.

C. E. CLAYTON.
A. R. DAWES.
J. G. GIBBINS.
HY. GRIFFITH.
DANIEL HACK.
F. V. HADLOW.
P. C. LOCKWOOD, M. Inst. C.E.
BENJAMIN LOMAX.
G. W. RYDE.
FREDK. E. SAWYER, F.M.S.
R. P. B. TAAFFE, M.D.
W. CLARKSON WALLIS.

WM. HAMILTON, General Hon. Secretary.

The Exhibition Closed on Wednesday Evening, Dec. 21, 1881,

When the Distribution of Medals and Awards to the Exhibitors was made by the Mayor.

THE ASSOCIATES' TICKETS FOR THE CONGRESS

INCLUDED ADMISSION TO THE EXHIBITION WHILE OPEN.

CONTENTS OF THE EXHIBITION.

Class 1.

FOOD PRODUCTS,

Such as Wheat, Barley, Maize, Oatmeal, Lentils, &c.

PREPARATIONS OF FOODS, DRINKS, &c.

F. MERRIFIELD, *Chairman.*

F. V. HADLOW, *Hon. Sec.*

Bread (Bread Reform League), Condensed Foods, Tinned Meats, Essences, Sauces, Biscuits, Preserved Fruits, Sweets and Confectionery, Specialities in Food for Children and Invalids, Economic Combinations of Food for the Artizan, Beverages of all kinds. Dairy Produce—Butter, Butterine, Cheese, and means for keeping fresh, perishable food, &c. Domestic Cookery and Apparatus.

Class 2.

DOMESTIC, HOUSEHOLD, LABOUR SAVING, AND EDUCATIONAL APPLIANCES.

Rev. J. J. HANNAH, *Chairman.*

W. CLARKSON WALLIS, *Hon. Sec.*

House Fittings, Gas and other Stoves, Ranges, Lamps, Utensils, Household Machinery—Sewing Machines, Coffee Mills, Mincing and other Machines, Velocipedes, Invalid Furniture and Appliances, Specialities in American and other Furniture, Bookbinding, School Desks, Maps and Scientific Appliances for Writing, &c.

Classes 3 and 4.

HOUSE SANITATION.

Ventilation and Heating Apparatus, Drainage, Baths, Water and other Closets, Chemical Appliances, Filters, Deodorizers, Disinfectants, Soaps, &c.

HOSPITAL CONSTRUCTION AND APPLIANCES AND PERSONAL HYGIENE.

INDUSTRIAL DWELLINGS.

Plans and Models for Cottages, &c.

R. P. B. TAAFFE, M.D., *Chairman.*

CHAS. E. CLAYTON, *Hon. Sec.*

Class 5.

ELECTRICITY.

Lighting, Telegraphy, Telephone, Photophone, Microphone, Phonograph, Electric Bells.

D. Hack, *Chairman.*

F. E. Sawyer, and
Magnus Volk, } *Hon. Secs.*

Class 6.

DECORATIVE ART AND PHOTOGRAPHY.

Painting on China, Terra Cotta, Tapestry, Silk, Art Needlework, Art Fabrics and Photographs, Floor and Wall Coverings, &c.

HOUSE DECORATIONS AND FITTINGS.

ARCHITECTURAL DESIGNS.

A. Fisher, *Chairman.*

J. G. Gibbins, *Hon. Sec.*

Class 7.

HOROLOGY, METEROLOGY, AND SCIENTIFIC INSTRUMENTS.

C. Dorey, *Chairman.*

A. Dawes, *Hon. Sec.*

Class 8.

LOAN COLLECTION,

Including a valuable loan from South Kensington of Indian Products and Works of Art; and numerous objects of interest lent by local gentlemen.

Alderman D. Smith, D.L., *Chairman.*

Hy. Griffith, *Hon. Sec.*

INDEX OF EXHIBITORS

IN THE

DOMESTIC AND SCIENTIFIC EXHIBITION.

Hanson, Jno. and Co., Wakefield.—Automatic Machine for treating Sewage.

Harrison, 1, St. Swithin's lane, E.C.—

Hart, Aukett and Co., Ann street, Brighton.—Purveyors of Sausages, Sauces, Tongues.

Harper Bros., 36, Ship street, Brighton.—Drawing Room Organ, Pianofortes.

Hatch, Mrs., 17, Western road, Brighton.—Embroidery, Tapestry Work.

Hawkins, C., 32, Preston street, Brighton.—Photographs.

Hayward, Bros. and Eckstein, Union street, Boro', S.E.—Semi-Prismatic Floor Lights and Coal Plates.

Hayward, Tyler and Co., Whitecross street, E.C.—Water Closets, Hydrants, Pumps.—The "Full Flush" Valveless Closet.

Heron, Thos., Manchester.—Duplex Gas Burner.

Hickisson, Mrs., 75, Southgate road, N.—(See M. A. Bond.)

Highbury Sewing Machine Co., 33, Holloway road, N.—Washer, Wringer, Mangler, Laundry Work.

Hill, Chris., 4, Devonshire place, Brighton.—Patent Arch Fire Bars (smoke consuming).

Hill, W. E., 37, Stokes Croft, Bristol.—Design for Semi-Detached Artizans' Dwellings.

Hills, Miss M. E., 6, Vernon terrace, Brighton.—Hand Painted Satin Fan.

Hindmarsh, T. and Co., 79, Queen's road, Brighton.—Shank's Baths and Lavatories.

Hine, Miss Ethel Egerton, 130, Haverstock hill, N.W.—Painting on China.

Hodges, Butler and Dale, Palace Chambers, Westminster, S.W.—Silicated Stone

Holford, Clayton and Black, Architects, 152, North street, Brighton.—Architectural Drawings and Views.

Holsner, James, 15, Ship street, Brighton.—Brass Shop Fronts.

Hospitals, St. Bartholomews
,, University College
,, Children's, Ormond street
,, London
,, Guy's
} Bed, Lay Figures, Diet Tables, and Appliances.

Howard and Son, 25, Berners street, W.—Parquet Flooring.

Howell, Fred., 19, Rose hill terrace, Brighton.—Floral Work in Pen and Ink.

Hughes, Miss, 43, Russell square, Brighton.—Painting on China.

Humphreys, J. C., New Bridge street, E.C.—Iron Buildings of the Exhibition.

Hutchinson, A. and Co., 3, Great Winchester street, E.C.—India Rubber Gas Tubing.

Hutchison and Co., 51, Fann street, E.C.—Patent Fork Cleaning Machines.

Hygienic Heating and Lighting Company, Lim. (R. W. Warhurst), 16, North buildings, Finsbury Circus, E.C.—"Syphon" Stoves, Heated by Gas or Oil.

Improved Industrial Dwellings Company, 34, Finsbury Circus, E.C.—Designs.

Inglis, Miss, 63, Grand parade, Brighton.—Decorative Art.

Ihlee and Horne, 31, Aldermanbury, E.C.—Balmain's Luminous Paint.

Shaw, Alfred, Lewes.—Mechanical Dry Closet.

Silverwood and Streeter, 22, Bread street, Brighton.—Sanitary Appliances.

Silicated Carbon Filter Co., Battersea, S.W.—Silicated Filters, Portable and for Domestic Use.

Singer Manufacturing Co., The, 39, Foster lane, E.C.—Sewing Machines.

Smith American Organ Co., The, 59, Holborn Viaduct, E.C.—Reed Organ, New Principle.

Smythe, Miss Nina, 28, Medina villas, Brighton.—Chromo Photographs, ("Kraus" Invention).

Society for the Prevention of Blindness (Dr. Roth), 48, Wimpole street, W.—Publications, Gymnastic Models.

South Kensington Museum.—Indian Products and Works of Art.

Squintani, C. G. and Co., 3, Ludgate Circus buildings, E.C.—The "Model" Self-Inking Printing Press.

Squire, R., 34, Myddelton square, W.C.—

Starley Bros., St. John's Works, Coventry.—The Salvo Tricycle.

Starling, Marion, A., School of Art, Brighton.—Hand Painted Tea Table, Grain of the Wood visible.

Stevens, H., 13, Dean street, Brighton.—Invalid Spinal Couch.

Struve and Co., Royal German Spa, Brighton.—Imitation German Mineral Waters and the Brighton Seltzer Water.

Stott, Jas. and Co., Vernon Works, Oldham.—Gas Valves and Ærometers.

Sugg, W. and Co., Lim., Vincent Works, Westminster, S.W.—"Christiana" and "London Argand" Gas Burners.

Sussex Co-operative Drug Stores, Queen's road, Brighton.—Cobden's Phos-Fer Ale.

Sutton and Sons, Seed Merchants, Reading.—Vegetable Seeds, Models of most Approved Vegetables.

Tabor, Trego, and Co., 186, Bishopsgate street, E.C.—Decorators and Coach Builders' Varnishes.

Taylor, J. M., 52, Turlerie street, Hackney road, E.—Patent Eclipse Ventilator.

Teale, Prigden, M.A., Leeds.—Diagrams Illustrating "Dangers to Health."

Telephone Company, The Consolidated.—Telephone Apparatus.

Treeby, Miss C., The Boltons, Corry crescent, Torquay.—Painted Plaque, White Azaleas.

Tuxford, T. H., 2, Arundel road, Brighton.—Sanitary Appliances.

Twelvetrees, Harper, 80, Finsbury pavement, E.C.—Laundry Appliances, Washing and Wringing Machines.

Twyman, Miss, 22, Addison gardens, North Kensington.—Decorative Plaque.

Underhay, F. G., Engineer, Crawford Passage, Farringdon road, E.C.—Patent Valve Closet, Patent Valve Balls.

Volk, Magnus, Electrician, 25, Ditchling rise, Brighton.—Electric Lamps, Fire Alarms, Appliances for War, Gas Escape Alarm, Telephonic Communications.


BRIGHTON
HEALTH CONGRESS
December 1881.
BOOTH'S MUSEUM
WORKHOUSE
GROVE
ELM
Reservoir
Reservoir
THE LEVEL
Cricket Ground
CENTRAL STATION
St. Peters Church
B R I G H T O N
QUEENS PARK
Emmanuel Church
St. Nicholas Church
NORTH
CHURCH
LIBRARY & MUSEUM
DOME
ROYAL PAVILION
KEMPTOWN STATION
BRIGHTON COLLEGE
COUNTY HOSPITAL
WESTERN ROAD
EASTERN ROAD
KINGS ROAD
Grand Hotel
West Street
Market
Town Hall
AQUARIUM
MARINE PARADE
SEA WALL
WEST PIER
Chain Pier
Scale
NOTE. The figures thus 26 denote the height above Ordnance Datum

J. E. MAYALL, 164, *New Bond Street, London, W.*

Faithfully Yours
Benjamin Ward Richardson

OPENING ADDRESS,

Tuesday Evening, December 13th, 1881.

THE SEED-TIME OF HEALTH,

BY THE PRESIDENT,

BENJAMIN WARD RICHARDSON,

M.D., LL.D., F.R.S.

In the depths of the night, in a climate where night is short, in the midst of that short interval, when even the gods are supposed to rest; when the sun-god himself has withdrawn from the earth, and the sun sees not the deeds of men, some men and women of the earth, in solemn silence, bring something forth from home.

If they should speak there would flow from the lips of those people a language so beautiful, so perfect, so expressive, that though the listening ear were foreign to it and understood it not, it would be held listening. But there is not a sound.

If these people could be seen in their fair stature and build of body, draped in their loose garments, the eye, like the ear, would be vanquished. Such incomparable beauty! Should a sculptor want a model for a work he would leave for all time, he would find it in them; should a painter want a face for his perfected art, he would find it in them; should a poet want a theme for a song on living beauty, he would find his inspiration in them; should a physician want a text for a discourse on the types of health and sanity, he would find it in those types of beauty.

In those faces, which actually live to this hour in marble more precious than gold, there would be seen, if they were unveiled from this awful stillness and darkness of the night, two living passions, engraved in life through expression of the soul, resigned grief and sublime fear. What has happened can never be recalled, and grief, therefore, is chastened by reason: but what has happened is so unnatural, so wrong, that reason, in its turn, is sublimed to fear. It is so terrible, none must look on it: if the sun-god, source of light and life, should see it, he might hide his face and punish all the races of mankind.

Well may there sit on every face the chaste beauty of resignation and sublimity of fear!

What can have happened?

There is something that is being carried tenderly, awfully! It is a casket small and light. It might be a cradle or a cot supporting some object of tender solicitude. A child! Yes, a child in all its childish wealth, its golden tresses on its pillow, its features divinely fair and spiritual, its limbs the ideal of grace. Surely in the dead of this night it sleeps, and they are taking it to some golden coast, where in the morning it will greet the sun, lave in the azure sea, listen to the shell picked up by the shore for the mysterious music, and bask in pleasure.

Alas! no. As the earth is now dead and silent, its soul of sun withdrawn, so is the soul of that human lovely form; and as the earth is proceeded to enter once more the eternal fire that at once animates it and destroys it, so this child of earth is being carried to the pyre.

Beyond expression terrible this event, that they, the bearers and followers, should be so ignorant as to let such beaming beauty die. Had it lived its course, played its mortal part, and like the ripe grain fallen fairly under the sickle of the immortal reaper, then, though a thousand suns had shone, the event had been natural, honourable. Then this ceremonial had been public as the day. Tears might have moistened the eyes of the lookers on, but there would be no shame; the deeds of the dead might be themes of honour, or fame, or joy; but shame, no trace of it. The shame is now; the shame that must be hidden in darkness of darkness, as a crime against knowledge, and love, and family, and country, and time! the shame that life in its earliest dawn should be let go, and run no Olympian game, and sing no song, and tell no history, and plant no work of art, and hold no standard, and fulfil no task of duty. They veil themselves from the truth that they may awake us from a deathly-dream. Let them pass from us also as a dream. Yet the dream is true, for I have embodied in these sentences an idea of mankind in that period of human history when, as by a miracle, the human soul burst into the flame which to this day is our great source of intellectual light; the flame that in its own home went out, but from which, while it burned, all the world lighted a torch and carried it away.

While the sculptor of to-day still strikes a light from the dead of that period of intellectual glory, from the very marble into which its fervid life was infused for ever, let us who deal with actual life strike a light from the sentiment regarding the young who fell as they were rising from the drowsy torpor of infancy into the waking dreams of adolescence, instead of passing, in natural course, through manhood or womanhood, towards maturity, towards drowsy decline.

These wise people knew that life ought to be a perpetual feast. They not only knew the fact, they acted up to it. They were equally well aware that a long and perfect life could alone be attained by perfection of life at its opening, in the seed-time of health. To die at that time was, therefore, an offence against natural rule, against reason, against sentiment. The knowledge of such an event was death to the brain, death to the heart. In this seed-time of health the life was to be made, the life that was to be in truth a life worth living. Animals beneath men, that are worthy of going through their appointed time, and of being made both useful and beautiful, must have their seed-time of health. Shall their human masters be less cared for? If the masters are to be mere slaves, yes; and then it were a pity and a danger; for they who have no respect for life and beauty, who drag through existence and grow weary of it, are to be trusted neither with life, beauty, nor fame.

In the history of great truths derived from the Hellenic wise times, there is not one truth so great as this, and not one so completely missed. It is the secret that was lost. In our day we have lost it so severely that it might never have been in existence for ought we seem to care. The key to all we would have, the key to the gates of health and happiness, has been lost as if it had never been found.

In point of health our children in these times, proud as we are of these times, are our reproach. Where is there a healthy child? I have never seen one. I might search through the length and breadth of the island, I could not find one. You may put before me a child in all its innocence. It has done no wrong that it should suffer; it may show to the unskilled mind no trace of disease; and yet I know that if I or any skilled observer were to look into the history of the life in question it cannot be found intrinsically sound. It will have to battle with future dangers sufficient for the soundest to meet; but it is not itself free from dangers other than those that are prospective and avoidable. It is sure to have some inherited failure, and too likely some that will help to increase the independent risks that lie before it.

So our children under five years are expected to die in what may almost be called a definite proportion. He is a fortunate man who, having four children born to him, retains three alive. Later on, for a short time, the danger is reduced; with adolescence it recurs. Again it retreats, but with such failure all along the line, that one-third of the allotted life, the life that would be were it planted in sound health, is only attained.

And for this we have no shame. The sun, the moon, and all the stars may witness our miseries, and we may grieve, but we have no shame. There is an assembly of learned men which I sometimes visit, an assembly of earnest men who are bent on understanding to the full these human failures from health. These men spare no pains, and to gain a spark of light will labour like miners in a mine. When last I visited them a puny feeble spark of life was in their presence undergoing their searching yet kindly scrutiny. Except that it cried a little and laughed a little in changing mood, this spark of life might have been considered a pathological specimen, and in truth it was discussed as such. No one there had a thought of that small life developing into wholesome life and passing through its natural term; not one was there who did not know that the chances of bare life were impossible, and that nothing could be done to save it. The intent was to study the pathology, and fix that by name. They said, when their technical language was translated, this child is suffering from the error, some would say the sin, of its parents. How deep did this error go? In what strange forms did it appear? How singular that the nervous system, once impressed with the poison of that error, should impress another nervous system, and so modify the nutrition of the organism to which it belonged as to cause false nutrition of internal organs and of the very bones themselves! In a whisper one of the learned expressed to another one the pity 'that such a specimen of humanity should ever have been born, to breathe and take notice, and smile, and cry, and love, and suffer, and die, and we be able to do nothing for it except hope for the relief that should end in the earliest death.'

I belong to a committee which takes under its care another class of sad childhood. The members of this community pass before us deaf and mute. We try to give them the powers of intelligent converse by laborious and artificial means, and we do some good; but the train of sufferers passes by, and we know that full half are mute from the undeveloped brain; that they are practically lost to life. It is not that the one sense is lost, and thereby the means of expression by intelligible language; it is not even that the nervous organisation which ministers to intelligence is low; it is that these deficiencies are some of the outward signs of a general deterioration of body, and that there is scarcely a structure which the eye of science would recognise as moulded in health.

Passing from the sphere of general observation, from modified to destroyed vitality, I find more startling facts at hand. A short unpretending essay reached me not long ago in which the writer, who in his too great modesty conceals his name, epitomises the facts he has collected respecting the attainment of maturity in peoples of different nations. He tells us that of ten children born in Norway a little over seven reach their twentieth year; that in England and in the United States of America somewhat less than seven reach that stage; that in France only five reach it; and in Ireland less than five. He tells us that in Norway out of ten thousand born rather more than one out of three reaches the age of seventy; in England one out of four; in the United States, if both sexes be computed, less than one out of four; in France, less than one out of eight; and in Ireland less than one out of eleven. And, he adds this significant computation, based on what may be called the commercial view of the vital question. 'In producing dead machinery the cost of all that is broken in the making is charged to the cost of that which is completed. If we estimate by this same rule the cost of rearing children to manhood, if we calculate up the number of years lived by those who fell, with the years of those who passed successfully to manhood, there would be found between the two extremes presented in Norway and Ireland,—both, be it observed unnatural,—a loss of one hundred and twenty per cent. greater in the first year of life, seventy-five per cent. greater in the first four years of life, and one hundred and twenty per cent. greater in the years between the fifth and the twentieth, in Ireland than in Norway. In Norway the average length of life of the effective population is thirty-nine and rather more than a half years; in England, thirty-five and a half years; in France, not quite thirty-three years; and in Ireland not quite twenty-nine years. Thus, again comparing the best with the worst of a scale of vitality in which both are bad, in Norway the proportion of the population that reaches twenty survives nearly forty years, or four-fifths of the effective period, to contribute to the wealth of the community; while in Ireland the same proportion survives less than twenty-nine years, or considerably under three-fifths of the effective period.

When we are sitting in the family circle and are speaking of families that lie within our cognizance, we estimate in the most natural way the happiness of the families by the health they represent. We may thoughtlessly speak of other standards of measurement. We may for a moment dwell on the riches of the house; on the luxuries that are to be seen in it; on the influence which the owners of it might or do exercise in the social sphere, and such like sentiments. But, after all, these rest on health as the basis of the happiness. If one out of every two of the offspring of the favoured house have died, if some who have not died are mute to the world or otherwise stricken, we soon fall into more thoughtful mood, and say that even this rich home is not a possible home for happy life. Pleasures there may be, happiness there cannot be.

How much worse the estimate of a family in which, together with the vital failures, there is the lack of all that is necessary to make the burthen of life endurable. The favoured in health and means wonder, when they think of it, how such unfavoured endure the life they live. In that sentiment no maudlin canker lies; it is as hard and as free from poetry as a mathematical problem; and for that reason a sentiment that, above every other, is persistently preserved.

What is true of family circles is equally true of nations. Rest, quiet of nations, repose for cultivation of refined arts and sciences, happiness derived from healthy and vigorous minds and intended for healthy, vigorous, and wholesome purposes, there cannot be, when one in two of life can only reach maturity with a survival of three-fifths of effective population. In such a national family there is persistent mourning. It sits for ever in gloom; the blinds of its home are always drawn. It broods, it attributes, as all heart-stricken mourners do, the loss it has sustained to every imaginable and unimaginable cause. It thinks with incoherency; speaks now with hysteric grief, then with hysteric rage, and acts the same. In a word, it follows natural law. State physicians tender their remedies for such families of nations and call themselves curers, as if that could be cured which is Nature pursuing her merciless course towards her merciful dispensations, in correction of those who have outraged her.

I have named this discourse "The Seed-time of Health," and in the sentences foregone I have tried to strike a contrast, and thereby to give to sanitation a broader meaning as a practical science than is commonly connected with it as a system of details respecting ventilations, sewer traps, and the like.

I want to point to health as the all-in-all to man; the gate of health, leading to the truly good in politics, art, science, letters,—aye, and religion, not less than the least of everything. The strain of my argument is, that, unless we make the early life of our children a seed-time of health,—unless we, from the root of life, so change the conditions which now exist,—all our other measures are practically valueless.

At this moment we have not, as a nation, got this notion set in our minds in such degree as even to accept it, basic as it is, as worthy of serious thought. We have no shame when our young fail and die. Grief we have, fond memories we have; but shame, none. We bury our young as if the act were natural, and erect memorials of it. We read obituaries of the young dead; we read the terrible obituaries of the Registrars-General; we discuss in Congresses like these the cost of young life; but the shame of the Greek touches us not. The knowledge of the troubles which flow from the lack of the shame reaches us not.

One bright Sunday morning I was in Dublin, in the Phœnix Park. A great crowd formed a vast ring, to the borders of which I made my way. A wrestling match! Men of different counties wrestling in deathly earnest, the lookers-on intent to terror. On not a face in that multitude, barring the faces of some four or five cockneys, who had a car all to themselves, and grinned as foolishly as they chattered and chaffed, was there so much as a smile; the victors were approved, but not cheered. If this be sport, I felt, it is the strangest I ever knew since I read of Christian trying to be merry in the Castle of Giant Despair. In that same day I traversed the city to see authority armed to the teeth in utterly joyless open places. I visited an exhibition of pictures to experience the same sense of all-pervading oppression. I followed a crowd, and found myself one of another multitude going out of the city until we reached a place where the members of that multitude were burying their dead; and as they swept by the train of young dead that was carried in the sight of the sun to sleep in that resting-place was to me as appalling as it was revealing. It was like lightning in persistent discharge. Peace, progress, content, happiness, with this discharge of fearful facts in view! A fable! 'As is the earthy,' says the priest, 'such are they also that are earthy;' and I knew that I had never understood the saying before.

It struck me for the first time, as I witnessed this painful phenomenon, that, with so much young death, there could no more be health in the body politic than in the body corporeal. We sanitarians are, however, only bound to treat of that which belongs to our own labours, and acknowledging the perils incident to early life, and it may be even recognizing the shame of them, have before us the question of their prevention from its health side alone.

That we may approach this task with intelligence, let us for a short time glance at the nature of the perils which beset the spring-tide of human life, and the period bounded by maturity.

The perils are of four kinds:—

1. Those that are inherited.
2. Those that are accidental.
3. Those that are inflicted.
4. Those that are acquired.

Inherited Perils.—Foremost amongst the perils to life, in all its stages, but especially in its early stages, are the inherited. We may safely say that no one is born free from taint of disease, and we may almost say with equal certainty, that there is no definable disease that does not admit of being called hereditary, unless it be accidentally produced. To what is known as specific disease, the disease of diseases; to struma, or scrofula, and its ally, if not the same, tubercular affection; to cancer; to rheumatism and gout; and to alcoholic degeneration, the grand perils of life are mainly due. These are the bases of so many diseases which bear different names; these so modify diseases, which may in themselves be distinct, that if they were removed the dangers would be reduced to a minimum. These diseased conditions do not, however, exhaust the list of fatal common inheritances. On many occasions, for several years past, I have observed, and maintained the observation, that some diseases, which are to be noticed in a coming page, as communicable, infectious, or contagious, are also classifiable under this head. I am satisfied that quinsey, diphtheria, scarlet fever, and even what is called drain fever, typhoid, are often of hereditary character. I have known a family in which four members have suffered from diphtheria, a parent having had the same affection, and probably a grand-parent. I have known a family in which five members have, at various periods, suffered from typhoid, a parent and a grand-parent having been subject to the same disease. I have known a family in which quinsey has been the marked family characteristic for four generations. These persons have been the sufferers from the diseases named, without any obvious contraction of the diseases, and without having any companions in their sufferings. They were, in fact, predisposed to produce the poisons of the diseases in their own bodies, as the cobra is to produce the poisonous secretion which in its case is a part of its natural organisation.

Accidental Perils.—Next amongst the perils which beset the early life are the accidental dangers to which it is exposed. I do not mean by this the mere physical accidents, the troubles and blows to which childhood is subjected. Not these alone, but the more subtle accidents which are incurred through exposure to vicissitudes of season, and to the influence of those particles of the communicable diseases, which, being introduced into the body, incubate there, and transform the secretions of the body into poisons like unto themselves. A long list of diseases incident to the spring-time of life is found in these two classes of causes of diseases, those due to the contagious particles, numbering from twenty-five to thirty alone.

The grand mortality of the child-period is indeed due to the two classes of causes now under our consideration. From exposure to the vicissitudes of season comes, foremost of all, that first step into so wide a universe of evil, the common cold, or catarrh. Upon that comes the continuous visitation which, extending to the pulmonary surface, causes bronchitis, croup, pneumonia, tubercular inflammation; or, extending to the mucous surface of the intestine, causes irritation there, diarrhœa and choleraic affection. From exposure, again, to the poisons of the communicable diseases, there are produced the long and fatal calendars of diseases of shortest incubation, like cholera; of short incubation, like scarlet fever, diphtheria, erysipelas, influenza, whooping-cough, and croup; of medium incubation, like relapsing fever and cow-pox; of long incubation, like small-pox, chicken-pox, measles, German measles, typhus, typhoid, mumps, and malarial fever; and of longest incubation, like hydrophobia. The returns of the Registrar-General will show, weekly, how in persistent procession these diseases march through the land.

Inflicted Perils.—Third amongst the perils incident to the early life are those inflicted by reason of ignorance, or false knowledge and practice, or hard necessity, or all combined. These perils begin with the earliest days of infancy and continue onward. The tight swathing band in which the helpless infant is enrolled, as if it were an Egyptian mummy; the frequent error that is made in depriving it of its natural food, its mother's milk, and in substituting for that true standard of food, foods having no proper arrangement nor proper assimilable quality; the too hasty introduction to it of foods in common use in adult life; the not uncommon introduction even of stimulants to these young; the imperfect feeding of the mother, and pampering her with stimulants when she undertakes the maternal duty of being nurse to her own child; the poisonous method of giving soothing or narcotic quieteners to children; the almost as injurious plan of taking up children from their gentle life-giving sleeps and exposing them to shocks, surprises, and excitements, that are injurious to every function of nutrition and of mental repose; the confinement of the child in close rooms, away from the fresh midday air; the evil plan of taking it out into the night air and into crowds and noisy places, like the railway station or busy thoroughfare; the worse plan still, of scolding, frightening, and even slapping, the helpless thing, and thereby implanting in it a nervous, irritable nature which it will never lose. These are the truly crying evils, which in earliest, dreamiest, and most eventful days and months of human life, plant, imperceptibly, their accursed strings into every day of life that is to follow. If young animals of lower life, that are to be bought and sold and made gross profit upon, were to be subjected to the same penalties, there would be such discomfiture in the selling of them that the reform of the manner would soon be accepted by the most ignorant salesman. It was so in the time of the insane traffic in human flesh and blood. The child of the choice slave, intended ultimately for the market, was often better nurtured in its infancy than the child of the man who owned it, and became a better speciman of humanity.

These evils inflicted on childhood in its first estate are, moreover, followed later on by other evils not less reprehensible, and by one worse than all, I mean the evil of endeavouring, during the time when all the nervous force the growing frame demands is barely sufficient to sustain the natural wants of nutrition, to tax that growing frame beyond the powers that belong to maturity, with competitive mental and physical labours. Both good in their way in moderate form, both necessary for health in moderate form, mental and physical labours are, in these days, made the bane of the nation. The false and useless efforts which crumple up the animal and spiritual natures, making distaste for all labour an early disease, and blighting every flower of genius so soon as it begins to bud, is equal in falsity only with the conviction it engenders, that men and women are made but to learn up to the time of maturity, and that an education which is not what is called "finished" when the school or college is left behind, is an education that can never be made up in after life. I know nothing so deathly to mind and body as this anxiety, now all but national in its acceptance, to complete education within twenty-one years, when the fact really is that length of life, and length of happy life, depend on the continued cultivation of mental and physical existence beyond all else.

He who has ceased to learn begins to die.

Schools for boys and girls, do you say? 'Yes,' I reply; 'and schools for men and women through every phase of life, if you would have them complete their career.' That crystal brain of the young man, surcharged with more than it can bear, will discharge itself abruptly and remain an empty shell. But the crystal brain, always crystal, slowly charged and sedately assimilating, will retain its natural lucidity and power through every stage, and will animate to its natural termination the body to which it is the ministering spirit.

And still to this grand evil inflicted on youth there is a supplemental evil which adds physical to mental scathing, viz., the commission of corporeal punishment on the helpless young before they know why that is wrong for which they are punished, and often when no wise man or woman could detect any wrong in any part of the savage performance save the wrong done by the one who punishes. To me, as a physician, nothing is more tainted with iniquitous injury than that corporeal punishment of children which proceeds to teach what is believed to be wrong by the instant infliction of physical pain. To the punished and the punisher alike the system is as mischievous as it is barbarous. On the punished it brands hate, or servility, or palpitating fear. On the punisher it brands coward, tyrant, hasty adjudicator of rights and wrongs; while it so perverts the judgment that he who would scorn himself if he struck a woman, will think the act right if a child be the object of his infliction. In another century it will sound as the tones of inquisitorial suffering sound to this, that in our public schools, not masters merely, but masterful boys, should be trained, during the seed-time of health, to tund, to strike with ashen rods, their younger, feebler fellows for faults or failings, or it may indeed be for virtues, which they themselves are not old enough to comprehend, nor wise enough to rectify, did they so much as comprehend.

Acquired Perils.—The perils acquired by the young themselves, acquired as a rule from imitation of the habits of their seniors, form a last part of the dangers incident to this seed-time. In boys, late hours, smoking, resort to the use of stimulants, indulgence in games of chance, and self-infliction of early worry, are special acts ruinous to the foundation of a long and healthy life. In girls, the passion for unhealthy systems of clothing; for compression of the too yielding chest in tight unyielding band and corset; the carelessness about clothing in cold weather; the desire to appear in late evening assembly; the recklessness about food and regularity of meals; the neglect of exercise, and the too frequent fondness of affectation in regard to good common-sense rules of manner and life, are, in their way, as mischievous as the errors committed by the juvenile male community, and in some respects lead more immediately to serious consequences.

We will, not, however, dwell longer on this theme, for the faults that might be included in it, were it extended to its full length, would, after all, be found to be but the reflected faults of older humanity; faults irreparable until that older humanity shows the way to those improvements in this direction, and in other directions to which it is now necessary to invite your attention.

I can imagine easily enough that some who are listening to the multiplied evils incident to the seed-time will shrink in despair from all hope of amendment. The sense of necessity of youthful death will seem for a moment to excuse the sense of shame. I hear one, sighing, say: if this be by design, it is vain to meet it. I hear another say: if this be by no design, but by, as it were, an universal accident or fortuitous occurrence, it were hopeless to try to meet it.

For my part, I am beset with no such doubts or fears. If I begin to think of design, the design I think of is poor mine; I am designing for the designer, and must come to grief. If I think of no design, I am merely building up something from the minds of those who conjure up design from their own designing. I, therefore, am content to feel assured that, while there is design in regard to this mortal life of man, it is out of the range of my inadequate comprehension; I bow my head and say I do not know. And yet there are lines of thought resting on knowledge of natural facts in which the directions of the design of life are traceable; these are laid, first, in the observation of constantly recurring phenomena bearing on this subject; secondly, in the observation of those phenomena of sentiment or undemonstrated opinion which also bear upon the subject.

Touching, then, the actual recurring phenomena, we may, I think, discover from them most distinctly that the tendency of human life is always towards a more perfect condition; that the natural tendency is towards a more perfected life, and that when man himself does not, in ignorance or intention, do what is injurious to himself, natural law does not. Nature follows truly its own course, and gives us no help against ourselves; but the moment we see the right way she is with us in our efforts, and with giant power helps us on. We are not to natural law as so much inanimate matter; we stand above natural law as we stand above the brutes. As our divine Plato expresses it—'We are plants, not of earth, but of heaven; and from the same source whence the soul first arose, a divine nature, raising aloft our head and root, directs our whole corporeal frame.'

Towards this same view our sentiments converge. We compare all that is desirable to all that is healthy, and the *summum bonum* of our wishes is the *summum bonum* of health. We cling to the idea of a persistent life even beyond death: a life encrowned with such health that to be sick and to die is impossible. We cling to the idea of such a life in unmeasured happiness; a life devoid of pain and sorrow, a perfected health. We cling to the idea of such a life in realms of perpetual beauty: a life of the beautiful of beauties, health in its completed form and character.

Thus, in this instance, reason and sentiment are one, the surest proof of truth.

On the sentimen tinvolved in the proposition I need not dwell: it thrills in every breast. On the reason I am bound to dwell, and if it be but in one instance, I should give proof of it. I will give one; a contrast of good and evil, of health and disease under human direction, and, I may say, under human control.

There were, some years ago, two communities existing at one time, and noted by an able observer. One community was at Montreux, a parish in the Canton of the Vaud, in Switzerland, a parish of two thousand eight hundred and thirty-three souls. The pastor, M.

Bridel, kept a life-history of his charge, and during a long series of years recorded births at the rate of one in forty-five, and deaths one in sixty-four annually, a death-rate of 15·62 in the thousand. The other community was a Russo-Greek, existing at the same period of time. In this community the births were one in seventeen, the deaths one in twenty-five, or at a rate of forty in the thousand. In the Switzer parish one sixty-fourth died per year; in the Russian, one twenty-fifth, or more than twice as many. In Montreux four-fifths of those born reached twenty years; in the Russian class, six hundred and six out of one thousand perished ere they had attained their fifteenth year, the nuptial garments of the mothers becoming, as it was said, the shrouds of the first-born. In the Swiss community the march of life, seemingly slow, was towards health and an improving life; in the Russian the march of life, seemingly so fruitful, if it had been calculated by the birth-rate alone, was the most fatal in Europe.

I would not, for my part, set up this Swiss parish as perfect—far from it; it was but half perfect. Still, the contrast is before us. Why did it exist? The answer was clear. The Swiss success was due to simple forethought and the virtue of continence. Those civilised peasants of the Vaud conserved their health, their happiness, their life, by the comparative slowness and circumspection with which their successive races were brought upon the scene of the world. Those uncivilised Russian-Greeks, reckless as to birth—not much more reckless than some great English towns have been in our time—lost their health, their happiness, their life, by their mad growth of life. With them death was the shadow of birth, and they had no shame. In our present day, in our best communities, though the reason for the shame is less than it was, yet still it is double, in the seed-time of health, what it ought to be, or what it need to be. That the reason for it diminishes is proof enough that it may diminish more; nay, may become refined to the delicacy of susceptibility of those who dared not let the sun behold their young dead.

How towards this perfection shall we wend our course?

We have seen that, in the seed-time of youth, there are four influences at work, sustaining the perils that bring the cause of shame. It is by carefully and earnestly correcting these that our course shall be towards success and honourable vitality.

To those *inherited* perils of which I have spoken our minds must first be turned. Say you, the task of reducing them is difficult, delicate? It is all that. But it is not insurmountable in a world that has commenced to throw off its animal impulses, and to reason, and to believe, that 'from the same source whence the soul first arose, a divine nature, raising aloft our head and root, directs our whole corporeal frame.'

I know, and it is hopefullest knowledge, that I shall be listened to by thousands with attention and respect when I urge that, in regard to these inherited perils, wise men and wise women will soon begin to think, even in relation to the marriage tie, before they of a certainty inflict those perils on the world. And with this hesitation such good will come as I dare not express. Let it be known that there are certain marriages which must lead to intermarriages of disease of body or mind; let it be known that results of combinations of this kind are inevitable towards premature death; let it be known that results of combinations of this kind are as inevitable towards sickness and death as combinations of health are inevitable towards health and long life, and we cannot but feel sure that no perversity of folly can long continue to produce through birth the most fatal types of all the fatalities. Let hereditary health be once recognised as an element of the marriage contract, and the health and life of the nation will receive a lease that shall double the value of one and the duration of the other. I speak on this point not from simple enthusiastic hope, but happily from a knowledge singularly cheering. A short chapter of mine in 'Diseases of Modern Life,' entitled 'The Intermarriage of Disease,' has itself during the last six years been the means of checking many of what would have been most deplorable instances of these intermarriages.

While this reform lingers we have some direct means in our hands for lessening the extent of even propagated perils. The tendency of hereditary perils is towards removal when the influences which support them and nurture them are removed. By beginning early in life to place those who are born to peril in conditions for good life, it is astonishing how much can be practically done for them in their bad if not in their worst estate. Take as an example of this reforming service the Annerley Schools, where waifs and strays of society, born to all kinds of physical perils, are tended and trained in mental and physical arts. It is like a regeneration. The bloodless, the scrofulous, the rachitic, the rheumatic, predisposed by birth to these afflictions, burst out into such active life that the diatheses seem in abeyance. Nature, always pursuing her unchanging course, would go with a bad system, no doubt, and cure the world of those affected by sweeping them from it, if they were left to their fate. Happily she goes also with those who work to save, and, aiding them, cures the world by restoring to it its life and re-endowing it with health.

In this cause and course the schoolmaster becomes the physician, and the more we have of this branch of the healing faculty the better for us all.

In the removal of the diseases by inheritance there are, then, two modes of treatment, the preventive and curative: preventive in wisdom of selection of parentage; curative in training those whom no prevention has blessed, into the choicest conditions for health in the seed-time of health.

There is yet another removable cause of these perils which I dare not, though I touch it with lightest finger, omit. It is indicated on the chart of sin and shame in dark, black, pall-like blot. It is the physical crime which men and women commit when in days of responsible life they acquire to themselves by intemperance and other terrible indulgences those inheritances of crime which pass to their children and proclaim their shame through them. If we could take the world, drowsy in ignorant lusts, and shake it into knowledge here, what crime and shame were saved in one generation, none can tell. I know the mass to be reformed is huge as the mightiest mountain, dense as lead. But faith and knowledge in steady action are all-potent even for overcoming this present overwhelming difficulty.

The accidental perils which beset the young in the seed-time of health, and which we accept as evils which sanitarians are bound specially to combat; those serious perils which spring from the exposure of the body to the poisonous particles which produce disease by contagion or infection, come next before us for removal. We call these perils contagious diseases; we call them plagues or pestilences, and, in respect to them, we have learned much that is accurate, and, I fear, much that is inaccurate. What is accurate is, however, the most important. We know the number of these diseases, we know that their number is limited, that it is confined to thirty at the most, and practically to little over half thirty. We know that the members of this class of diseases have different periods of incubation, that is to say, of period intervening between the reception of the poison and the development of the symptoms produced by the poison. We know that the symptoms of the diseases, once developed, run a regular course. We know that some persons are more susceptible to them than others. We know that, to a certain extent, one attack of suffering from many of the diseases is a cause of exemption from a future attack. We know that the diseases assume an epidemic or spreading character, and that each of them has its season in which its spread is so remarkable that its general course may be charted or outlined as connected with the time of weeks or months or years. And if, regarding the nature of the poisons which produce the diseases we know least and are most divided, we have, at all events, this precious knowledge, that the poisons themselves are removable and destructible, so that they lie within the range of human control.

What is more, we have the clearest demonstration that while the poisons of these diseases can be generated, cultivated, and disseminated, when the conditions for such generation, cultivation, and dissemination are present, they can also be prevented to such an extent that places which were their favoured homes can be made the places in which they cannot live.

When you enter a court of justice, to this day in some old country assize town, you see lying before my Lord Judge a bunch of rue. My Lord himself may not know what that bunch of rue means, and the man who cuts it and lays it out will give you, if you ask him, the strangest version of the ceremony. Some will rue the day when my Lord Judge comes down to try. That is true, many will rue the day; but the meaning is not there. That bunch of rue was once, not very long ago, the supposed antiseptic or purifier which interposed between my Lord Judge's nose and the fever-stricken prisoners at the bar before him. Once, not very long ago, the gaols from whence those prisoners were brought were the centres of the great pestilent disease, typhus. The men, stived up in those horrid dens, fed with air charged with their own emanations, and fed with food on which they starved, generated the contagion of disease. They were the cobras of society, secreting a poison worse than the cobra's, a poison volatile, subtle, deadly, that would diffuse into the air, and not spare my Lord himself if he came within the sphere of its influence. The goals then were the foci of fever. But a change took place. Howard, who was as good a sanitarian as he was a philanthropist, and whose rules for the construction of sick hospitals remain model rules to this hour, proclaimed his mission. The gaols began to improve; one improvement of a sanitary kind followed upon another improvement; the results began to arrest attention, and the good that was being done increased and increased with every year. And now, what think you is the triumph? The triumphant result is that in the gaols, the foci once of disease of the spreading kind and of worst types, spreading diseases cannot practically exist at all. We might lay roses before my Lord to-day instead of rue, or lay the rue on the dock instead of the bench, for the prisoner, in matter of risk from contagion, is actually safer than his judge.

I cannot overstate this lesson. If the homes of those who live in the seed-time of health; if the nursery, the schoolroom, the school dormitory, the playground, were only kept in the same state of physical purity as the model prison, the perils from the accidental diseases caused by infectious particles of diseases were soon removed, and the *immortelles* we see on the little graves so thickly laid in cemetery and churchyard were as little called for as the rue on my Lord's dais.

To you who are interested in the events that occur in the seed-time of health I press this lesson. I press it because of the truth it conveys, the plain, the practical truth, that the simplest means are all that are demanded for the removal of the most fatal of human foes. You are masters and mistresses yourselves of the position. Those shame-faced mourners who would not let the sun see their faults and sorrows, were not so much masters of the position, perchance, as you are; had not the dearly-bought experience that has been incurred for you. Shall you be less shamed than they when death from accidental causes which you could so largely control comes to your door or enters your domicile? Again I press this lesson, and there is need of it again, for yet another reason. Science in the main most useful, but sometimes proud, wild, and erratic, is lately proposing a desperate device founded on an hypothesis clever and specious, but not yet gilded with wisdom or proof, for the prevention of these infectious perils. She proposes to prevent one peril by setting up another. She would innoculate new diseases into our old stock in the anticipation that thereby the new diseases will put out the old. This may be called homœopathy on the grand scale; and if it goes on we may soon see the ranks of sanitarians divided into two ranks, as we see in medicine the regular and the homœopathic practitioners. I pray you be not led away by this new conceit of prevention. In infinitisimals the homœopathic principle may be harmless enough, and on the old adage,

> Our doctor is a man of skill;
> If he does you no harm, he will do you no ill.

It may sometimes seem to compare favourably with heroic methods of cure. But homœopathy on this grand scale, this manufacture of spic-and-span new diseases in our human, bovine, equine, and canine, perhaps feline, is too much to bear the thought of, when we know that perfect purity of life is all-sufficient to remove what exists, without invoking what now is not. I doubt, indeed, whether it were not better to continue in our present imperfect state than venture to make new additions of prophylectic maladies; and content, with Hamlet's sage advice,

> Rather bear the ills we have,
> Than fly to others that we know not of.

By a few rules, in short, which all prudent and wise people may carry out in their own homes, the accidental perils of the seed-time may be kept from the homestead as easily as from the prison-house. Let every man and wife be their own sanitarians and make their house a centre of sanitation. Let in the sun, keep out the damp; separate the house from the earth beneath; connect the house with the air above; once, nay twice, a year hold the Jewish Passover, and allow no leaven of disease to remain in any corner or crevice; let the house cleanse itself of all impurities as they are produced; eat no unclean thing; come back to the first-fruits of the earth for food; drink no impure drink; wear no impure clothing; do no impure act; and all the good that science can render you is at your absolute command.

The perils incident to the seed-time of health which I have called *inflicted*, come before us as altogether removable. To remove them skill even is not demanded; nothing is demanded but common human nature and common human sense. That every mother should nurse her own child; that in the early days of life, before the consciousness is naturally developed, the blessed sleep of infancy should be allowed its natural course; that the senses should not be oppressed until they are duly developed; that the quickly breathing lungs should be fed with fresh air; that the yet feeble digestive organs should be supplied with simple food; that the growing body should be clothed in warm and loose garments; these, surely, are practices the simplest people can carry out, practices easier than most which now prevail. Again, that gentleness should be the law of treatment to the young, and that the mind should be taught to know before the body is taught to suffer, that surely is a practice which all can carry out; a practice which both for learner and teacher is easier and better than many which now prevail. Once more, that the growing bodies of our youth of both sexes should be permitted to enjoy the full force of the growing power allotted to them; that such power should be permitted to play its part for their nutrition, so that the body may be endowed with its full maturity; that, surely, is a practice of letting Nature have her free course,—in other words, of letting well alone,—which all can follow much more easily than most practices that now prevail. Lastly, that the growing mind should be permitted its free and natural course to grow and grow throughout the whole term of its earthly life, and not be killed in its early career by the insane pressure of labours it is utterly unable to bear, or to apply if it could bear them; that, surely, is a practice simplest of all, most natural of all, and most certain for the promotion of intellectual and social advancement.

The fourth series of perils incident to the seed-time of health,—those which I have designated the *induced*,—are, like the last, entirely under human command. For them to be removed, however, a reform beginning with those who have passed the seed-time is the absolute necessity. These perils must cease, and can only cease, by the process of the younger learning what is right from the examples of the older and the wiser creations of humanity. While middle-aged and old men and women indulge in low and injurious luxuries and pleasures, which inevitably shorten and embitter existence; while these revel in intemperance, and break every sanitary law in the Decalogue and out of it, it cannot be expected that imitative youth will do less than follow in their staggering and bewildering footsteps. What now is wanted is the ideal of a new nobility. In the wild-boar days of human existence, in days when men, hardly emancipated from lower forms of life, crept out of their caves, their huts, their walled prisons, to see their nobler species go forth to exercise those rude arts of fighting, hunting, revelling, which formed the whole art of civilisation, there was a nobility which deserved the name, the representative of necessity. But now, when these arts have degenerated into mere childish imitations, mere apedoms of the great past, they are but injurious pretensions for nobility of soul and body. Once noble according to the spirit of their day, they are in this day ignoble. Gamblings and struggles for money, false fame, false hopes, false health, they kill the older, cripple the younger, pervert all. I say nothing but what is good of physical exercise; I would that every school were a gymnasium; I would that every man and woman could ride well, walk well, and skilfully exercise every sense and every limb. I urge only that this example be set, that all exercises, whether of body or mind, be carried out in purest habitude and in accordance with the enlightening progress of the age.

Approaching now the close of my discourse, I find two applications of thought with which briefly to trouble you; one general, the other local and connected with this passing hour. I have tried to bring before you the seed-time of health, the time when this humanity of ours, in body, mind, and spirit, is learning either to live well or to live ill, to live long or to live short, according to its life in the seed-time. I have shown how bad is the seed-time, how pressing the shame of it, and how shameless nevertheless. I have tried to show what are the elements of reform which in that seed-time are required. In general expression of thought I would, respectfully as earnestly, ask those who rule and govern us to look at this period of life as it is; to make it their test object of good or bad government; to assure themselves that when the death-roll of this period of life reports itself filling, filled, the government is bad, happiness out of the question; peace, order, national greatness all impossible; that when the death roll of this period is emptying, is emptied, all is well; that life then promises to run its completed course, and peace, concord, and prosperity to accompany the health that is ensured.

But to you, Brightonians, I address myself specially. It may easily be your fate, if you will it so to be, to have less cause for shame than even those shrinking mourners of whom I drew a picture in my opening lines. You, planted by the silver sea, have now, in spite of yourselves, a health you do not of yourselves deserve. You, whose coats the breeze of the sea brushes, whose homes it of its own wild will cleanses, you are made for the work of tending those who are living in the seed-time of health. That specifically, in so far as your resources permit, is your great mission. You have called us sanitarians here to speak the truth that is in us. Let our meeting be useful, and the date from whence you move until the shame of mortal events the sun should never witness be felt whenever they occur. You have before you opportunities almost without parallel. You have Nature with you in all her freshness, expanse, and beauty. Learn her ways from herself. Embarrassed by no traditions of antiquarian treasures, you can pull down and rebuild as freely as you can build anew. You are already a school-ground of schools: let that be your abiding tradition, and let your town, in which the ideal of a model city was announced, be the model Hygeiopolis itself, the common-health of the Commonwealth. Then your sons, proud of their ancestry, shall realise even here, that 'as is the heavenly, such are they also that are heavenly;' and approaching the Infinite Spirit, from whom all proceed and to whom all return, shall declare, not in words merely but in very deeds, that perfected consummation of sanitary principle:—'Thy will be done on Earth as it is in Heaven.'

During the reading of the address there were frequent manifestations of approval by the audience, and on the President resuming his seat a most enthusiastic burst of cheering followed.

The MAYOR said it was his great privilege to ask the assembly to join in a hearty vote of thanks to the President of the Brighton Health Congress for the instructive address he had just delivered, which would not be limited to those who had listened to it in that Dome, but would ring throughout England and throughout the world. (Applause.)

Mr J. R. HOLLOND, M.P., in seconding the vote, took that opportunity of saying that there were persons who thought a scientific view of the universe weakens the sense of responsibility, but he thought no one could have listened to the Presidential Address without feeling that that theory was utterly baseless. Every one must rather feel his sense of responsibility very much deepened.

The vote of thanks was carried with acclamations.

The PRESIDENT expressed himself deeply thankful for the vote. It had been at considerable labour and trouble that he had undertaken the responsible duties of President of the Congress. At the same time, he wished to bear testimony to the hearty manner of the invitation and the readiness he found on all sides to render him assistance. The Congress would be a considerable event, as it was the first of the great local congresses which had been held in the country. He trusted their hopes in respect of it would be realized; that it would be the means of spreading good everywhere, and that the results would come back again upon the town in good—physical, material, and moral—leading to every happiness, comfort, and solace in life.

Mr CHADWICK, C.B., proposed a hearty vote of thanks to the Mayor for what he had done towards the promotion of the Congress, which was one of the best and most complete he had ever seen. (Applause.)

Professor GLADSTONE, F.R.S., in seconding, expressed pleasure in being called upon to do so on personal grounds, and also on public grounds. His Worship was the worthy representative of Brighton,—a town where Londoners could very readily resort, knowing the welcome they always received and the facilities which the town possessed for such gatherings as the present one. (Applause.)

The MAYOR acknowledged the compliment paid him, and tendered a hearty welcome to those visitors from a distance who had come to join in the Congress.

ON THE PREVENTION OF EPIDEMICS.

ADDRESS

BY

EDWIN CHADWICK, C.B.,

PRESIDENT OF SECTION A.

I have been requested to give a Paper on the Health of Towns and on the sanitary legislation affecting them. In relation thereto I begin with an account of one special measure of such legislation, involving the sanitary principles of relief and protection against ordinary epidemics, such as the small-pox; and I believe I may best do this by a narrative of the measures for a defensive campaign undertaken to withstand the invasion of the extraordinary epidemic of Asiatic cholera in 1848-49, which may probably be new to most people at this time. At the first general Board of Health of which I was the chief executive officer we had, in 1848, warning of the approach from India of the enemy, and the threat by such infliction of a heavier slaughter by thousands than would be effected by visible enemies of the largest of hostile foreign hosts. Our first council was as to the nature and state of the former established defences.

ORIGINAL DEFENCES BY QUARANTINES. WHY DISCARDED.

Those of the old routine were for the outer defences by strict quarantines, and, when these defences were broken through, of hospitals, and a common treatment of the sick in them—almost of necessity in the later collapsed stages of the disease. We had information of the measurable distances of infection from the specific disease not greater than those of our common epidemics; but, as we showed in a report on quarantines, which was accepted and

J. E. MAYALL, 164, *New Bond Street, London, W.*

Edwin Chadwick

translated for circulation, the quarantine service as practised on the Continent as a defence, would be as an attempt at shutting out the east wind, and, for reasons which I shall give, utterly feeble and illusory as a defence against cholera.

LOCAL CONDITIONS OF ORDINARY AS WELL AS OF EXTRAORDINARY EPIDEMICS.

Our conclusions on that head have been affirmed by subsequent experience, especially by the vastly quickened international communications, by steam on sea as well as on land, which bring in and distribute everywhere persons in conditions of latent incubation of infectious disease, diffusing everywhere, according to our information, sources of infection that must have aggravated such visitations to an extent never heretofore experienced. I have shown that all the mischievous and false securities against epidemics, of quarantines, and grievous obstructions to international communication will have to be removed. It appeared to me and my colleagues, on examination, that the great impending visitation would probably advance as to places chiefly on the lines, in local conditions, on which ordinary epidemics now proceed. In Poor Law administration, I had been pressed by medical officers to take business out of its turn, because, from the state of the weather, they had a confident expectation that they would have some visitation of one of the ordinary epidemics to deal with. Asking one of them, the medical officer, what was the specific disease he apprehended, he stated that when he arose in the morning and found the atmosphere warm, moist, and stagnant, he always found that there would be an increase of some foul air disease; —it might be typhoid, it might be scarlatina, it might be measles, it might be small-pox, but of one species or another of eruptive disease he was sure to have in such weather in the low-lying and ill-drained districts. I asked a relieving officer of a large district—to test his knowledge of the habitat of such disease—whether, if I gave him some half-dozen cabs, he knew where, without previous knowledge, he could go and fill them to bring fever cases, and he said he could, just as a gamekeeper might go and get a bag of game—he said he certainly could; the cases might not be all of typhus, but fever cases of one sort or another, he knew where he could find them. It appeared that small-pox follows on much the same lines as typhus, and so does scarlatina, but with wider deviations as to classes of cases and conditions of persons. On passing through a low district I observed, "Surely this must be a fever nest," when out came some children with the marks of recent small-pox upon them. I remember that I was once consulted by Dr. Lyon Playfair as to the readiest mode of making a sanitary inspection of an urban district, without the medical officer's or the Registrar-General's returns, which there was no time to get out. I advised him to go into one of the primary schools, and select a group of the most squalid children, get their addresses, and go there. He told me that he had acted on this suggestion; and that, in the first school, there were two boys with particularly blotched faces, and he had found that their habitations were at the confluence of some putrid sewage. I have indeed myself, on view of the children of different large district schools, made proximate estimates of the comparative death rates of the districts whence they came; and it is a large and most pregnant fact, attested by experienced teachers, that as the lowest districts have been improved by sanitation, the type of the children received therefrom has been improved. On inquiring as to the course of the Asiatic cholera in its previous visitation, we found that it was very much upon the common fever conditions. It did not visit them all, but such as it did were visited with marked severity. Indeed medical officers of experience in the former visitation foretold in which streets, and on what sides of street, and into what houses it would again come; and their forecast was verified even as to the rooms of particular houses.

VARIED TYPES OF EPIDEMICS IN COMMON CONDITIONS.

The variations of the types of these extraordinary visitations, and their repeated attacks on populations in the like local conditions, and the state of the intelligence which continues those conditions, is a matter of profound interest in sanitation. In the City of York we had one classical instance presented of a particular court, called the Hagworm's Nest (the Hagworm is a species of anguis, infesting foul heaps), which by tradition was the first spot visited by "black death"; the first by the "great plague"; the first by the "sweating sickness"; and, as it remained unchanged, inquiry was made whether it was true to its traditions on the visitation of the cholera in 1832, and it was so. We have had analogies to such variation of the types of epidemic visitations on the like local conditions, in more recent times. For example, Dr. John Sutherland, our active sanitary inspector in London, and on the Army Sanitary Commission in the Crimea, and Captain Douglas Galton, in their report, as members of the Barrack and Hospital Improvement Commission on Malta, show that the same localities and houses in Malta which yielded the majority of plague deaths there in 1813, yielded the majority of the deaths in the cholera epidemies of 1839 and 1865; and that in the intervals the same localities yielded the majority of cases of small-pox, fever, and of an anthrax, a very special eruptive epidemic attended by carbuncles. Up to our time, although the occurrence of the epidemics on certain local conditions was noted, the occurrence was taken as a constant, and no steps were thought of or taken to change those conditions.

ALTERATIONS FOR PREVENTION MADE IN THOSE CONDITIONS.

The observation of the experiences had then pointed out to us that the first objective points of defence against the coming attack were the alteration as far as might be done within the time of the conditions of the exposed places, the sites of the ordinary foul-air diseases on their epidemic visitations. We sent out instructional notifications to the Boards of Guardians, and the Local Authorities, to put them on the alert against the extraordinary visitation coming. They were inapt and dilatory. We then sent out our sanitary inspectors to examine and report on the particular measures to be taken for the protection of the population in the most exposed districts in the Metropolis. It is to be observed, that action by such authorities at intervals of Board meetings are slow, and that, for prevention, it must be quick, and by skilled and responsible officers. Much was done in the lower districts there and elsewhere by extra activity in surface cleansing. Parish fire-engines were turned out, and courts and alleys were thoroughly washed down by them. For covering the excrement-sodden pavements and surfaces in the close courts, such as urban districts particularly of the Northern towns paved with bolder stones, we ordered fresh mould to be brought in, and a covering made over them and over dungheaps, some three inches deep, to serve as an earthwork, as it were. The people declared where this was done that they felt themselves in new atmospheres such as they never had before. We ordered pigs to be turned out and the styes to be cleansed. In some of the Scotch towns there was great uproar against this, but our orders were then law, and the pigs were turned out by the thousand, and kept out, until the epidemic had passed. Stagnant ditches were ordered to be drained. But we soon found that, simple as it might appear, the work of ditch cleansing could not be left with safety to the parish authorities, but must be done under skilled superintendence, as to methods and times, as otherwise the people were apt to spread the putrid contents over the banks and extend the evaporating surface, so as to generate immediate fever. Stable dung we ordered to be removed, and the stables in mews to be cleansed daily, and one experience I gained was, that by proper arrangements this might be done in ordinary times with little extra expense.

EVIDENCE OF THE CLIMATORIAL CHARACTER OF THE EXTRAORDINARY EPIDEMIC VISITATION.

But there were places which we found to be in conditions of filth that were irretrievably bad. There our only remedy appeared to be, as the epidemic advanced, to tent out the people. We borrowed tents from the army stores in the Tower, and ordered the people to be tented out in them, as at Wolverhampton and other places. One of them, the small fishing town of Mevagissey in Cornwall, presented when the cholera came an instructive instance of the climatorial character of the epidemic. People in the tents after some days got tired of bivouacing out and returned to their dwellings, where they were re-attacked with premonitory symptoms; they returned to their tents and were freed from them. They again ventured back to their homes and were again attacked. They returned to the tents, and were freed, and remained there until the epidemic had passed. I was informed that members of the bar of the Northern Circuit, on going to towns where the cholera was advancing, were many of them subject to premonitory attacks, on leaving one town were freed until they got into another affected town, where they were again attacked, and on leaving it were again freed.

During the prevalence of the epidemic, Lord Palmerston sent for me, and told me that the Queen had been invited to return from Scotland in the direction of one of the towns, and asked whether I thought it safe for Her Majesty to do so. I advised certainly not, and I did so from the belief that the epidemic was climatorial, and the information of the fact that passengers staying only for a night in the good hotels of one of the districts had been subject to premonitory attacks.

Instances were noted in India, Russia, and Germany, as characteristic of the epidemics, that birds, such as rooks, disappeared on its advance, and only returned on its departure. Thus, Colonel W. K. Stuart, of the 86th Regiment, in his Memoirs, states in relation to the cholera at Burantpore:—'Before proceeding further, I must relate a curious circumstance that occurred, which, in my opinion, establishes beyond doubt the fact that the cholera is atmospheric. Every person who has served in India must be aware of the number of kites, vultures, and other birds of prey that congregate around the cantonments of a regiment. For some days before the first case of cholera broke out, all these birds had disappeared; not one was to be seen, and they never returned until the plague was gone. Where they went to nobody knew, but such was the case. Surely they must have been made conscious by the sense of smell, or by some instinct, that there was danger in remaining in that atmosphere.' It has been held that the cholera is conveyed only by human intercourse; and when it advances itself, in the direction of lines of communication, it may appear to be carried in that way. If there had been any affected persons in the house at Mevagissy, it might have been surmised that the people returning were infected by the persons instead of the places, and in the places being many of them excrement-sodden the attacks might be ascribed to the alvine secretions which were probably exciting causes. But troops on the march in India have been attacked on particular open spots, clear of population, and on a change of position, as from one hillside to another, have been freed from attack.

We had neither time nor means to direct the efforts of chemists, to ascertain, if they could, what these aerial conditions were. But be those conditions what they might, they appeared to traverse districts in particular directions. In India there appears to be a cholera law on the subject. Thus cholera is moving along a certain line to the north-west. In the rural districts the people are sedentary, and they scarcely ever move from home. But onward moves the epidemic. At last it arrives on the borders of the desert, where there are no people, and no intercourse, no alvine secretions, and no sewers, yet the statistician sitting in Calcutta can tell almost the day in which the epidemic influence will have crossed the desert. On such facts there appears to be as little ground for speaking of the importation of the infection of cholera by persons, as there would be of the importation of the 'infections of skin eruptions,' which we know are attendant on the advent of the east winds.

EPIDEMICS INFECTIOUS THOUGH CLIMATORIAL.

I may here state, that although the evidence points to the fact of these large epidemics occurring at long intervals being chiefly climatorial, or affecting particular areas, they may yet be, and, as in the case of the small-pox, they largely are communicable by infection. Permit me to illustrate this by a story told of Beau Brummel: a friend met him with his throat muffled up, and asked what was the matter with him, when Brummel answered that it was owing to that rascal Tom his servant having put him in the same room with a damp stranger! Now a damp stranger might have done this to a highly sensitive person. But a crowd of damp strangers in a room might be really additionally dangerous, although the cause was climatorial, and due to the outside storm which made them damp. When an ordinary epidemic advances, is it ever observed, that there has been no extraordinary corresponding movement of persons, or of society preceding it? We directed an examination of the cholera advance in the metropolis, and found it did not advance in succession, case after case, but nearly simultaneously in widely scattered instances between which it was impossible to prove communication. By the various means I have recited, we got the local defences more extensively prepared than might have been expected, considering the very inadequate central staff we had at our disposal, and the weak local staff. We were greatly aided by reasoned notifications on which we derived great aid—from the clergy, and persons of education.

But we could not cover all points of defence effectively. There were obviously weak lines through which we must expect that the coming epidemic would break, and we must provide for a greater or less number of sick and wounded. For them the provision of hospital accommodation was heretofore usual and general, and the exclusive system. On this topic we made anxious inquiry. We sent for all the practitioners we could get together, who had been in the thick of previous visitations, and consulted their experiences as to what did do and what did not do in cholera.

WHY LARGE HOSPITALS' TREATMENT ABANDONED.

From them we gathered this experience; that, in the stages of collapse of the disease, the mere act of lifting up the patients from their beds to remove them frequently killed them; also that conveyance over rough roads in common cabs, or even in litters, delivered many dead at the hospital. In the hospitals, moreover, the mortality, under every form of treatment, was excessive. On the whole, with all defects of their homes, and the difficulties of medical appliances in them, it were better to let them remain there than to remove them. The evidence in support of this conclusion was so strong that we were led as a general rule to dispense with the provision for special, or even general, hospitals. We had then to resort to provisions for home treatment. At this time we made what was really, as regarded all antecedent treatment, a discovery.

DISCOVERY OF PREMONITORY SYMPTOMS OF THE EXTRAORDINARY EPIDEMICS.

Through my friend Mr. Hodgson, of the College of Surgeons, we learned that a doctor McCann, of Bilston, had made much observation of the previous course of the disease, and had ascertained that it had generally premonitory symptoms of slight diarrhœa, with rice water purgings, and that in that stage, if taken in time, it was amenable to regimen and medical treatment. This general fact was established upon the widest information we could collect. We, upon this, consulted the curative authorities, the College of Physicians, and obtained from them the sanction of medical treatment by opiate confection.

HOME TREATMENT OF THE PREMONITORY SYMPTOMS.

With this we inaugurated a general system of house to house visitation, to inquire as to each person in the family, whether he had experienced any premonitory symptoms, or observed rice water evacuations, and, if so, to give the medicines provided in packages; and to accompany such exhibition with instructions as to precautions in the regimen due to a weakened stomach. There was at first great difficulty in finding properly qualified house-to-house visitors, and getting them into action. Then it was that we had experience of the evils of the default of the local administrative organisation, against which I had from the first remonstrated, and which has yet to be removed for the effectual reduction of the ordinary epidemics—the evils, e.g., of allowing the public health service to be combined with the private practice. For at this time, when there was the greatest pressure for the public service, there was the conflict of the preponderant private interest in the greatest pressure upon the officer for his service to his private patients. We got the local deficiencies from this cause supplied as well as we could in the time, though it was with great inconvenience and often with loss. On the whole, the house-to-house visitation and home treatment was eminently successful in meeting the extraordinary epidemic, and it commends itself for adoption decidedly in dealing with ordinary epidemics. By it in this epidemic errors in regimen were most easily overcome. An effect of the visitation reported as observable in various districts, the causes of which passed without examination, was to depress vitality, to make it as if the people were made old and weakly by it, and to make irregularities and all errors in diet, which in ordinary times had been heretofore incurred with impunity, at this time particularly injurious. It appeared as if some of the common sources of water supply had been injuriously affected by a passing cause; so much did this appear to be the case in some of the rural districts as to create a suspicion in the minds of the people that their wells had been poisoned.

ORDINARY COURSE OF THE ATTACK OF THE EPIDEMIC.

The common course of the attack of the epidemic on a place undefended by any organisation was that it began with a large proportion of deaths to the attacks; one half, even, fell, then one out of three; as it spread widely the proportion of deaths diminished to one out of four, of five, and of six, and so it went on until the epidemic was exhausted. Its rise was represented by a curve, like a mountain; the curve then gradually fell in number and in the proportion of attacks, until the epidemic disappeared. At the first onset of the epidemic, no treatment appeared to succeed; as the epidemic spread, and the force of the attack weakened, and became utterly reduced, then almost every sort of medical treatment appeared to succeed, or had the credit of succeeding. By the defensive course taken, of the reduction of the local aerial impurity by the cleansing of the places, the number of the attacks was reduced; by the house-to-house visitation, and the dietetic and medical treatment, the proportions of the deaths to the attacks were immediately and decidedly reduced. So clearly was this the case, that if from the daily returns to one central office from any place it appeared that the proportion of deaths to the attacks were not reduced,—if the proportion of attacks still went on,—we were clearly of opinion that there must be some default, and that the house-to-house visitation must have been interrupted, or not carried out. In one large place the house-to-house visitation had been arranged and brought into operation, with the proper results. Suddenly the proportion of deaths to the attacks, and the attacks, rose again. It was evident to me, at the Central Board, that the house-to-house visitation was interrupted. One of our most efficient assistant-commissioners was telegraphed for and sent to the spot, where it was found, as apprehended, that, from some dispute amongst the local authorities, the house-to-house visitation had been stopped. Matters were arranged, the practice was restored, and carried on properly, when the proportions of the attacks, and of the deaths to the attacks, were again reduced, until they entirely ceased.

GENERAL RESULTS OF THE COURSE OF DEALING WITH THE EPIDEMIC, BY ALTERING THE LOCAL CONDITIONS AND BY HOME TREATMENT.

On a view of the results of this same great epidemic visitation of the cholera in continental countries, where it was met in the old way chiefly by reliance for defence on quarantines, and then, when it got in, on impromptu hospital accommodation, with general treatment necessarily chiefly in the collapsed stages, and a comparison with the results of the treatment we adopted of the removal, as much as possible, of the predisposing local causes, as by cleansing the places, and then of a house-to-house visitation and home treatment in the earliest stages, in the place of a general hospital treatment—it was evident that we obtained a gain of full two-thirds by our defensive course. Comparing the rate of mortality with that which prevailed in Sweden, where the ordinary death-rate was then lower than in Great Britain, but where our precautions and the home treatment were not taken, it appeared that we might claim to have saved some fifty thousand lives. But Professor Zedkauer, consulting physician to the Emperor of Russia, supplies decisive testimony of demonstrative facts on the point in a letter written to the last Medical Congress at Brussels. In that letter he says that 'to England is due the honour of having introduced on a large scale measures (prophylacticques) against the contagion of cholera.' He states that during the cholera epidemics of 1830, 1848, and 1855, there were not less than from 23,000 to 25,000 deaths, or from 47,000 to 50,000 attacked with cholera in St. Petersburg, but that in 1866, when they became acquainted with our practice in the house to house visitation and followed it, out of 15,000 attacks they had only 3,000 deaths. On an independent examination of the work for the attainment of the end described, I think it would be evident that if there had been any other than the ordinary distracted political attention prevailing at the Government; had there been a Minister of Health, such as it is now agreed that a State organisation requires, with a superior responsibility and interest in observing the beneficial working of the temporary administrative power confided to us—if it had been duly observed how large an amount of sickness and death was saved by the exercise of that power during so short a time, it may be submitted that there would have been an anxiety to make the authority permanent, to strengthen it, by due public acknowledgment of the service rendered, and to extend it. But when the extraordinary epidemic disappeared, the special organisation—the powers of prevention—were allowed to lapse.

INJURY TO THE PUBLIC BY THE CHANGE OF THE FIRST SANITARY AUTHORITY.

Some time after, the first Board which had achieved the result was discontinued; and its discontinuance was received abroad as a shock and injustice, and was publicly expressed as such by the chief sanitary authority of France. The uninstructed, unaided, and lax local administration reappeared, and with it the causes of the foul air diseases, and also the ordinary epidemic diseases which now cost some hundred thousand of the preventible deaths throughout the kingdom, the extent of such accommodation for which provision is now in question. The visitation of the cholera in 1848-9, which the first general Board of Health dealt with, reappeared in 1854, and had to be dealt with by the department, under the presidency of a political chief. Most beneficial examples had been achieved by the almost entire clearance of the common lodging-houses from the ordinary epidemics, by the application of the principles developed by the first General Board under Lord Shaftesbury's Act, and by the model lodging-houses, chiefly by house drainage, ventilation, and the prevention of overcrowding, initiated by the Prince Consort, where the death-rates of the class-occupants have been reduced nearly one half. But these examples cited in the general report, made for the new president by Dr. John Sutherland, our chief sanitary inspector, had yielded little imitation. It was found, on renewed local examination by the officers of the Board in the metropolis, that the local conditions of filth, and of the ordinary epidemic diseases, had reappeared, together with those ordinary epidemics. I may mention, as respects London, that our Board had elaborated a plan for placing the water supply of the metropolis under unity of management on a public footing, such as we had effected in a number of provincial towns, involving the adoption of the constant supplies, and the abolition of stagnation in cisterns which make good supplies bad and bad supplies worse.

FRUSTRATION OF MEASURES PROPOSED THAT MUST BE RENEWED IN THE METROPOLIS.

In the report made by a new inspector, Dr. Hassall, on the second reappearance of the Asiatic cholera, he is struck with the continuance of this evil condition, and he says, 'I beg to express my conviction that the water supply of the metropolis will never be in a satisfactory condition until the use of cisterns is abandoned, and the constant method of supply adopted.

INCREASED CHARGES INCURRED BY NON-FEASANCE IN THE METROPOLIS

But through the greater part of the metropolis this vicious system is continued up to this time (1881), together with the waste of more than three-fifths of the water pumped in, which is fouled water, saturates the excrement-sodden sites with a quantity of fouled water equal to a double rainfall, the results of which are shown in the supersaturated lower levels by double attacks of the ordinary epidemics. But this continuance of the old evils as respects the water supply is accompanied by augmented charges, sanctioned by Parliament, for double and threefold separate works, for the separate trading companies that would have been unnecessary under the unity projected on a public footing, which unity has since continued to be reinforced, as a necessity, by commission after commission. Plans had been got out, based on trial works, and experiences obtained of buildings for carrying out all the fouled water by self-cleansing house drains, and this would have been accomplished, as was proved by experiences in block buildings within the expenses incurred for amending and maintaining the old drains of deposit, or at about a third of the expense that must now be incurred by the individual householder who drains his house separately, even under one of the effective Sanitary Defence Associations that are now being usefully promoted. For the reception of the fouled water were provided chiefly tubular sewers, which by their ordinary dry weather flow were proved to be self-cleansing and to need no flushing. For the lower districts a concentrated flow and a quick discharge by engine power from pumps was prepared. For the relief of the low-lying marsh districts, which are a great source of the fogs of the metropolis, a separate system was in preparation on the principle of the successful drainage of the fen districts of Lincolnshire. From the results of the rudimentary applications of the sanitary principles executed in some twenty towns, as at Croydon, where the whole of the fouled water is out of the houses and out of the town on the land in some two hours, there can be no doubt that all the matter of putrefaction which now remains in ill-drained houses and the sewers of deposit for months and years would have been removed from the metropolis within half a day, with the result obtained in those several instances quoted, of a reduction of the general sickness and death rate by at least one-third.

DISUNITY OF WORKS MAINTAINED WHERE UNITY NECESSARY FOR EFFICIENCY AND ECONOMY IN THE METROPOLIS.

But to effect this, entire unity over the whole metropolis was essential for the combination to be effected by very special science. It would be too long, and beside the present purpose, to state how the sanitary authority which had prepared this was set aside by a surprise-vote against the Government, by combined adverse interests at a morning sitting, and how the succeeding political President of the Board brought in a "Bill" for the government of metropolitan works, by which all the requisite unity was destroyed; with the entire omission of the essential part of the system—the house drainage; and a bill was passed to effect the disunity by placing the trunk lines of the sewers under one authority and the branch lines under thirty-six others, and those others, of all authorities for dealing with a scientific work, the vestries! Under such rule the old conditions of the ordinary epidemics are maintained. On a recent examination of some mile of trunk sewer, which was a foot deep with putrid deposit, a line giving off fever into the public offices was discovered which, combined with bad house drainage and the foul sewage of the rest of the district, recently occasioned the loss of Dean Stanley.

HONOUR ERRONEOUSLY AWARDED FOR MALFEASANCE.

It is not unfair to observe that the President who, left to our officers and the partial use of our measures, without the increased experience that would have been available for the task of meeting the second extraordinary visitation of the cholera in 1854, and who brought in the measure which I have described as effecting the egregious subsisting disunity of works, which, if the condition of the metropolis is to be ever retrieved, must certainly be set aside, claimed, and was accorded, a peerage for that work, the mischief of which neither he nor the Government could have understood in the retention of lines, really of epidemic, neither he nor the Government could have known, and that all will have to be superseded by the system of unity and circulation for the more expensive as well as more mischievous one, now prevalent, of disunity and stagnation. By the change brought about at the Central Department, officers who had done the most meritorious preventive work, calling for acknowledgment, were put under a cloud, as it were, as if they had been doing something bad, only excusable by defaults of their instructions. In the metropolis the works were given over chiefly to railway engineers, who had nowhere done sanitary work or reduced a death-rate by a percentage. The first objective point for sanitation was the purification of the river by intercepting sewers, made great to receive, with the sewage, extraordinary storm water. Those works are pronounced to be great blunders, accummulating deposit, and acting as extended cesspools, giving off, like the one I have described, noxious products of decomposition. The expense of these trunk lines of intercepting sewers would, it is now shown, have sufficed for the re-drainage of every street, court, and alley in the metropolis, with self-cleansing sewers, and also to have re-drained the worst of the ill-drained houses. As to the river, Professor Frankland repeatedly reports its continued impurity.

MALFEASANCE MAINTAINED AS THE EPIDEMICAL CONDITIONS OF WATER DISTRIBUTION.

By microscopical examination he finds epithelia in it, human fibrine, and in a note to me he describes its condition to be one in which the people are made, as it were, refined anthropophagi, consumers of what has formed portions of humanity. Whilst these works were in full operation up to the last decade, there was a general increase of the death-rate. Since then there have been large reductions of overcrowding in particular districts. The City of London proper has been reduced in population to about half that of Brighton. Hence there has been a check and some reduction of the death-rates; but they are now in access by one-third.

MALFEASANCE MAINTAINED IN DRAINAGE WORKS AS CONDITIONS OF EPIDEMICS.

The great lines of the ordinary epidemics have, however, been left, and every measure which sanitary science had prepared will inevitably have to be restored, to bring up the metropolis to the sanitary conditions of the places where they have been properly applied, was left untouched. Our subject is then, how, there and elsewhere, to check the spread of the ordinary epidemics coming along those lines which complete sanitary measures will effectually close. I say effectually close, because I may adduce examples where former centres of epidemics which have been effectually closed to them, and in which the children's epidemics for example are effectually banished.

NONFEASANCE AS TO THE SPREAD OF EPIDEMICS IN SCHOOLS.

The primary schools are the common centres of children's epidemics. We framed a set of rules for the regulation of the duties of the local officers of health. One of these duties was that the officer should regularly visit and inspect the children of the schools, and that when he detected premonitory symptoms on one of them, he should separate it, and go with it to its home, and there take order for its preventive treatment. The course in the home would be to separate the well from the ill; to take order that the child should be placed by ieself in a room in a proper condition, and should have proper attendance and appliances, and that no one else should be admitted until after the disease had passed. It would follow that trained nurses should be appointed to visit the house, and see that the health officer's instructions are properly followed. We had provided regulations of the duties of the officer of health, which included weekly visits and examinations of children, at the infant and the primary schools. In going over the school with him the schoolmistress would point out to the inspector, or he would observe, the child with the premonitory symptoms to be looked to—the cold shivers, the pains in the head—and would separate it from the rest, and go home with it, examine the state of the habitation, and take order for the separation of the healthy children, and direct the sick ones to be kept alone, and give the requisite directions for its treatment; and a trained nurse would follow with more frequent visits to see that the directions were complied with. The regulations provided for similar visits and examinations of places of work; the separation of the workers, followed by visits to the habitation, and by the removal, as far as possible, of the injurious conditions found there. Had these regulations we had prepared been duly carried out, they would have carried preventatives to a great proportion of the excess of fifty thousand fatal cases in the school stages, in addition to the adult stages of life, of the classes the most scourged, and would have stopped the widespread of the ordinary epidemics.

REDUCTION OF THE DEMAND FOR LARGE HOSPITALS BY HOME TREATMENT AND SMALL HOSPITALS FOR EPIDEMICS.

They would have reduced the demand for hospital accommodation to the minumum. Dr. B. Richardson has lately examined the subject on the difficult question at present of hospital accommodation to meet the small-pox epidemics in the metropolis. He shows that by provisions for home treatment in analogy with those provided for in our regulations, that the demand left after home treatment would be met by four small refuges or hospitals capable of holding from ten to fifteen cases each; that such arrangement would meet all the necessities of that epidemic for Marylebone, with its hundred and fifty thousand of population. But by our successor, who was not instructed in the local adminstrative organisation needed, our regulations were superseded.

RECLAMATION BY MEDICAL AUTHORITIES OF THE RE-ENACTMENT OF THE ORDERS OF THE FIRST GENERAL BOARD OF HEALTH.

I consider this act as an adminstrative disaster, as a culpable misfeasance and nonfeasance, which has cost, and is costing, throughout the country many thousands of preventible deaths. In justification of this conclusion, I may state that by a select committee of the British Medical Association, appointed to consider the health laws, the same regulations have been reprinted, held forth and circulated, as models of sanitary regulations, of which they call for re-enactment. This view has been emphatically reinforced by all the medical Quarterlies. On re-examination it will be found difficult to deviate, without detriment, from the course of action which those regulations provide.

MODE OF STAYING THE SPREAD OF ORDINARY EPIDEMIC.

Meanwhile, until justice is reclaimed for the administrative service in behalf of the public, as much as possible should be called for by appeal for voluntary effort. Of what this may do in preventing the spread of the ordinary foul air epidemics, I will state the experience of a nurse of twenty years' practice as a specialist in dealing with the most infectious and dangerous of them, namely, scarlet fever. Her chief practice was the common one in respect to all cases of the varied epidemics—to isolate the patient in a single room, the upper room if possible, and let no one else enter it; to so arrange as keep the door and part of the window open in order to let a current of air pass through the room over the patient; to observe all the details of regulations as to the cleanliness of the patient and the articles of clothing and furniture, and the removal of excreta, &c., and as to her own personal protection, never to drink out of the same vessel that had been used by the patient, and to wash from head to foot twice a day with tepid water, and to change her clothes each day. With these precautions, she had never had a single case of the spread of the disease to a member of the family or anyone else during the twenty years; nor had she once contracted the disease herself! A collective example of the working of the principle provided for preventing the spread of epidemics is supplied by the Sanitary Aid Society near here, at Hastings, and at St. Leonards, under the direction of a very able and energetic lady, Mrs. Johnston. At Hastings, on the early information of the occurrence of infectious disease, the health officer attends, and she follows and visits from time to time more than he can do, to see that the requirements as to the isolation and treatment of the patient are duly attended to by the mother, or the female resident in the house as it may be. The service is given which would have been rendered, under our regulations, by a trained nurse visiting the patients at their homes instead of at the ward of a hospital. I am assured that the arrangement has the full efficacy we anticipated from our rule. As one example, it is stated that since it has been at work not an instance has taken place there of the breaking up of schools from the outburst of an epidemic. On the nurse's practice of the protection of herself by head-to-foot washing, I may note that two medical officers who had been through the most dire epidemics in the East stated to the Academy of Medicine that they ascribed their immunity to their careful attending to that practice. Virchow showed at the Medical Congress that Pasteur's germs must have a predisposition or a nidus.

FREQUENT BODILY ABLUTIONS PROTECTIVE AGAINST EPIDEMICS.

It may be that the ablution destroys them. However that may be, I consider it an important topic that escaped our attention on the occurrence of the great epidemic we had to deal with. If it were to occur again, I certainly would proclaim and enforce the active application of soap and water as a preventive. I had subsequent opportunities of observing its action as a factor of sanitation. I may state that I have received accounts of it, showing its efficacy, such as this. In one orphan institution, where the death-rate was twelve in the thousand, a cleansing of the place, the removal of cesspits and foul drains ere the cleansing was effected, the death-rate was reduced to eight in a thousand; and next, a cleansing of the person was effected by a constant ablution with tepid water, and then a reduction by another third, or to four in a thousand, was achieved. Other experiments tend to establish the value of personal cleanliness as a preventive factor at one-third.

EPIDEMICS EXCLUDED FROM INSTITUTIONS IN GOOD SANITARY CONDITIONS.

It is to be borne in mind that our immediate object is the prevention of the spread of the foul-air-diseases occurring on the lines of the ordinary epidemics, whilst Sanitary Science has now evidence of the primary prevention, or of the possibility of their occurrence; as in institutions, such as well-managed district schools on the half-time principle, where the children's diseases, as they are called, are, as of primary origin, banished; where a case of typhus has not been seen for years; as in well-administered prisons, the walls of which cannot shut out the epidemics of a climatorial character; but where, whilst they are freed from them, the surrounding populations are ravaged by them. In staying the spread of the ordinary epidemics by home treatment, or treatment in small refuges, we are saving the sufferers from the vastly increased dangers which statistics now demonstrate to be occasioned by collections of sufferers in the best appointed and the best managed huge hospitals. It may be objected that the intrusion of house-to-house treatment will not be accorded.

GOOD LOCAL APPOINTMENTS OF PAID SANITARY OFFICERS A MEANS OF ECONOMY.

As a matter of experience I can state that the house-to-house visitations, which we ordered under a penalty, during the visitation of the cholera, was everywhere well received, and that we did not hear of such refusals, or of any case for the infliction of a penalty. All, however, would depend upon the manner in which the law is executed, and the securities taken for the proper qualifications of the officers of health for the performance of the duties set forth in our regulations, the need of which has been reiterated on the part of the British Medical Association. The expense of the personal for the requisite improvement local organisation may be objected to by those who have still to be informed of the wastefulness of ignorance and of unskilled service. The extension required would be the attribution of some three thousand local health officers, who would be under the control of the Local Government Board, forming part of the greater local administrative force, including that for the relief of destitution, with which that Board is now charged. Objections were made locally to the appointment of some seventeen thousand paid local officers, including medical officers, on the principles of administrative organisation, set forth in my report of 1833, on the administration of relief to the destitute. But by that expenditure the adminstration was, with all shortcomings, vastly improved, and an economy effected of more than one-half over the unpaid services of the overseers and of the parish officers; such half amounting to upwards of four millions. Since then, by error in superior administration, it has been sent back, and the economies of the local taxation have been reduced. But here again I have the consolation of the vindication of principle by the recent reclamations of the representatives of the new local sanitary authorities (the Boards of Guardians), who have sent petitions to both Houses of Parliament, praying for a return to a more efficient adminstration of those same principles of 1833.

PETITIONS FOR THE ADVANCED APPLICATION OF THE ADMINISTRATIVE PRINCIPLES LAID DOWN IN 1839 FOR ECONOMY AND EFFICIENCY.

Petitions of the same tenor have been sent to Parliament from the Chambers of Agriculture with a view to the relief of the pressure of local taxation in the rural districts. With the warranty of part success in the economy of local rates by improved administration, I can undertake that, if I were in a position to examine the administrative officers myself, I could demonstrate the practicability of a relief to the amount of some three millions per annum of the local taxation, in compliance with the prayers of the petitioners, and, in that economy, there would be included improvement of the local sanitary service, which the British Medical Association have sought for in an improvement of the status of the executive sanitary local officers. In fact, the foregoing propositions may be now presented in the following light, viz.: that the object of sanitary administration is not merely to reduce suffering or alleviate misery, but to save money; and that our immediate object of preventing the spread of epidemic diseases is to prevent the spread of charges for curative relief or for funerals, and to prevent the cost of extended working disability, which must be borne on the rates or by somebody. It is a defect of our fiscal system that it gives only an account of expenditure, and is heedless of the results; and, in other words, gives no account of them in savings. In a recent report by the Local Government Board it is shown that sanitary administration in England and Wales during the last decade has, by scattered local exertions, somewhat emerged from the dead level, in which an inefficient reactionary administration had kept it, and that during the last decade there has been some movement and a reduction of the death-rate by nearly four and a half per cent., chiefly from the diseases prevented by sanitary work, and that this amounts to a saving of a quarter of a million of lives, and at least of three million cases of sickness (with proportionate amount of cash). For I have shown that this means, that, in the saving of the expenses of a quarter of a million of funerals, and of the cures of three millions of cases of sickness, the result at the very least is an economy of four millions of money, during the decade, in England and Wales.

CUNIARY GAINS BY EFFICIENT SANITATION IN THE CIVIL SERVICE.

This saving of money by sanitation is, however, estimated on a reduction of the general death rate by only 4½ per cent., whilst we have before us, in various parts of the country, examples of the reductions of death rates by 25 and 30 per cent., through rudimentary, very rudimentary, sanitation. But the economical operation is brought more closely in view in the case of the army. Whilst the losses by the sword had been as one, the previous losses by disease had been as heretofore, as more than three. On the return of the army from the Crimea, the service whose concern was with the smaller loss was honoured and conserved for further care and improvement; whilst the preventive service, conserved in the larger conservation of force, was allowed to pass away unnoticed and unrewarded. But it did appear to me that the service rendered by the Army Sanitary Commission, composed of sanitary officers trained under our first General Board of Health, who, it was declared by the War Minister, had saved the second army in the Crimea, had been allowed to pass away, unapplied and unappreciated—when it did appear to me that the experience gained in the Crimea might have been applied to the saving of our army in India, and, in 1858, I wrote an expository paper to that purpose. At the instance mainly of the Secretary of State for India and Miss Florence Nightingale, a Commission of the War Department was got to work as a Commission for the Protection and the Sanitary Improvement of the Army in India and other places. The service of that Commission for twenty years has been rendered mainly by two of the sanitary commissioners trained by us, whose labours had saved that army in the Crimea; namely, Dr. Sutherland and Mr Robert Rawlinson.

EXAMPLES OF ECONOMY OF MONEY BY GOOD SANITATION IN THE MILITARY SERVICE.

By the last returns it appears that the death-rate in the Indian army, which was formerly 69 in a thousand, was during the last decade 20 per 1,000; and that during that decade there has been a saving of life of 28,000 men, and a saving of force from sickness of about the same number, and a total saving of nearly double the British army at Waterloo. But no account is taken of the saving in money. It is an under-estimate at £100 per man, which makes the money-saving during the decade £5,321,700 for that period, an economy which may be commended to the attention of the Premier as Chancellor of the Exchequer, and to Parliament, with the assurance that, with a due attention to past sanitary service, and to the improvement of its organization, and effective position for the future—a yet greater economy may be effected. In further assurance of this, we may recall the partial economies of sanitation accruing, the economies first achieved, as I have recited, by our defences against the extraordinary epidemic with which we had to contend, when the savings of the expenses of funerals from premature deaths throughout Great Britain must have been about as much as if the whole of the present population of the City of London, 50,000, were killed and had to be interred separately. We may add to this the pecuniary economy of the saving of force by the saving of the health and lives of the second army in the Crimea, acknowledged to have been achieved mainly by the specialists trained under our Board. Altogether we may, I submit, claim credit for the collective economies of the past for the sake of the future—now especially—in claiming as a source of economy, if properly conducted, the relief of the population from the pecuniary burthens, direct and indirect, inflicted upon them by the continued retention of removable conditions of the ordinary as well as of the extraordinary epidemics.

GENERAL CONCLUSIONS FOR THE PREVENTION OF THE OCCURRENCE AND OF THE SPREAD OF EPIDEMICS.

I now beg to recapitulate the chief conclusions which the facts in question appear to establish.

That cases of small pox, of typhus, and of others of the ordinary epidemics, occur in the greatest proportion, on common conditions of foul air, from stagnant putrefaction, from bad house drainage, from sewers of deposit, from excrement-sodden sites, from filthy street surfaces, from impure water, and from overcrowding in foul houses.

That the entire removal of such conditions by complete sanitation and by improved dwellings is the effectual preventive of diseases of those species, and of ordinary as well of extraordinary epidemic visitations.

That where such diseases continue to occur their spread is best prevented by the separation of the unaffected from the affected, by home treatment if possible; if not, by providing small temporary accommodation; in either case obviating the necessity of removing the sick to a distance, and the danger of aggregating epidemic cases in large hospitals—a proceeding liable to augment the death-rates during epidemics.

The skilful and complete works of sanitation and the removal of conditions of stagnancy and putrefactive decomposition are the most efficient means of reducing the expenses of excessive sickness and death-rates.

For my own time there is little left to me but the valedictory vindications of established and experienced principles, and, for the sake of their advanced application, I would conclude in the terms of a passage which I quoted in my report of 1842 from a distinguished communicant and supporter at that date—Dr Wilson, of Kelso. After having noted some improvements which had taken place, as it were, accidentally, and independently of any particular aids of science directed to their furtherance, he observed: 'It is impossible to avoid the conclusion that much more still might be accomplished could we be induced to profit by a gradually extending knowledge, so as to found upon it a more wisely directed practice When man shall be brought to acknowledge (as truth must finally constrain him to acknowledge) that it is by his own hand, through the neglect of a few obvious rules, that the seeds of disease are most lavishly sown within his frame, and diffused over communities; when he shall have required of medical science to occupy itself rather with the prevention of maladies than with their cure; when Governments shall be induced to consider the preservation of a nation's health as important as the promotion of its commerce or the maintenance of its conquests—we may hope then to see the approach of those times when, after a life spent almost without sickness, we shall close the term of an unharassed existence by a peaceful euthanasia.'

The Mayor of Brighton (Mr Alderman W. H. Hallett) said he thought nothing could have enhanced the dignity of this Congress on Sanitary subjects so much as having the veteran—the great original leader in the cause of sanitary improvement—as President of one of its Sections. Mr Chadwick's work began very nearly half a century ago. His work was then done quietly and, as it were, "under the bushel," but now the whole of the thinking people of the kingdom were rising to the great necessity of preventing and avoiding the formation and propagation of disease, especially in areas where danger was greater through the aggregation of people. He moved a vote of thanks to Mr Chadwick for his address, and, in doing so, hoped that gentleman would have joy and continued health in his great age. (Applause.)

Mr Geo. Jacob Holyoake (London) seconded the resolution. He remarked that it was hardly necessary for him to say more than the Mayor had said on behalf of the vote of thanks they were solicited to give. But he had been asked to second the motion because he had had, during many years' personal knowledge of the great services which their President of that morning had rendered, not only to the working classes in the homes and quarters in which they dwelt, but also in the education of their children, for whom their President had taught and procured the means of those children being more wisely and mercifully instructed than they were years ago. He should only add that, while they understood last night from the observations of the President of the Congress, in a brilliant comprehensive address, —which united great completeness with great reverence, and singular beauty of speech with freshness of thought,—that sanitation had become a great human force, they had heard this morning an exposition of the manner in which it had become that force. They had had no teacher amongst them who had equalled Mr Chadwick in explaining facts to the people. (Applause.) He remembered well when Mr Cobden had great enthusiasm about facts being given to the public; he lived to discover and know in after years that facts given to the public, unless interpreted and explained, and made luminous by demonstrations of consequences, became practically uninteresting and useless. Mr Chadwick had not only been the prophet of this great movement; he had been more than that, he had been its architect. Mr Chadwick had taught the public what facts were, and explained them with a perspecuity and capacity which enabled them to see the consequences of them. Of this they had had an admirable specimen this morning. It was, therefore, not only for the ability with which he had delivered his address, and the nature of the facts he had communicated, but for the noble persistency with which, in years gone by, he continued in the great work when the public cared not for his lessons, that they would agree to give him a hearty and sincere vote of thanks. (Applause.)

Dr. RICHARDSON, in submitting the motion to the Congress, said he entirely re-echoed every word that had been spoken. He was always proud to speak of Mr Chadwick as his master, when he was present or when he was absent. It was to Mr Chadwick's work that he was first indebted for that spark of enthusiasm which had led him to become one of the leaders of Sanitary Science, and with far more pleasure than if they were being given to himself he should listen to the acclamations with which the vote would be sure to be received. (Applause.) He then vacated the chair to Mr Chadwick.

BRIGHTON CORPORATION WATERWORKS.

BY EDWARD EASTON, C.E.

THE proceedings of the meeting of the Health Congress at Brighton would scarcely be complete if a description were omitted of the means by which water, that most important hygienic agent, is provided for the wants of the great population in the midst of which we are assembled.

Brighton and its neighbourhood are fortunate in possessing a supply of water of the purest quality and practically inexhaustible in quantity. At first sight, the country surrounding the town would appear to be the least likely to afford such a supply; no streams run on the surface, there are no large ponds or collections of water, and the whole surface of the country is dry, even after the heaviest rains. But a closer observation of the great chalk Downs,—covered, as they always are, with a sweet herbage from which the sheep, for which they are so celebrated, can almost always, even during the longest drought, obtain a sufficiency of food,—will show that Nature is at work in some way that is not at first apparent. If, leaving the Downs, the observer betakes himself to the sea-shore, he will be astonished to see at low-water, trickling down from the beach left uncovered by the sea, numberless rills and streams of pure fresh water. Further, if leaving the sea-coast he drives along the foot of the noble escarpment of the chalk from Steyning towards Lewes, he will again find a great number of magnificent springs of the same pure water issuing from the bowels of the earth, but at a very different level to those he saw on the sea-coast. In some years, also, after intervals of greater or less duration, he will see, running down the generally dry valleys of the chalk which lead to the sea in different directions, large streams of water of the same quality, which seem to spring up suddenly out of the earth.

Those of you who took advantage of the opportunity, kindly afforded by the Corporation of Brighton, of inspecting the Waterworks at Goldstone Bottom, will have already obtained a fairly good idea of the causes which give rise to all these phenomena. In descending the hill leading from the Dyke Road, you were looking down into a basin, naturally formed in the chalk, of more than two square miles in extent. The middle or bottom of the basin is at least 60 feet below the lowest part of its sides. In a few hours there frequently falls sufficient rain to fill the lower and smaller area of the basin to the depth of several feet. No such result, however, follows the downpour; the rain disappears as quickly as it falls, and in less than an hour the surface of the ground is as dry as it was before the storm. The water has all been received into the absorbing ground, and is finding its way through the pores of the chalk down into subterranean streams, and so into the sea. But these streams are rills and not torrents, as they might be expected to be after the enormous downfall of rain; and there is clearly some storage reservoir intervening which has prevented its immediate discharge. This is the chalk itself, which acts as a sponge and stores up the water until saturation takes place, and it is obliged, as it were reluctantly, to give up what it has lost the power of retaining.

Brighton is situated in the midst of a considerable extent of country, all bearing the same character. For at least 6 miles to the north, as many to the west, and nearly 8 miles to the eastward, there is a succession of chalk downs untraversed by any river or stream. The geological formation is that of the Upper Chalk with flints. Throughout the whole of this district (with a few exceptions of no importance) there is no system of agricultural drainage. None is required. The whole of the rainfall, except that absorbed by the vegetation, or given off by evaporation, percolates at once into the chalk, and has its chief outlet in the sea, as before described,—its chief outlet, because all round the base of the great escarpment at the northern boundary of the Chalk Downs there flow out springs more or less copious, which are formed by the overflow of the great chalk reservoir when saturation has taken place. Such springs, for instance, are those at Poynings, at Plumpton, and at Clayton. They find their way into the sea by the river Adur, at Shoreham, on the west, and by the Ouse, at Newhaven, on the east. The volume of these springs, however, is but a very small percentage of the total quantity of rainfall, the main body of which is absorbed by the chalk, and by its means travels to the sea.

It has been variously calculated by different observers that from

$\frac{1}{3}$ to $\frac{2}{3}$ of the total rainfall in the chalk district is thus absorbed. It must not be forgotten, however, that a very considerable amount of water is also derived from the atmosphere at certain times of the year when the rain-gauge shows no indication whatever. This water comes not only in the shape of fogs and sea mists, but it is produced very frequently, especially in hot weather, by condensation. In no other way can we account for the persistency with which the ponds on the surface of the Downs, not only near Brighton, but on Salisbury Plain and other similar localities, maintain their height, although the water is used for the supply of cattle. At the commencement of the investigations for the British Association on Evaporation by Professor Symons and the Rev. Mr Griffith, they were astonished one very hot day to find that, instead of their apparatus showing a loss of water, there was an absolute gain, which gain had been absorbed from the atmosphere. This fact, which is sometimes lost sight of, will help to account for the great capacity of the chalk for giving out water. But although the chalk is as absorbent as a sponge, it is equally unready to give up its contents; and, consequently, were it not for some outlet more free and open than those afforded by its own pores, it would necessarily overflow, and the ordinary phenomena of surface-streams would result. These freer outlets are provided in the shape of clefts or fissures extending almost from the surface downwards to a very great depth, which have been formed, in all probability, in the first instance, and continually kept open, by the action of the water through a vast series of years. Where the stratification of the chalk has not been disturbed by local upheavals and depressions, these fissures are almost invariably at right angles to the coast-line; each is entirely independent of its neighbour, and forms in itself a small rivulet, which takes its origin from the supersaturation of the chalk, and flows down, collecting water as it goes, and finally discharges itself into the sea. The sides of these fissures are generally of the colour of mahogany, caused by the infiltration of small particles of the upper clays, and are polished by the continuous friction of the water. The fissures vary in size, but are seldom more than a few inches in width, and, generally, not more than $\frac{3}{4}$ of an inch; there is, therefore, considerable resistance to the passage of the water, and, consequently, as the body of the chalk gets full, the pressure keeps on increasing, as shown by the varying level of the water in the wells. The diagram on the wall shows the quantity of rainfall of each month for the twenty years, 1862 to 1881, and also the fluctuations of the level of the water in the wells on the Lewes Road. This latter varies, as will be seen, from as low as 5 feet in depth in the autumn of the year 1864 to as much as 88 feet in depth in the spring of the years 1866 and 1877. Speaking generally, the maximum quantity of water in the chalk is in March each year, and the minimum in October to December; and the curve formed by the depths of the water follows that of the quantity of rain at an interval of four months, the highest part of the one curve being nearly coincident with the lowest of the other. It follows that the chalk is acting exactly as a storage reservoir, and is receiving the surplus rainfall of the months of October, November, December, and January (when, in consequence of the low temperature and the comparative sluggishness of vegetation, nearly all that falls goes down to feed the springs), and giving out in the summer the quantity so stored. At intervals the reservoir becomes full to overflowing, and then is seen the phenomenon which is known in the Caterham valley as the rise of the Bourne, and the surplus water bursts out. This happened in 1852 in the Preston valley, when there was a considerable stream running down the London Road; in 1866 in the Lewes Road valley, when the basements of the houses were flooded with the spring water; and to a far greater extent in 1877, when the water overflowed in both these valleys to such an extent as to render it impossible for heavy traffic to pass for a considerable time between Lewes and Brighton. A similar bourne or overflow occurs almost every year in the month of November or December, in the valley leading down to the lower part of the town of Lewes.

The course of the rainfall in its passage to the sea is still further illustrated by four sections, which show the depth of water in a number of wells, soundings of which were all taken at the same time. Sections A, B, C give the soundings of wells situated in lines running northward from the sea, and as nearly as possible at right angles to the coast-line. Section D gives the depths of several wells dug at about the same distance from the sea, along a line running from E. to W. It will be seen that there is a uniform slope in the water-level of the chalk, in the former sections, whilst the water-level in the latter is almost the same throughout. The furthest of the wells in sections A, B, C is not more than two miles from the sea; but levels taken to a well sunk at the foot of the chalk escarpment about one mile east of the end of Clayton tunnel, show that the water there stands at the height of about 250 feet above low water, and that the line of the water in Section B B would, if produced, very nearly cut that of the well just mentioned, which is about six miles in a direct line from the coast.

The existence of the water being thus demonstrated, the problem to be solved by the Engineer was how to extract it in sufficient quantities for the wants of a population like that of Brighton and its neighbourhood. In 1853, the late Mr. James Easton, the father of the writer, and his predecessor as Engineer to the Waterworks, recommended the Company, who then possessed the undertaking, to adopt a plan which he had been the first to originate when supplying the town of Ramsgate in the year 1834, and which was to sink wells down to the level of low-water mark or thereabouts, and drive tunnels or adits at the bottom of these wells, running in a direction parallel with the coast-line, so as to cut as many as possible of the fissures before alluded to, and so intercept the water before flowing to the sea.

Before this period, Brighton had been supplied, but very imperfectly, from a well sunk near the Lewes Road, where a boring had been made and pumping works established, which sufficed for about half the number of houses then existing in the town. Acting under the late Mr. Easton's advice, new wells were sunk at this place and tunnels driven, which have been extended from time to time as the town needed more water.

Up to the year 1865 the whole of the town was supplied from the Lewes Road works, but in that year it was determined, in consequence of the great demand for water, to erect another pumping station on the west side of the town. Accordingly, a well was sunk at Goldstone Bottom, and tunnels driven to the extent of about a quarter of a mile across the valley, parallel to the sea. Goldstone Bottom is a naturally-formed basin in the chalk, of which the lowest side, nearest the sea, is more than 60 feet higher than the middle or bottom of the basin. The water is obtained, as at Lewes Road, from fissures running generally at right angles to the coast-line; but they are of much larger size, and at far greater distances from each other; whereas, at the Lewes Road works, it is rare that 30 feet of tunnels were driven without finding a fissure, and the produce of the largest was not more than 100 to 150 gallons per minute, at Goldstone nearly 160 feet were traversed without any result, and then an enormous fissure was pierced, which delivered at once quite

1,000 gallons per minute; and the same interval was found between this and the next fissure, which was of a capacity very nearly as great. In consequence of the great size of these there is a much freer vent to the sea, and the water stands relatively to the Lewes Road valley, at a much lower level, being generally not more than 25 feet above low water. The fluctuations also of the water are not great, the difference of the quantity of water being felt rather in the impossibility of the pumps lowering its level than in its rising higher.

The total length of the tunnels at Lewes Road Works is about 2,400 feet, and at Goldstone 1,800 feet.

So much for the sources of supply. It is now necessary to give a short description of the means by which it is conveyed to the consumers.

The district supplied by the Waterworks comprises not only the parish of Brighton, but the neighbouring parishes of Hove, Preston, Rottingdean, and Patcham. The number of houses supplied, which, in 1854, when the new company purchased the Works, did not much exceed 7,000, had risen on the 1st of August, 1872, when they were transferred to the Corporation, to 18,000. The number now on the the rate books is about 24,000. The number of inhabitants at the last census in the whole district was 130,000, to which must be added, in the fashionable season, from 30,000 to 50,000 visitors.

The area of the district is considerable, being as nearly as possible 7 miles in length from east to west, and about 5 miles from north to south. The ground is very undulating, varying in level from 30 feet above the sea to as much as 550 feet. In order to avoid lifting the water higher than is necessary, and at the same time to prevent undue pressure on the service-pipes and fittings, the plan has been adopted of dividing the district into four zones or services, each fed by its own reservoir or reservoirs, with its own system of main pipes. The highest zone (at present but little built upon) is commanded by a reservoir containing 500,000 gallons, built at a height of 470 feet above the sea, on the Down, about half-a-mile north of the Grand Stand of the racecourse.

The next is called the high service zone. It is fed from two reservoirs—one at Park Road, on the east, containing 500,000 gallons, and the other on the Dyke Road, on the west side, containing 600,000 gallons; both of these are at the same level of 300 feet above the sea; they are connected by distributing mains, and afford a supply to about two-ninths of the town.

The third is the middle service zone, containing about three-ninths of the whole number of inhabitants. It draws its supply from a reservoir near Brighton Park, containing 2,000,000 gallons, the water-level being 220 feet above the sea, and another, on the west side, near Upper Shoreham Road, containing 1,000,000 gallons.

The fourth, or low service zone, contains about four-ninths of the whole population, and is fed from two reservoirs— one above the Lewes Road Works, containing 1,000,000 gallons, and the other, at Goldstone Bottom, 600,000 gallons. These are at the level of 150 feet above the sea.

The Corporation have acquired land for the construction of two additional reservoirs, one on the east and one on the west side of the town, to form another zone, intermediate between the high and highest services, at a level of about 400 feet above the sea.

The high and low services, as already mentioned, have reservoirs at the same level on both sides of the town, with main pipes connecting them together. Those on the west side were constructed in 1863, 1865, and 1871, when the western districts increased, and it was found difficult, in consequence of the great length of the supply main, to give proper pressure at the extremities of the districts. The effect of putting them at the same level, is, that during the night, when little water is drawn by the consumers, the water pumped into the reservoirs on the one side passes through the mains to those on the other, and becomes available in the morning for serving the houses, the supply being drawn at an equal pressure from both reservoirs simultaneously, the length of the supply mains being thus practically reduced by half.

All the zones are connected together, and stop-cocks are arranged so that, in case of fire, the water from the upper can be let down into the lower service mains, self-acting valves being fixed on the outlet of each reservoir to prevent the passage into it of the water from the reservoir above.

The water is supplied both on the intermittent and constant system. When the Water Company obtained their first Act, the intention was to furnish a supply only on the constant service; but, on buying the old works, they found themselves unable to keep up the supply, in consequence of the enormous waste of water caused by the old fittings in the houses, and, as they could not obtain any relief in the shape of delay, but were obliged at once to give constant service, the directors determined to lay a duplicate set of service-pipes in every street, so that when called upon they could give either form of supply to every house. This was done, and Brighton is now in the position of being able to give constant service to one house, and intermittent to the house next door in the same street. The number of constant service customers now amounts to about 12,000, or about half of the whole number.

The pumping power at the two stations of Lewes Road and Goldstone Bottom is as follows :—

At Lewes Road there are two engines of the nominal power of 100 horses and 150 horses respectively, the one capable of raising out of the wells 130,000 gallons per hour, and the other 150,000 gallons per hour; the boiler power at this station is equal to about 350 horses.

At Goldstone Bottom there are two engines, each of the nominal power of 150 horses, raising 150,000 gallons per hour, and supplied with steam from six boilers of the collective power of 480 horses nominal.

The engines are all on Woolf's principal, high and low pressure condensing beam-engines, the smaller cylinder being 28 inches diameter, and the larger 46 inches, the stroke of the latter being 8 feet. They are erected directly over the wells, which are of an elliptical shape, 12 feet across the longer and 8 feet across the shorter axis. The centre of the beam is immediately over the centre of the well. On each side of the centre, at the bottom of the well, is fixed a single-acting pump 29½ inches diameter, 3-feet stroke: these pumps raise the water into the lower service reservoirs above described. Also under the beam, at the crank end, is fixed a bucket and plunger double-acting pump, drawing its water from the delivery of the deep-well pumps, and forcing it to the high or middle service at pleasure; this pump is 2-feet diameter, 4-feet stroke. At the Lewes Road Works there are also two sets of three-throw pumps, capable of raising 400 gallons per minute each, and at Goldstone a horizontal double-acting pump, equal to 600 gallons per minute, for the middle service. The highest service of all is fed direct from the Lewes Road Works, there being a separate double-acting pump under each engine at that station exclusively for its supply, and also from a water-pressure engine fixed at the middle service reservoir sucking its water thence and forcing it into the highest service, the power required for this operation being obtained by passing the water from the high service into the middle service, the difference of height between the two reservoirs being, as before stated, 80 feet.

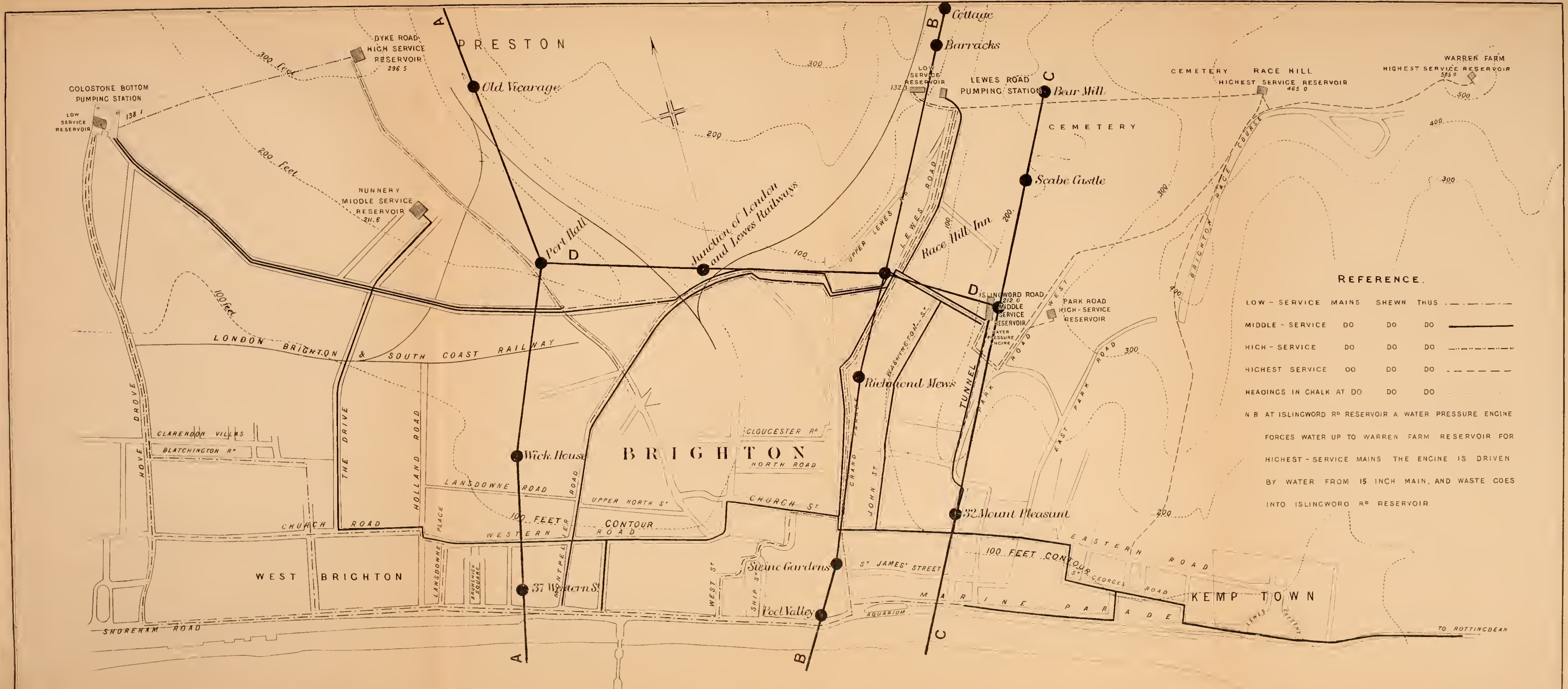
Thus each of the engines, at the same time, can pump into all the three zones or services, and keep up the supply without any manipulation of cocks and valves, and without altering the working pressure on the engine.

The reservoirs are all constructed in the chalk, of brickwork, without any puddle; they are lined with two courses of tiles in pure cement, and are arched over with 4½ brickwork in cement, and covered 12 inches to 18 inches deep with soil. This arrangement keeps the water perfectly pure and cool, and prevents the vegetation which grows so quickly in chalk water when exposed to the action of light and air. From the time of its leaving the tunnels at the bottom of the wells to its being delivered into the houses it is never exposed to any contaminating influence, and is thus used by the inhabitants, especially those on the constant service, in a perfectly pure state.

The total quantity of water pumped during the year is between 1,100 and 1,200 millions of gallons—equal to about 3,200,000 gallons a day. Assuming that the visitors take an extra 10 gallons a head per day—a quantity which the author has found by experience in other watering-places in generally consumed by that class of the inhabitants—there results a rate per head on the ordinary population of from 23 to 24 gallons for all purposes, including street watering and flushing of sewers. This satisfactory result in regard to the waste of water, as compared with that of most other towns, has been obtained by constant inspection of the house fittings and services, and by the adoption of Deacon's water meter, which has enabled the inspectors to detect waste, just as was done at Liverpool and many other places.

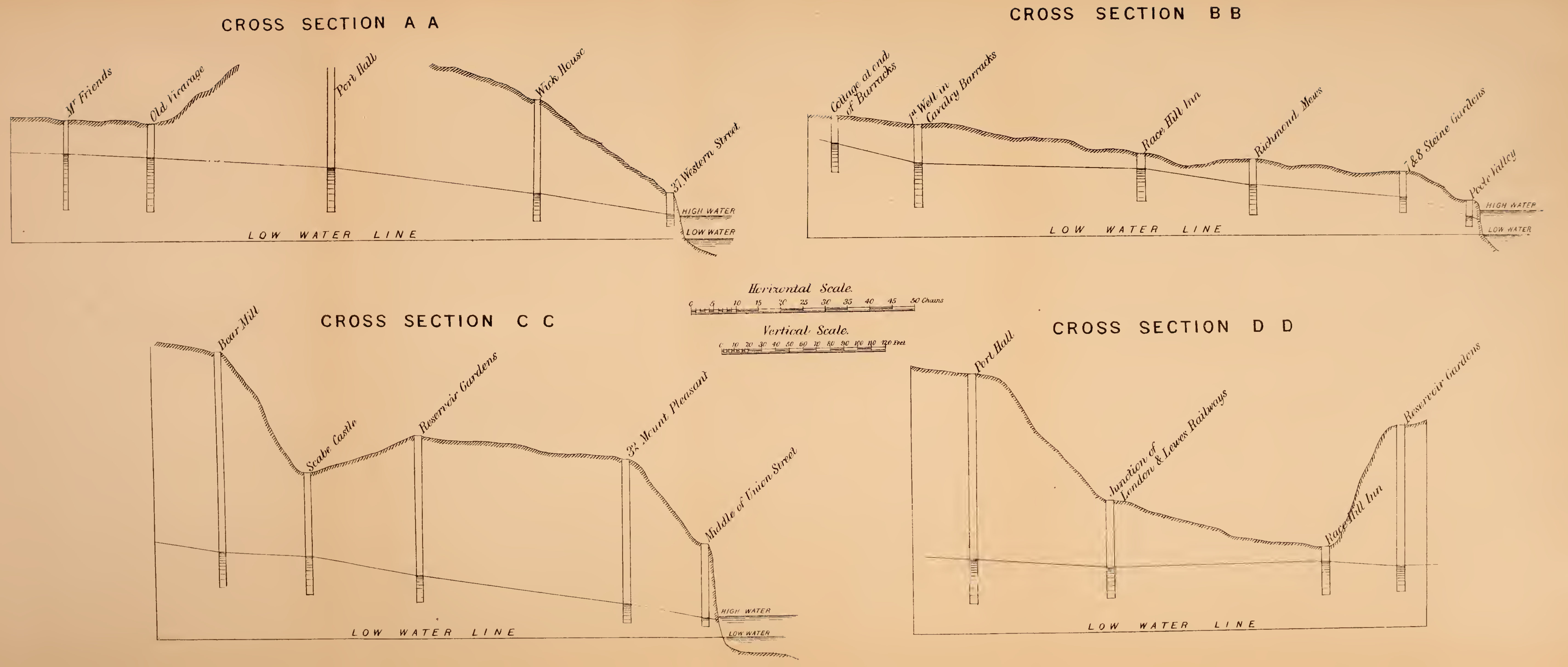
The amount of water that at present can be pumped in the dry season, without exhausting the wells, is not less than 5 millions of gallons daily at Goldstone Bottom, and from 2½ to 3 millions of gallons at Lewes Road Station.

Before concluding, I wish to take this opportunity of directing attention to the admirable manner in which the Corporation, acting through its Water Committee, have managed this important part of their business, and to the foresight with which they have kept pace with the rapidly increasing demands of this great population.



SCALE 4 INCHES TO A MILE.

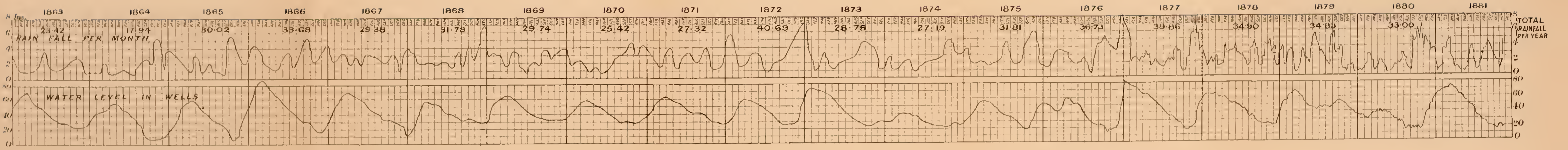
WATERLOW & SONS LIMITED, LONDON WALL, LONDON.



CROSS SECTION A A
Mr Friends
Old Vicarage
Port Hall
Wick House
37, Western Street
HIGH WATER
LOW WATER
LOW WATER LINE
CROSS SECTION B B
Cottage at end of Barracks
1st Well in Cavalry Barracks
Race Hill Inn
Richmond Mews
7&8 Steine Gardens
Poole Valley
HIGH WATER
LOW WATER
LOW WATER LINE
Horizontal Scale.
0 5 10 15 20 25 30 35 40 45 50 Chains
Vertical Scale.
0 10 20 30 40 50 60 70 80 90 100 110 120 Feet
CROSS SECTION C C
Bear Mill
Scabe Castle
Reservoir Gardens
32, Mount Pleasant
Middle of Union Street
HIGH WATER
LOW WATER
LOW WATER LINE
CROSS SECTION D D
Port Hall
Junction of London & Lewes Railways
Race Hill Inn
Reservoir Gardens
LOW WATER LINE

Water Supply from Chalk.

Diagram of Rainfall and Water Level in Wells at Brighton.



GEOLOGY AND CLIMATE OF BRIGHTON IN RELATION TO HEALTH.

By EDWARD MACKEY, M.D. (Lond.), M.R.C.P.

Brighton is situated nearly at the centre of the curved line of coast extending between Beachy Head and Selsey Bill.

From the point of view of this paper, it is usual to divide it into three districts, East, Central, and West, and this division (which might be extended) is borne out by the differing character of the soils. To the *east* (and again upon the Downs at the north-west), we find a great depth of chalk, 30 or 40 feet or more, covered with a thin layer of earth. The *central* part, *i.e.*, the Old Steine and the Valley running north towards Preston, is alluvial soil, shingle, and marl. Quite at the *west*, in Hove, and on the Stanford and Aldrington Estates, is an extensive bed of clay, varying from two to twenty feet in depth, whilst between this part and the Steine Valley is a district intermediate both as to soil and elevation.

To consider these more in detail: the East Cliff is not all solid chalk, but is largely formed of what is known provincially as "Coombe rock," geologically as the "elephant bed,"—broken chalk with flints in a yellowish calcareous mass—a coarse conglomerate—not stratified but all disordered as usual in alluvial deposit; in this, broken marine shells are interspersed with water-worn blocks of sandstone and ironstone and small masses of crystalline iron carbonate and calcareous spar. The organic remains found in it include not only bones of ox and deer, &c., but also of the Asiatic elephant (which give the name to the formation); some of these are in the Museum, others are figured in Dixon's Geology of Sussex. In brief, we have on this cliff, and down to as far as the side of the watercourse that flowed through the Old Steine, a soil—alluvial, it is true—but of so long ago, so dry and porous, as to be admirable from a health point of view.

Through the second district,—the valley between the east and west cliffs,—I have said that a stream of water flowed. Rising from a *well* at Patcham, it was called the Well'sbourne or brook, and gave its name by corruption to the Hundred of Whalesbone, in which Brighton is, legally speaking, situated; it debouched at Pool Valley, which is probably a silted-up harbour. The soil along this valley is also alluvial, but of much more recent formation. Less than 100 years ago (1793), the then Prince of Wales constructed a sewer to carry off the piece of water, shown in maps before that date to exist on the Steine; and within the last thirty years the so-called "Level" and Park Crescent have been inundated from an overflow of the brook. Along this track but little chalk is found; it is mainly shingle and marl with clay in patches, hence it is a damper soil than the first described,—the air is moister, and mists, not to say fogs, are more frequent. As a point of interest may be noted the occurrence of glacier boulders in this valley.

Rising from it towards the west, up North Street and to Queen's Road, the southdown formation of chalk is again reached, and extends for some distance by the sea. In Russell Street and even in West Street clay is found in patches; and beyond the West Pier, it begins to form a main proportion of the low-lying land along the front. Within recent memory Brunswick Square and Palmeira Square were brickfields, nor do I believe that their stratum of clay was wholly dug out before the house foundations were laid; further west, to Portslade, the surface land is almost wholly marl and clay.

In the "Montpelier district," a down, mainly chalk, rising to a height of more than 200 feet at the N. and W. of Regency Square, there is a large patch of surface clay at the upper part. Furze Hill represents a curious and anomalous mixture of soils, and it has been thought to be of volcanic formation—a theory for which some support may be found in the presence of mineral springs there; the sub-soil is damp.

It is almost a truism to say that the soil directly influences climate. Speaking generally, on the *chalk* the air is dry and comparatively cool, not to say cold and sharp, and its effect on the system is bracing; over *sand*, the air is also dry but warmer, often relaxing, though over gravel, in open country, this latter quality is not so marked; in districts where *clay* forms either surface or sub-soil, the air is often raw and damp, and disposes to catarrhal and rheumatic disorders. (The respective absorptive power of heat of these soils has been found to be in the ratio—sand, 100; chalky arable land, 74; clay, 68—Schubler.) But the question of climate is more complex than this, and modern science expects for its solution long-recorded exact results registered by instruments of precision.

Examination of records of mortality will tell something, but not much, under modern conditions of life; for the best of natural climates may be neutralized by imperfect drains or the fever of dissipation.

As Dr. Richardson said last night, Nature has done much for us in this locality, but our claims as a health resort are not improved by building streets on the one hand, of close, small, cramped, crowded tenements; or, on the other, of terraces and squares of lofty piles of brick packed together without an inch of garden or airing ground, drawing their air supply often from a basement in doubtful sanitary condition, and in which not only health and comfort but frequently "sweetness and light" are sacrificed to a fine outside and a large reception room—such things would make an artificial climate injurious to health in the Garden of Eden. (I must add, however, that my remarks do not apply to the latest buildings in the Avenues, in Wilbury Road, or on part of Mr Willett's estate.)

In estimating the *natural* climate of a place, we consider not only the soil, but (1) the aspect, here towards the S. and S.W., (2) the situation, which is partly on a slope of the chalk downs, partly in an open valley—(3) the amount of sunlight—(4) the air temperature in the shade—(5) the amount of rain and humidity—(6) the barometer pressure—(7) the direction of prevalent winds and sea currents.

Some figures with which Mr F. E. Sawyer has been good enough to furnish me supply the necessary data on these points: they represent his own observations for a number of years in the upper part of the Montpelier district, a N.W. aspect, 200 feet above the sea level.

(3) As to *sunlight*, take the averages for the last eight years. There have been 13 days without sun in January, four days in May and June, three in July and August; for the average total per annum, 90 days,—about one quarter of the year. Unless reduced to figures in this manner one would think there were scarcely so many sunless days, for a marked element in the typical climate of Brighton is the clearness and brightness of the air, resembling that of the best parts of France rather, than an ordinary English blurred, or misty atmosphere.

(4) The *mean temperature* of a place is one of the main points bearing on its climate: taking the last 13 years, it stands at 50° in the

shade. The highest was 86·7 in July of the year 1868; the lowest 11·4 in January last; the yearly range was 75, the daily range was 11·7. The Greenwich mean for 60 years is 49·1; that at Plymouth for 16 years, 51·6; at Eastbourne, for a shorter period, 51. It is remarkable how little the temperature of a given place varies when the averages of long terms of years are compared. It may differ from other places on the same parallel of latitude, but it remains curiously consistent to itself. Thus, the Greenwich mean temperature of one period of 20 years differs by less than half a degree for that of another similar period. It will be seen that the Brighton average here quoted is slightly higher than Greenwich; an average taken on *the coast* would probably be lower.

To the *range* of temperature, *i.e.*, the number of degrees between the highest and lowest points recorded in one day, we attach the utmost importance in chest cases, and 11 degrees is not a bad record. In some places, Malta for instance or Malaga, the range is much less, 6 or 4 degrees, and on the deck of the great Garth Castle, during its last voyage to the Cape, the temperature did not vary 5 degrees day or night—a very paradise for sensitive lungs. On the other hand, in inland places, the average daily range is usually higher; at Greenwich it is 16, at Uckfield 17, and in climates where lung disease is specially prevalent—I refer to some American stations —a daily range of 30 occurs;—thus our daily range of 11, though trying sometimes, and perhaps higher than that of some other places along the coast, is not great, comparatively speaking. From the table it will be seen higher in summer than winter.

MONTHS.	AIR TEMPERATURE IN THE SHADE (13 years. 1868 to 1880.)								
	Max.	Date	Min.	Date.	Range	Mean max.	Mean min.	Mean daily range.	Mean.
JANUARY	54.7°	19, 1877	11.4°	22, 1881	43.3°	42.9°	35.5°	7.4°	39 2°
FEBRUARY	56.7	27, 1868	20.5	12, 1870	36.2	44.8	36 6	8.2	40.7
MARCH	61.4	30, 1873	22.8	11, 1874	38.6	47.9	37.0	10.9	42.5
APRIL	71.5	28, 1869	28.0	26, 1873	43.5	54 7	41.4	13.3	48.0
MAY	78 5	27, 1868	31.0	8, 1879	47.5	60.2	44.9	15.3	52.6
JUNE	79 8	16, 1870	38.0	4, 1871	41.8	67.3	51.4	15.9	59.3
JULY	86.7	17, 1868	45.4	8, 1877	41.3	70.9	55.8	15.1	63.4
AUGUST	84.5	17, 1876	44.0	2, 1875	40.5	69.7	55.9	13.8	62.8
SEPTEMBER	77.2	7, 1868	37.7	22, 23, 1872	39.5	64.7	52.0	12 7	58.3
OCTOBER	72.0	8, 1869	27.0	28, 1869	45.0	56.5	45.5	11.0	51.0
NOVEMBER	60.4	14, 1876	24.6	30, 1879	35.8	47.8	38.8	9.0	43.3
DECEMBER	56.4	1, 1876	18.0	23, 24, 30, 1870	38.4	43.1	35.4	7.7	39.3
RESULTS	86.7	July 17, 1868.	11.4	Jan. 22, 1881.	75·3	55.9	44.2	11.7	50.0

(5-6) As to *humidity*, the mean barometric-pressure for the last nine years is 29·961, which corresponds almost exactly with the normal pressure for this country; the mean amount of humidity is 82 (taking 100 as saturation point). The driest month is May, from which time humidity increases rapidly to its highest point in January. The mean monthly fall of rain has been 28·87in.; the average of rainy days, 164. The significance of these numbers is, however, lessened by the fact that there is scarcely one day—certainly there are not 10 days—in the year when, at some hour or other, there is not sufficient clearness for necessary exercise in the open, and, thanks to paving, or asphalte, or chalk (along the coast line at least), without mud and without wet feet. Note also, in estimating the effect of rainfall, the great porosity and sloping character of the ground, and remarkable absence of decaying vegetable matter. Land fogs are uncommon here; and morning and evening mists are dispersed earlier in the day and return at a later hour than in many places.

The rainfall in the Weald of Sussex beyond the high line of the Downs is much greater, partly because their heights attract the clouds; it is said to be greatest at Crowborough.

MONTHS.	BAROMETRICAL PRESSURE, CORRECTED AND REDUCED TO 32 DEG. AT SEA LEVEL (9 years, 1872 to 1880).						Mean Degree of Humidity at 9 a.m., Saturation 100.	Mean Amount of Cloud (0 to 10) at 9 a.m.	Mean Number of days without Sunshine (1872 to 1880).
	Highest	Date.	Lowest.	Date.	Range.	Mean at 9 a.m.			
	Inches.		Inches.		Inches.	Inches.			
JAN..........	30.712	1878	28 514	1872	2.198	30.050	92	7.6	13
FEB..........	30.801	1873	28.902	1873	1.899	29 954	91	7.9	13
MARCH ...	30.732	1874	28.437	1876	2.295	29.970	84	7.1	9
APRIL......	30.558	1875	28.931	1879	1.577	29 893	77	6.7	6
MAY.........	30.511	1879	29.355	1877	1.156	29.996	72	6.8	4
JUNE	30.504	1874	29.498	1872	1.006	29.932	74	7.1	4
JULY	30.445	1876	29 206	1877	1.239	29.933	74	6.7	3
AUGUST...	30.490	1874	29.179	1876	1.311	29 953	75	5.9	3
SEPT.	30.523	1873	29 241	1876	1.282	29.989	80	6.9	6
OCTOBER	30.644	1877	28.885	1880	1.759	29.915	85	7.0	11
NOV..........	30.656	1879	28.618	1880	2.038	29.896	87	7.3	12
DEC..........	30.818	1879	28.515	1876	2.303	29.954	91	7.4	15
RESULTS ...	30.818	Dec 23 1879	28.437	Mar 12 1876	2.381	29.961	82	7.0	99

MONTHS.	RAIN. (12 years, 1869 to 1880).				MINIMUM TEMPERATURE ON THE GRASS (1870 to 1880).			
	Mean Monthly Fall.	Greatest Fall in 24 hours	Date.	Mean Number of Rainy Days.	Mean	Lowest.	Date.	Mean Number of nights at or below 30°
	Inches.	Inches.			°	°		
JAN..........	2.79	1.09	10, 1877	17	31.8	8.7	22, 1881	18
FEB..........	2.22	1.02	26, 1874	16	32.6	18.8	24, 1875	14
MARCH ...	1.51	0.72	20, 1869	14	33.3	15.5	14, 1870	14
APRIL ...	1.86	0.94	16, 1871	13	37.5	22.5	25, 1875	5
MAY.........	1.66	1.21	28, 1878	11	41.6	26.0	3, 1877	3
JUNE	2.18	1.99	22, 1876	11	49.2	35.0	13, 1874	—
JULY	1.80	1.52	14, 1875	11	52.8	40.4	2, 1870	—
AUGUST...	2.57	1.23	19, 1879	12	53.0	39.0	24, 1877	—
SEPT.	2.86	1.16	11, 1880	13	48.1	26.8	23, 1872	—
OCTOBER	3.34	1.27	22, 1870	16	41.8	21.6	31, 1873	3
NOV	3.27	1.41	18, 1880	15	34.3	21.8	19, 1871	12
DEC..........	2.81	1.06	13, 1870	15	30.7	11.3	27, 1870	17
RESULTS ...	28.87	1.99	June 22, 1876	164	40.6	8.7	Jan. 22 1881	86

(7) The most prevalent winds are S.W. and W., 74 days of each representing an annual average of 6 years, as against 54 of N.E., and only 23 of E. The N. is most prevalent in an average November, the N.E. in March and May. The S.E. wind is the warmest, probably because blowing from the Continent, and in summer makes the nights hot, for with it temperature falls but slowly, even after sunset. The S.W. is not so warm, and in summer often cool, being charged with moisture from the sea. The aspect of the town already mentioned, S.S.W., exposes it to the full effect of this wind.

Without quoting more figures on the present occasion, I must, for practical purposes, briefly characterise the climate of the respective quarters of the year. Considering that of *Winter*, we note what Brighton possesses in common with other places on the coast,—night warmth,—from the neighbourhood of so large a body of water, for, as the sun loses its power with the waning year, the land parts with heat by radiation *sooner* than the sea, so that the latter comes to be warmer of the two. According to Dr. Kebbell, in one December it was at 52°; January, 44°; February, 41·5°. Naturally, when land atmosphere is colder than that of water, the latter gives up some heat to restore equilibrium; and the mean winter night-temperature of Brighton is at least 4 degrees warmer than that of London. On arriving here, however, from town, it is not unusual to experience a sense of cold, or rather, I should term it, freshness (due either to temporary sensations from travelling, or to the freely-circulating air of the station hill, as compared with the close, still atmosphere of the City); but, allowing for variations in wind, this sensation of cold is not felt in low-lying, sheltered, but sea-exposed portions,—as Madeira Walk or

King's Road,—when it may be well recognized on the Montpelier Hill. If a bright sun be out and the wind not in force, all along the front is warm, even in the depth of winter; and this part has been compared to the higher parts of Ventnor.

An early *spring* (meaning March, April, and May) is scarcely charming in the prose light of bare fact, in England at least. Slow and uncertain in arrival, with east winds but a sunny sky, cold mornings and evenings, and increased range of temperature—like time—it tries all, and is escaped by most of those who can escape. The land gradually becoming warm, returns some heat to the sea, this tending to *lower* the land-temperature, and Brighton, although of equal warmth with Greenwich in February, is found four degrees colder in March and May (this, however, does not apply to all parts of the town). Sir James Clark doubtless contributed to the fashion of forsaking Brighton in the spring, and for some delicate chests I think the advice still good, but he referred particularly to the east cliff, which is then the coldest part; personally, I think the Steine and the central front have by no means a bad spring-climate for this country. The great danger is meeting the N.E. when walking slowly home up hill, and I have known this answerable for erysipelas, jaundice, or pleurisy.

In the *summer* the favourable influence of the sea in equalising temperature is again exerted. In June it (the sea) has been at 61°, when 95° has been registered inland, and at Brighton the *air* temperature is often 72°, when at Greenwich 79°. The freshness and coolness of the air here in the early summer is proverbial, given a W. or S.W. wind, though the S. and S.E. are warm and depressing, and often induce sea fog by their sudden condensation on meeting the cooler air of land. As summer progresses, come the heat and glare of a shadeless beach. Children have a good time now, but with some risk of headache and diarrhœa if allowed to remain out too long.

Popular opinion is right in pronouncing the *autumn* the best climate of Brighton, and I have nothing new to say in its praise.

A word as to the choice of climate for special conditions of health. Climate is not a "fetish" to cure the incurable, or cure in despite of ourselves, or exert a good influence without thought in selection. On the other hand, there are some fortunate individuals, independent of aspects and winds, to whom the careful observation of physicians seems only trifling and unnecessary refinement; such persons may please themselves, and follow fashion rather than science, but we here find in practice much difference in the effect of different positions.

Speaking generally (as in a meeting not of doctors), some parts of our town in summer, autumn, and winter, suit all strumous and scrofulous conditions and anæmic states, brought on by acute illness, by life in a close town, or in a tropical country; also, specially well, chronic chest disorders, resulting from pleurisy and bronchitis. In consumptive cases, the main points to be desired anywhere are general salubrity of climate, facility of frequent open air exercise, and not too much damp. All these Brighton ensures, and, as a rule, consumptive cases have no cause to complain of the place. Such subjects, however, must not choose—as I have known them—a house in the Drive on clay, and exposed fully to N.E. winds, or a stone palace in Sussex Square, or an old house on the Grand Parade: this they might regret when they would do well on the front, between Markwell's Hotel and Regency Square. Ague is practically unknown here, and the few cases I have seen (at Park Crescent) were traceable to some days spent at Worthing. Depressed nerve-conditions do well especially on the east cliff.

For what cases is Brighton unsuited? For sufferers with congestive headache, and irritable dyspepsia, especially when connected with bilious conditions; still, even with such cases, it is largely a question of locality. There can be no doubt that a walk near the charming green by Brunswick Place, or an hour on the beach at the sea *level* at the West, means headache to susceptible subjects and a bilious attack to others, and such an attack after first arrival here is quite expected by many,—as they say, "the air is too strong for them,"—it seems traceable either to some peculiar influence of the sea-level, or to saturation of the atmosphere with saline particles, for the symptoms described may be avoided by living in the higher parts of the town, and the headache may often be cured by a walk along the Dyke Road, or on the high green cliff towards Rottingdean,—*i.e.*, by breathing air less saturated, and high above sea level. Possibly the clay soil indicated earlier in the paper has some influence, for we meet with people very sensitive to it;—but whatever the precise explanation, the tired languid condition induced in the hot season by the air of Hove contrasts strongly with the exhilaration felt on the Downs or the East Cliff.

Time fails for more particulars on this point; if I have not been able to bring forward much novel information, I trust that even what I have read may be of interest to our visitors.

ON THE NECESSITY FOR RECREATION SPACE IN ALL LARGE TOWNS.

BY DR. FUSSELL.

ALL that concerns the subject-matter which occupies our attention this week—the health of the masses—is such a topic of the day, so freely discussed in the public journals, and, therefore, now so thoroughly ventilated, that, when we are asked to read a paper on a branch of Sanitary Science, we are reduced perhaps to a quandare; we are embarrassed because it is by no means an easy undertaking. Probably we can divulge nothing that is new. We have, therefore, to fall back upon by-gone precepts, golden rules we may have once termed them, but, not being interested in their practice, our memory faileth them, and, like other antiquated maxims, they may be clean forgotten. At a Health Congress it will be, I think, generally admitted that we should bestow a share of our attention to the various means by which we may promote the sound and robust evolution of the rising generation. To effect this, we should aid in maintaining the perfect elaboration, the active circulation; in fact, a normal condition of that all-important fluid,—the Blood,—which, in the young especially, should be preserved at a healthy standard, so that the child may attain a vigorous, and not a decrepit manhood; in other words, that he may become physically and mentally constituted to enjoy life, and not be "vexatious of spirit" within himself, an incubus to his friends, or a burden to the State. In selecting my subject, I was much influenced by local annotations and home-spun meditations. Many of you are aware that, owing to the foresight of our predecessors in urban legislation, we fortunately possess a "*recreation space*," a public play-ground, at a spot accessible to the families of the large wage-earning class who live at the north end of the town. Visit it on a fine summer's evening, and you will be at once reminded of the necessity of such recreation space, for those who cannot otherwise obtain it, in all large towns.

A short time ago, I had a fear that such a boon to the masses was about to be curtailed, or even annihilated, in order that "purple and fine linen" might walk decorously through this ground, over well-kept walks, and by the side of flowery and artistically-arranged plateaus,—an iron fence was erected, shrubs planted, flowers were, I believe, proposed by some æsthetics. To a certain extent my fears were not realised; but the half of this space is assuredly not sufficient for its intended purposes. Perhaps we shall hear more of this presently. Doubtless, if an Alderman be in the room, he will say "Doctor, whilst under such apprehensions, your timidity was comparable to that of the old lady, who, when on board ship in a violent storm, exclaimed: 'Captain! is there any fear?' 'Yes, ma'am,' replied he, 'there is a great deal of fear, but not the slightest danger.'"

"Self" is a great motive power. We will, therefore, first consider the necessity of "recreation space" in large cities, as it affects self, as it immediately concerns our own convenience.

In walking, perhaps hurrying, through the streets, whose temperament has not at one time or another been sorely vexed by the bounding impetuosity of youthful frolics; at one moment we may be almost knocked over, at another we may have to shield our face from an ugly blow of the cat. The hoop of the urchin may besmear a handsome dress. The pebble from the catapult may injure the eye, or smash the window, instead of hitting the sparrow. Such impediments in our pathway, or more vexatious still, such hindrances in a "press for business engagements," will rouse the ire of some of us, though a moment's reflection will induce us to exclaim, "How can they help it; the public thoroughfare is of necessity the public playground?" Whilst upon social reasons, let me add, that in places set apart for recreation, young and idle hands may not be so prone to play at "pitch and toss," they will not be writing indecent words upon the walls, they will not be witnessing scenes to which, for lack of other amusements, they are often addicted,—the repulsive doings at the slaughter-houses amongst other sights. Moreover, it must be a satisfaction to the parents to know that their little ones are freed from the dangers inseparable to the crowded streets; that their children's gambols are not in danger of being fatally ended, either by the heavily-laden dray, or by the loaded omnibus.

We reap innumerable social and material benefits from the state of civilization which we now enjoy; nevertheless, this advanced culture entails a bitter cup to some of the human race—ills, indeed, in every aspect, moral, social, physical, and economical. Beginning with the microscopic germ, the "ab ovo" commencement of the future man, we are obliged to confess that, by and by, we may have to combat in its growth some of the drawbacks which result from this civilization. In these enlightened times we do not eliminate the weak in body and mind as the savages do. We support the sick and imbecile, and seek medical skill to endeavour to save the life of every one. Weakly individuals, the consumptive, and those—to speak euphemistically—with tainted blood, are free to marry and so to porcreate. There are thousands of children in our large towns, who, if they are born healthy, become ill-nourished, puny—not, perhaps, from the neglect of the parents, but because they derive imperfect nutriment from the impoverished milk of the mother; or from a substituted diet quite incompatible with their physiological requirements. If such impediments to robust growth be absent, the anæsthetic agents, "the black drop" and "the soothing syrup," will blunt the nervous supply of the digestive organs, and thus be as destructive to the nutrition of the child as the excessive use of alcohol is to the well-being of the adult. Healthy development is frustrated by the tainted atmosphere of the overcrowded "dwelling and sleeping room," with its contracted cubical breathing space, and all the sad surroundings usually and not exceptionally met with by the priest, the physician and the visitor in these polluted homes. The tents or the vans of the gipsies may be similarly overcrowded with inmates; but these itinerant domiciles are surrounded by a free and unalloyed atmosphere, and are not placed in a *cul de sac*, in which the air, always foul from numerous animal, and perhaps, vegetable exhalations, is rendered still more pestilential by its being as stagnant as the growth of those little ones who are forced to inhale it. The Peabody dwellings are of no assistance to the very poor—the rents are too high; moreover, I believe, no "work" is allowed to be done in these dwellings. Fortunately we have now a number of associations, not merely philanthropic, but established on a commercial basis, for improving the abodes of the labouring classes.

The marked physical effects upon the young of such confined areas, and of such tainted atmospheres, are clearly visible to the trained physiologist, as well as to the ordinary observer—the pallid hue, the parchment-like skin, the large head, the pigeon breast, the protuberant abdomen, the bandy legs, and the generally stunted growth. There are about 100 towns in England containing upwards of 25,000 inhabitants which remind us of the stern fact that much of this decrepitude and high mortality amongst the young is in a great measure caused by the excessive density of their population.

The nutrition and health of an individual depend upon the soundness, vitality, and systematic co-ordination of function of all the organs of his body. Such stability cannot be properly maintained in the growing youth, if he be not enabled to give free play to his locomotive powers. The muscular more than the mental elements must be specially tendered. Can the above hereditary and acquired infirmities be, I will not say eradicated, but modified by judicious treatment? In some agricultural counties, there is an old saying which, unfortunately, at the present moment, comes home to some of us most forcibly—"One year's seeding, seven years weeding." At the commencement of my paper, I spoke of "antiquated maxims." Let me recall to your mind how, many centuries ago, the great Spartan legislator weeded humanity. In his time, there was an "upper crust." There were "the equals" and "the inferiors"; removal from one class to the other was as a punishment, or a reward. Removal from the higher to the lower was a special penalty incurred by those who did not give up their children to be educated as the law required. If a child were born sickly or deformed, it was at once destroyed. If approved, it was sent back to its parents. At the 7th year, he was taught exercises suited to his strength; after the 12th year, the exercises became much more severe, even at 20 gymnastic exercises were his chief employment. The whole youth, both male and female, contended daily in running, leaping, and wrestling.

We have not far to go to witness the good results to the rising generation of exercise in large and unobstructed recreation spaces. If we visit our Industrial Schools, located in the salubrity of the South Downs, we find there boys and girls taken indiscriminately from all sources—irrespective of healthy or unhealthy parentage, legitimate or illegitimate birth. Some of these children may have sprung, perhaps, from a diseased germ, predisposing the child to one or many of the objective deformities I have named, and which are often summarized under the term "Scrofula." What does the Superintendent tell us respecting the effects of out-door exercise on this abnormal state of development? Though not a physician, physiologist, or psychologist, he must of necessity be an observer, hundreds of children of both sexes having been under his charge He tells us that exercise, with that free and pure respiration which the boys enjoy on the Downs, are therapeutics in the widest sense. That if the ill-effects on the human frame of a blemished parentage, of defective nursing, or of a tainted atmosphere, cannot be altogether obliterated, they can be modified—a fresh lease of life is established, and the once sickly lad emerges from pauperism, and may become the useful mechanic.

These boys, the majority of them being so feebly constituted, and taken for the most part from the courts, alleys, and overcrowded rooms of our town, are trained somewhat after the Spartan mode of discipline. They may be seen, on that large "recreation space" termed the "Race Course," playing at foot-ball, cricket, and other invigorating games. The girls do not take such unlimited exercise, they do not run about so much; and, instead of "the athletics," use swings,—consequently their improved development does not proceed *pari passu* with the boys, and, to repeat the trite phraseology of the Superintendent, "The girls do not get rid of scrofula so readily as the boys."

Amongst the "upper crust" the necessity for large and "open recreation spaces" is wisely admitted and practically acknowledged by all the large schools—for boys—in Brighton and Eastbourne. In the Dyke Road, and behind Sussex Square, large recreation spaces, open to the heavens and bounded only by the horizon, are devoted to the advancement of the physiological maturity of their youthful frames. But where are the recreation grounds for the girls? Where can they run in the race, or enjoy athletic games? Whilst the boys are bounding over the turf, the girls are being marshalled along the road, where, in long cloaks, they are walking demurely, *two and two*, with apparently as little life in them as if they were walking to the cemetery. Out of town, boys' schools, also, may now and then be seen walking "two and two," it may be "arm in arm," their limbs confined, because the slow and measured steps necessitate their being hampered by great coats and comforters.

Where may the contagious germ be probably rendered harmless; in the confined and overcrowded alley, or in the large and airy recreation ground?

Having commented on the necessity for "recreation spaces" as it immediately concerns ourselves, let us consider how their absence in large towns exerts a prejudicial effect on the national welfare. Towns increase, and villages decrease. Muscle is now for the most part flabby and weak, not robust and enduring. In these days iron and steel may be very efficient protectors, but we must still depend upon "muscle" as our chief national defence. It would be without my province to go into the details of a subject to which much attention has recently been devoted by Quetelet, of the Belgium Academy of Sciences; Professor Bowditch, of America; and by Roberts and Boulton, in this country, —viz., anthropometry, *i.e.*, briefly speaking, the study of the standard height, weight, and measurement of the human frame.

Nevertheless, I may remind you that an enquiry into these special characteristics is made by the Government officials on admission being sought to the army, navy, or some of the public offices. I have here the requirements for the navy, by which you will see that a boy, æt 16 to 16½, height 5ft. 2½in., without his shoes, should measure 31½in. round the chest, taking the nipple line; and should be able to raise a weight say of about 115lbs. But this is, I think, a maximum chest capacity.

The Superintendent of the schools, who is always wishful to procure berths in the navy for some of the boys, tells me "that, during his four years of office, no boy of 16 has attained the 31½ inches, and that many of those from other places who exhibit such chest capacity may be older than 16 years."

Bearing in mind a noted physiological fact, "that in youth the changes of nutrition are quick," the method of treatment is more readily solved, and though the highest standard may not be reached, yet it is satisfactory to know, that by special attention to bodily development, the ill-conditioned and sickly-nurtured town child may, on his approaching manhoood, be chosen to take a share in the defence of his country.

School education is now loudly proclaimed, but in densely populated places education out of school hours is equally necessary. We have noted the necessity for muscular as well as mental exercise, and therefore the need for large playgrounds is acknowledged by the principals of all our large private schools. How much more needful are these essentials for the youthful denizens who droop in the enervating slums of our large towns. Such is the economy of space, that at the London School Board some few years ago, it was proposed to have underground play-grounds, and play-grounds on the roofs. At a school in a street out of Long Acre, there was, I believe, a play-ground on the roof. It was said "to have been discontinued because the blacks from the chimnies made the children so dirty."

How recreation spaces should be provided, and when provided how they should be supervised, is not within the scope of my paper. I have endeavoured to prove that there is an urgent call for them. At nearly all our northern cities, a rich man appears, who provides a park for his native town, evincing his practical religion by contributing to the health and happiness of his less fortunate fellow creatures. By the establishment of the public crèche, we endeavour to mitigate the sufferings of the infant, exposed otherwise to all kinds of evils by the neglect—unavoidable often—of the mother. As the child attains boyhood, we may lessen some of the debasing surroundings of the courts and alleys of our large towns by providing these children with recreation space, where they can display all the attributes of their youthful animalism; where full play may be given to their exuberant spirits; where, by rehabilitating their weakly frames, we may hope to awaken their better feelings, and to givy them an active body and a sound mind, the original design of their beneficent Creator.

DISCUSSION.

Mr R. Crosskey (Lewes) said as this was a Health Congress he wished for an expression of opinion upon a point which the President had raised—the question of a constant supply of water, and its effect upon the health of the people. The admirable paper of Mr Easton showed that the supply of water at Brighton was pure and inexhaustible, and at the same time Mr Easton told them that only a portion of the inhabitants had the advantage of a constant supply. It appeared to him to be important that the renters should be supplied only from the constant service, if the Corporation wished for good health throughout the town. (Hear, hear.)

Mr E. B. Ellice-Clark (Hove) said the only point in which he thought Brighton water failed was that it was exceedingly hard, and he should like to hear from Mr Easton whether he had gone into the subject of softening the water by an economical process, and whether there was any prospect of the Brighton Corporation adopting a system for that purpose within a limited period?

The Mayor of Brighton remarked that, from the time of the Corporation becoming purchasers of the Water Company's property, he had been a member of the Committee having its management, and for several years Chairman of that Committee, and he could say they had considered very seriously whether it was worth while to adopt some process of softening the water for general use. They had not been able to find any process which would not involve great expense, and an expenditure for softening which was really not required to be applied to every portion of the water raised from the chalk formation.

Mr George B. Jerram, A.M.I.C.E. (Walthamstow), said he should like to know, as Brighton was supplied on the intermittent and constant systems, if there had been records taken of the health of the houses supplied by one system as against that of the houses supplied by the other? He should also like to know whether there was any restriction put on the supply of the water for health purposes?

Dr. Richardson thought the best system of softening water was that in use at Canterbury. He had recently inspected it, and he must say the results were most satisfactory. The system, which was based on Dr. Clark's original process, brought the water down to eight or ten degrees of hardness, and, although the first outlay was expensive, he believed it was now continued with the expenditure of a small amount of money. The system was now conducted automatically and thoroughly well, without danger to leaden pipes, or otherwise. He did not know what the original cost was at Canterbury, but he thought it would be worth while for their Secretary (Mr Ellice-Clark) to communicate with the authorities there, and ask for information on the subject. They might have an answer by Friday morning, when the Congress might revert to the matter. The reservoir holding the water for the town was at some distance from the softening works, but there was telescopic communication which enabled the employés to ascertain the quantity of water required. The water, after having been softened, was passed to the reservoir and supplied to the town.

The President (Mr Chadwick) said he had made inquiries on this subject of great water engineers. Messrs Quick told him they were conducting works for softening water with great success; and Mr Bateman told him that at one place the water had been brought down to a softness of 2½ degrees, and that it was equal to the Loch

Katrine water. He thought that the Brighton water, looking at the way in which it was derived, ought to be better than the Katrine water, after softening, so full was the latter of peat.

Mr Ellice-Clark said, inasmuch as the Brighton Corporation derived a revenue of about £3,000 a-year from its supply of water one would have thought that they would have applied a portion of that income towards softening the water. (Laughter and hear, hear.)

Mr Thomas Dunhill (Hove) said he was sorry to hear the Mayor declare that the softening of water in Brighton was unnecessary. He thought the hardness of the water was one of the greatest evils they were suffering from, and he hoped for health's sake the Corporation would take into consideration the desirability of softening it by some process or other.

The Mayor remarked that he did not think Mr Dunhill understood him. (Hear, hear.) He said it was unnecessary to soften all the water, because much of it would be used for waste and domestic purposes. (Hear, hear.)

Mr Dunhill: My purpose is answered in eliciting that explanation from the Mayor. (Hear, hear.)

Mr Easton, replying to the discussion, said there could be no doubt now in anyone's mind that the constant service was the only one that ought to be allowed in any town. His experience at Brighton, where he had the management of the waterworks even before they became the property of the Corporation, and in a great many other towns was, that the waste of the intermittent system was considerably more than that of the constant service. In 1867, he gave evidence before Mr Ayrton's Committee on the East London Water Company's Bill, and he showed from meter tests made in Brighton at that time in different streets of the town, where the intermittent service was being used, the quantity of water supplied was 25 to 30 per cent. per head a-day more than was used in those streets where the constant service was in operation. With regard to the question as to restrictions upon the constant supply, he said there were none whatever at Brighton. (Hear, hear.) The intermittent service was used through cisterns, but that, practically, was constant, because the water was then turned on to fill them three times a-day. While on the intermittent service, he might mention a great objection to it, that it was used through cisterns; this was a great source of contamination and deterioration to the water supply of any town. In the interests of health then, and also because it was cheapest, water ought to be supplied on the constant service system. With regard to the question of the quality of the Brighton water, he knew it had always had the consideration of the Corporation and the Water Company, with which he was connected before the Corporation became the owners of the waterworks. The hardness of the Brighton water, however, was not excessive; in fact, it was softer than most chalk water, it was from 16 to 16½ degrees, and might be boiled down to from three to five degrees. The great objection to a universal system of softening the water was the expense, which was no slight matter when they came to think of the quantity used for absolutely waste purposes. Whereas, probably only from two to three gallons per head per day were used for drinking and cooking purposes, the Corporation supplied twelve times as much for all purposes. The direction in which he would like to see the softening of water was in the houses. Another reason against the adoption of a softening system for general use was that, unless they had a constant service throughout the town, it was worse to soften it than to let it alone, because, there being more pores to fill up, as it were, the danger of contamination under exposure was greater. They could not enforce the constant service in all streets, because the Corporation of Brighton, like other corporate bodies, could not get sufficient powers to alter existing fittings; but he might say year by year they were getting more houses under the system. Whereas, in the year 1872, when the Corporation took possession of the Water Company's works, there were only twenty-five per cent. of the consumers on the constant service system, now nearly half the town was so supplied. (Applause.)

The PRESIDENT closed the debate by suggesting that the supply per head might be greatly economised, as at Sheffield; but this must be done by the Corporation putting in the fittings and having them supervised by its own officers. It ought to be a rule, too, in the intermittent supply, that when fresh water was put into the cisterns the old should be carried out. (Hear, hear.)

ESCAPE OF FOUL GASES FROM VENTILATING GRATINGS ON THE MAIN SEWERS OF TOWNS. THE CAUSE OF THE EVIL AND ITS REMEDY.

By EDWARD FYFE G. GRIFFITH,
Associate Mem. Inst. C.E., &c., &c.

This subject is one of great importance to every individual, for wherever a system of main drainage has been carried out with the street ventilators as usually constructed, it is patent, even to those who are ignorant of sanitary matters, that these ventilators emit foul gases. Even supposing this be not injurious to health, it is yet exceedingly unpleasant to all passers by.

I will not give an opinion as to whether this sewer gas be injurious to health or not, that being a medical question, but I simply state the fact that both rich and poor throughout the country are constantly inhaling it, and universally complain of it.

The annoyance is most prevalent during the summer months, when there has been but little rain, and it is a startling fact that it prevails in those towns which have been drained within the last 20 years on the best known sanitary principles. The main drainage of many towns is, as a system, as nearly perfect as sanitary science can make it; but, notwithstanding, the fact remains that in these very places where the best sanitary knowledge has been brought to bear, and the largest outlay of money expended, the evil is the greatest.

The public naturally asks, can this system of ventilation then be correct? And I answer, certainly it is, so far as the ventilation of the main sewers is concerned. The cause of the evil lies elsewhere, and is not far to seek, although generally overlooked and but little considered.

There are doubtless instances in which the evil is principally due to the main sewers being sewers of deposit, but these cases seldom exist in towns which have been drained within the last ten years, and to which I more particularly refer.

The defective *house drainage* throughout the whole country is, I believe, the great cause of emanations of foul gases from street ventilators on the main sewers, and for the following reasons:—

The house drains generally, being drains of deposit or elongated cesspools, the main sewers instead of receiving fresh sewage receive putrid sewage, it having been lying in the house drains for months and sometimes even years.

It may be remarked that even although putrid sewage were discharged into the main sewers, it could not create the evil complained of, being so quickly carried away.

This is an erroneous idea, and, as a proof of it, I will take the following example. If the cover of an old cesspool be removed the effluvia will at first be most offensive, but in the course of a few days, if the cesspool be left open and undisturbed, no perceptible smell will arise; if, however, a stick or a stone be thrown into it so as to move the liquid the smell will again become as offensive as at first; exactly the same principle holds good in the main sewers.

The house drains gradually discharge putrid matter into the sewer; this is immediately put into motion, being churned up by the velocity of the flow in the sewer, and gives off the foul air, which passes at once out of the ventilators into the street.

Again, another cause of the evil, and perhaps one of the most important, lies in the fact that the majority of house drains are totally unventilated; the pipes being badly jointed, the sewage percolates into the surrounding earth, and if it be of a porous nature saturates it.

Even if the drain be laid to a good gradient, foul gases escape from this sewage polluted earth into the house drain, and as soon as a flush of water is discharged into it, the foul air is carried along with it into the main sewer.

Another cause of putrid sewage being discharged into the sewer, and one with which I have frequently met, is, that the house drain is connected with the overflow of an old cesspool.

In town sewerage, too, especially in the older towns, cases are frequently to be met with, where old sewers of defective construction are permitted to form part of the new system, and with similar results to those I have previously mentioned.

The principal causes of the house drains being so frequently drains of deposit are :—insufficient fall, great carelessness in laying the pipes, and universal bad workmanship.

Many engineers cannot insist upon the house drains being laid properly, because it is impossible for the engineer of a town, with such assistance as is usually allowed him, to give the requisite supervision. This is especially the case when a new system of drainage is being laid, and when many house connections have to be made within a comparatively short time.

I am sure that engineers and borough surveyors will be the first to acknowledge that this is the case, as I have often been told by them of the absolute impossibility of paying that attention to the house drainage which is so essential.

In my opinion, the careful supervision of these details of a main drainage system is really far more essential to its success than that of the main sewers themselves, and until this fact be recognised, not only by engineers and surveyors but by the general public, typhoid fever and other diseases must inevitably prevail, besides which, there will always be a constant annoyance and expense to householders for alterations which should never have been required.

With regard to the fall given to house drains, if all the sanitary arrangements and appliances inside a house were of such construction that the water were always discharged in a body, the fall allowed for the drains might safely be considerably less than the standard which I consider necessary under existing circumstances, as, in consequence of the defective fittings inside, it seldom occurs that the water is discharged in a body, the discharge usually consisting of little more than a dribble, which almost invariably permits the drains to become choked.

In making a calculation of the gradient necessary for the house drains to be self-cleansing, instead of assuming, as is usually done, that they will run half full, the velocity should be calculated on the assumption that there is only $\frac{3}{4}$ in. or 1 in. of water, as is most frequently, if not universally, the case.

Another point that might be raised is that it is often found impossible to give such a fall as is required in consequence of the main sewer being too shallow.

In such cases the house drains should be provided with an automatic flushing arrangement, of which the simplest and most effective kind yet invented, as far as I am aware, is Mr Field's flushing cistern, the principle and application of which is now very generally known.

An evil with regard to house drainage, which is rapidly increasing in the neighbourhood of London, is one caused by the fact that large tracts of land are bought up by speculating companies; roads are laid out, sewers constructed under their supervision, and, when the district has obtained sufficient importance, the authorities of the parish in which it is situated are asked to take it over, and generally do so without giving a thought to the state of the drainage.

Now, nothing can be worse than the way in which both the main and the house drains are laid by these speculating builders, the work being "scamped" in every possible manner, whilst the commonest principles of sanitation are quite disregarded, and the most ordinary precautions neglected.

In my experience I have seen many cases of this, and know of houses which have been bought of speculative companies in which the owner, after a few months' occupation, has found that his house drains have become completely choked, the cause being that the main sewer in the street has been laid too flat, and consequently is nothing better than an elongated cesspool.

Now to return to the root of the evil complained of in this paper. Supposing we admit that the foul smells from these ventilators arise from defective design and workmanship in the house drainage, the question naturally arises, how can this state of things be prevented in the future?

I am quite aware that I shall raise a question in the minds of many people as to the advisability of doing what I propose, but I consider that the only real mode of prevention, is, that in every house the soil-pipe should be carried up above the roof as a ventilator, so that it not only ventilates the house drains but also the main sewer in the street.

It must, however, be distinctly understood that, in advocating this as a principle, it should be applied universally, and if so adopted, the ventilators in the street would act as inlets for air and the soil-pipes as outlets for any foul gas.

I maintain that in a properly drained town there should be no such thing as sewer gas; this result, however, can only be obtained by paying strict attention to details. I am not speaking without experience on the subject, having just drained and supplied with water a model village in which every house was completely re-drained, and from the time the work was completed, in May last, there has been no foul air from the ventilators. If this is possible in a village under certain conditions it is also possible *under the same conditions in a town.*

To do this in a town would be considerably more difficult, as the village I allude to belongs entirely to one owner, whereas in a town there would be almost as many owners to deal with as there were houses. This is, however, the great difficulty, and it appears to me that the only remedy is to grant to borough engineers and surveyors the right to insist upon the drainage of a house being thoroughly satisfactory before permitting it to be connected to the sewer. They should also have the power of supervising the drainage of all new houses, and of insisting on its being carried out in an efficient manner.

I am well aware that in many districts the sanitary authorities have drawn up sanitary regulations, and that these have been sanctioned by the Local Government Board, and are to a certain extent enforced; but that the powers given the engineers and surveyors of these districts are insufficient, is proved by the fact that these rules are invariably only partially complied with.

Frequently, also, supposing surveyors have the power of insisting on everything being carried out on the soundest principles, the staff at their disposal is too small to ensure good workmanship.

The general principles upon which house drainage is carried out must be either correct or the reverse; for instance, "the disconnection of sinks," "the ventilation of soil pipes," &c., have now become almost axioms, and regulations embodying these and like principles should, in my opinion, be drawn up by the Local Government Board, and universally enforced.

In conclusion, I may remark that, when a house is once built, it is almost impossible to remedy its defective drainage, except at a very great cost.

This arises from the fact that not only has a new system of drainage to be constructed, but that the old has to be removed, in doing which the cutting away of walls, ceilings, woodwork, &c., and the destruction and consequent renewal of paper, paint, &c., is involved. If only one small pipe passes through a room it frequently makes it necessary for the whole to be fresh painted or papered.

In consequence of the foregoing causes, people wishing to place their houses in a sanitary condition find the cost so heavy in comparison with the expected benefit to be derived and the apparent amount of work to be done, that they frequently give up the idea, or else have the old system patched, which latter is simply a waste of money as far as the result obtained is concerned. One fact is certain —that until house drains are perfectly laid and thoroughly ventilated, sewer ventilators will continue to emit foul gases.

DISCUSSION.

The PRESIDENT said that, as its author was connected with and well-known in the Metropolis, he would ask Mr Griffith to say what was the condition of the sewerage of the house in which Dean Stanley died.

Mr GRIFFITH replied that he might say, with reference to the Deanery of Westminster, that he reported upon its state some eighteen months ago, at the same time strongly urging the Dean to alter certain things. The estimated cost of the alterations was somewhere about £300. The late Dean at first entertained the idea, but afterwards he said he had lived in the house for nearly seventeen years, and had found no inconvenience, that he was getting an old man, and that the present state of things would last his time. That, said the speaker, was the almost universal reply of people with regard to the introduction of sanitary improvements into their dwellings. However, the Deanery of Westminster, though not in the sanitary state it ought to have been, was better than most houses in the Metropolis, and better even than many houses in Brighton.

Mr G. B. JERRAM, C.E., thought they had been listening to a dissertation on the subject of house drainage rather than to the subject of the escape of gases from ventilating covers. If they wanted to get rid of the bad smells from the sewers the proper way was to have plenty of ventilators, the smells arising from the want of a free current of air through the sewer. What was also needed was a ventilating pipe going from the house pipe to the sewer.

Mr ELLICE-CLARK said that, after many years' experience, he entirely dissented from nearly every proposition laid down by the author of the paper. It would be impossible to discuss all the technical details with regard to ventilators and sewers at such a meeting as that, but he might say that he had spent thousands of hours in the sewers, and that the results of his observations had been laid before the Association of Municipal Engineers in two papers. It had been said that the gases from the sewers were carried up the ventilators, but from 13,000 observations which he had made in Hove it had often been the contrary. There was no fixed law with regard to the movement of air in sewers, and sometimes instead of being carried up the ventilators they would find it carried just the other way. In Brighton, he had found from a number of observations, the sewer air on some occasions passing upwards towards Hove, and on other occasions downward towards Rottingdean. All that could be done was to make general observations, for there were no fixed laws with regard to the passage of air in sewers, and they could lay down no specific formula for curbing them. From his own observations he had found that the first thing to be done in dealing with the difficulty was to lower the temperature by the admission of fresh air. If they kept the temperature down to 52 degrees, they would do away with a very large accumulation of gases, prevent the formation of fungi in the sewers, and also putrefaction to a very large extent. These results, he said, had been arrived at practically in regard to the large old sewer in Waterloo Street, Hove, which had been so treated. He maintained that even a sewer which had no deposit would still require ventilating, because the water in it during the fore part of the day was higher than at a later period, and on subsiding it left small particles of solid matter adhering to the sewer which putrified and was the real cause of the emination of foul air from the sewer. The cure was, therefore, to admit fresh air into the sewers. With regard to the assertion of Mr Griffith that the workmanship in regard to house drainage was universally bad throughout the country, he (Mr Clark) said that the whole of the houses put up in the town of Hove during the last ten years would prove that that statement was not founded upon fact. The assertion could be disproved by any individual who might come and pick out any particular house for the purpose of testing his assertion, and he (Mr Clark) would pay the cost. The person would find the house drainage good; the ventilation good; the workmanship good; the materials good; but there was one great thing he might find which did not come up to Mr Griffith's requirements, namely, the absence of ventilation; but it was impossible to ventilate the sewers simply by way of the house drains, because the currents of air in the former were very capricious and would not always go up in one direction or down in another, being affected by the height of the houses, the formation of the sewer, and many other things. What he had stated he believed to be the solution of the whole question.

Mr HURLOCK, from his personal knowledge of Hove, said he could quite bear out what Mr Clark had said with regard to the sewers of Hove. Where ventilators were sufficiently numerous, all smells had disappeared, and he therefore considered it a strong argument in favour of ventilating the sewers.

The PRESIDENT said he had given a good deal of attention to the subject, especially as regarded large towns, where the drains were in tubular form. From enquiries in some twenty towns as to bad smells, the answer was always that there were none, or, if there were, that they proceeded from bad workmanship. He could not, however, admit the doctrine for a moment that they could not have their house drains clear and their sewers clear, and free from putrefaction.

Mr GRIFFITH, in reply, said he would accept the challenge thrown down. What he wanted to impress upon them was that it was not sufficient to have air in the sewer, there must be a free current of air through from beginning to end, and it ought never to be checked. The principle of good drainage was that there should be no such thing as gas in the sewer.

ON SOME ANOMALIES IN THE ADMINISTRATION OF THE SANITARY LAWS.

By E. B. ELLICE-CLARK, Assoc. M. Inst., C.E.

Thirty years' experience of what were practically novel laws for England and Englishmen, has demonstrated the fact that the public in the aggregate take but slight interest in the administration of the sanitary laws—an apathy in itself so remarkable as to call for enquiry and discussion. In the selection of local representatives, where the election is made by voting papers delivered at the house of the voter, a very high percentage of such papers are never filled in at all, and a large quantity only partially so.

In selection by polling,—where some of the rough excitement of a Parliamentary contest is thrown into the election, a little interest, if not enthusiasm, is exhibited; but curiously enough, not in the qualifications of the candidate to fill an office exclusively municipal and sanitary, but in the fact of his being attached to this or that section of politics—to such an extent has the mischievous practice grown that the political party to which the selected and rejected candidates belong has become a regular item in the newspapers reports of Municipal Elections, and the letters C or L, are bracketed after the names of the New Mayors as tho' they formed an essential part of the official title. Why this want of interest on the one part, and misdirected interest on the other, is shown it is difficult to understand, and admits of but one interpretation, viz.: ignorance of its importance.

There is no question in which the public are so vitally concerned as the administration of the public hygiene laws, inasmuch as they affect all classes alike financially, physically, and morally. Any demonstration which attracts the attention of the public to sanitary matters is, therefore, of great value. Amongst the anomalies in the administration of these laws is the varying number of members to each district. Newtown Heath, with a rateable value of £80,000, has only 9 representatives. Crediton, with a rateable value of £9,900, has 31 members. The local circumstances of these towns cannot differ so materially as to require such a difference in representation. From sixteen years' experience in various parts of the country, the writer is of opinion that one representative to every 3,000 inhabitants is plenty, with a minimum of seven, and a maximum of forty members, the latter adequate in itself to govern any town in Great Britain but the Metropolis. A large number of members always impairs the business capacity of a committee, though every class in every ward should be represented. The area of elections is again anomalous; in many towns where the municipal area is undivided, at each election every voter exercises his influence over the whole town, instead of confining it to the particular quarter in which he resides, consequently we see one class and one interest only governing a town. The division of all sanitary areas into wards is so practical and just, that it should form the subject of a clause in the next Public Health Bill. The class of members is an important factor in the success or otherwise of the sanitary laws; in the large towns, doubtless, candidates with the necessary qualifications are attracted, though it cannot be denied that often the reverse is the case. A noticeable feature is the almost entire absence of the medical profession. Brighton, with 50 Councillors, has not a single medical man on the Board. Of all the learned professions whose members would be of the highest value to a Sanitary Board, the medical is conspicuous by its absence. It is therefore desirable to attract, if possible, members of this profession. If, therefore, municipal electors would look more to the special qualification of candidates than to their party politics, and the numbers of the members were limited, greater efficiency and economy would result to ratepayers.

The assimilation of the sanitary laws is much needed. Boroughs with Quarter Sessions are exempt from the operations of the Highways Act, 1875, may appoint their own auditors, and do a variety of things which Local Board districts may not. While the Public Health Act contemplated uniform laws for all towns, its provision for making bye-laws and permissive character have produced quite the contrary result. Not only are the laws of adjoining districts different, but in the same area two separate

Sanitary Authorities administer the law. In Local Board districts, the Poor Law Authorities are armed with sanitary powers, distinct, yet clashing, with the powers of the Sanitary Authority. Two sets of officers go over the same ground, two legally constituted bodies exercise their powers in dealing with epidemics in the same area; both have power to isolate disease. Such a conflict of authority can have but one result—that of impairing the Acts they administer. Further, we find an authority, created for the special purpose of relieving the poor, having cast on it the administration of the Sanitary Acts—a duty which it is clearly unable to perform in a satisfactory manner, more especially since the introduction of complicated regulations for new buildings. Is not the relief of the poor a question itself of sufficient importance to demand a separate authority? For by what process of reasoning are linked together such questions as out-door relief and the disposal of sewage? The areas of numerous Rural Sanitary Authorities contain large towns requiring urban supervision, the Union Authority is cumbersome, inconvenient, and unsuited to their requirments, while the multiplication of separate authorities would be equally so; a re-distribution of areas is necessary in such cases. County or Watershed Boards appear to offer the most practicable machinery for giving effect to Rural Sanitary Legislation.

Of the division of great towns into separate authorities, the writer must speak with caution at a Brighton Congress; but putting aside local prejudices, the sub-division of a great town into districts has considerable advantages. Paris is so dealt with, though under one chief. Nearly every great town in the kingdom is so divided—there may be cited Liverpool, Bootle and West Derby, Manchester and Salford, Plymouth and Devonport, with many others, in addition to Brighton and Hove. Whatever theoretical disadvantages this dual government possesses, it has this one practical advantage which must not be lost sight of—that it brings about competition. A standard of sanitary efficiency is set up at a standard cost; without a subdivision of authorities there is not such a standard of efficiency at a given cost.

Amongst the most important functions of a sanitary authority is the control of new streets and buildings—it may be here remarked *en passant* that a grave defect of the Sanitary Acts is the non-interference with existing buildings. Remembering that the very nature of old streets and buildings was the primary cause of sanitary legislation, it would seem temporizing with the case not to deal with streets and buildings where sanitary evils exist. Property has justly great rights; but property has justly great obligations. To cite an example shewing the deficiency of the Public Health Act, any house erected previous to the adoption of the Act by the Local Authority may be enlarged, or dealt with in such a manner as its owner wishes—it may be rebuilt with every sanitary defect, except bad drainage, perpetuated—there may be rooms of any height—without any ventilation; walls of any thickness; every inch of area within the curtilage may be covered;—in short, all those evils for which bye-laws are made may remain, and worse still, may be exaggerated and intensified, for there is no difficulty in so rebuilding a house as to place it outside the pale of the Act of 1875. Supposing that the application of every clause of the Building Bye-Laws would entail great hardship and deteriorate the value of property, is it not practicable to deal with the cardinal points of sanitation—rooms to be of a minimum height, walls of a standard thickness, air space of a minimum area, where such area was previously not built on, water closets or privies to be erected next to an external wall, and have external ventilation. Respecting laws to control new streets, putting aside for one moment the anomalies existing in the requirements of different localities, a most important omission is the inability to control the direction of streets. Convenience is of as great importance as construction, yet a property owner may so lay out new streets as to render inconvenient for all time streets which in a few years pass into highways, usable and repairable by the public purse, entailing great sacrifice in carriage of burdens on succeeding generations. Few towns show this in relief to the extent of Brighton and Hove, where new streets from east to west have become an absolute necessity. These might have been arranged with immediate advantage to landowners, and perpetual positive convenience to the public, at little or no cost. They can now be only attained by sacrificing property, at great cost to the public rates. If the public are to bear the burden of maintaining in perpetuity any road, they have a right to determine its direction. The requirements of Sanitary Laws as to the minimum width of streets in Liverpool and the Metropolis is 20 feet; in Brighton 40 feet. Many towns in Lancashire and Yorkshire insist on streets back and front, 35 feet as a minimum for front streets, 20 feet for back streets. What physical or other reasons exist for these variations? On the question of Mews, which may be any length and contain any number of human habitations, both the statute and all bye-laws are silent. In practice we find them constructed on the old lines "of each to his own choice."

Under the latest edition of the Model Bye-Laws, there are erected Mews of great length, unrestricted in width, with dense populations, residing at the double disadvantage of living over stables, surrounded with manure heaps, in confined streets. If, for the purposes of preventing overcrowding any area in a town, it is essential to have streets 40 feet in width, when houses are free from the insanitary contamination of stables, it would appear doubly necessary to give houses so situated an equally large breathing area in front. Not only is the construction of such places insanitary, but positively unjust. If an owner of property proposes to construct houses without stables, he must give a large area for street purposes; if he makes provision for both man and beast, then his own will is law, and he may crowd double the number of human habitations on a given area. A statute law is necessary enforcing a minimum width of front street when human habitations are erected. The sanitary supervision of new dwellings is a matter which requires much consideration and detailed labour before it can be effected. Of all the various privileges interfered with by the Sanitary Acts none strike so directly as the sections which relate to this subject. But, wide as their scope appears to be, and detailed as are the provisions of modern bye-laws, they are insufficient to effect the object intended. The first question arising on the 157th section of the Act of 1875, which empowers local authorities to make bye-laws, is whether or not this section should be swept away and replaced by a Building Act, as in the Metropolis, so that sanitary law would be Imperial instead of Local. A great disadvantage possessed by bye-laws is the difference existing between them in the same neighbourhood. In one town of 4,000 inhabitants, within the writer's knowledge, there are four distinct sets of bye-laws for new streets and buildings, administered by the same executive. Within two miles of these buildings there are three separate and distinct sets of bye-laws, with this anomaly, that in the rural district the bye-laws are more exacting and presumably more effective. In the Lancashire and Yorkshire districts the bye-laws of various authorities clash to such an extent that architects have to become acquainted with as many as 12 different kinds of laws relating to buildings, many of them in contiguous districts varying essentially in their requirements. This is the result of the permissive nature of the Act and the elastic wording of the section.

While local, physical, and other conditions prohibit practically identical provisions for all works of construction, there are some main features to which a general statue law could be applied; amongst others, the thickness of walls, which now vary so much that at Hanley party walls may be 4½ inches in thickness, at Ramsgate there are no restrictions, in Aldrington they must be thicker than required by the Brighton bye-laws. With reference to the sufficiency of air space about buildings, the laws are equally at variance. In the Metropolis an area of 100 square feet is considered sufficient for any house; in Hove every two-storied building must have width across of 15 feet; in Brighton, 10 feet. In many towns no provision whatever is made as to the area, beyond stating that it must be sufficient; insufficiency being decided by the local authority. As to the drainage of buildings, again diversity of law has produced conflicting systems bewildering even to experts. It would not be difficult to frame a statute law for—

(*a*) The width of streets,
(*b*) Structure of walls,
(*c*) Sufficiency of air space,
(*d*) Drainage of buildings;

and other matters might be left to be dealt with under bye-laws, remembering always that such bye-laws should be as similar as is possibly practicable, allowing for the different physical conditions, and nothing further. No sanitary requirements that the necessities of the case demand should be omitted because of the value of the land, building materials, or the social position of the inhabitants. But while this change from bye-laws to statute-laws may take years, new streets and buildings are growing with giant strides. In the Local Board district of West Ham 200 houses a month are completed; a public statement was recently made that the Tottenham Board had passed plans for 5,000 houses in one year. To imagine that all these houses are built in accordance with sanitary lights, even if the strictest bye-laws are in force, is a delusion that the public should have exposed as soon as possible. Mr Lewis Angell, the Surveyor of West Ham, in a recent paper says, "probably hundreds of thousands of houses are annually put together, we cannot say built, in such a manner as to be dangerous to the lives of the occupants. Not only is stability disregarded, but every essential principle of sanitation ignored. This result is as much due to ignorance as to carelessness. In too many instances it is also the result of the most wilful and wicked cupidity." Here is a public statement by an official of 30 years' practical experience. He makes no blush at telling the public that it is impossible for him and his staff to exercise anything like the most elemental supervision required; that this is generally the case throughout the kingdom is unquestionable. Sanitary authorities may not confess it in public; but those who see what is daily going on know that the most insanitary evils are being perpetuated, and modern speculative builders are forging a rod for the backs of our immediate descendants, which must kill its thousands and tens of thousands. You will ask as members of that public having to live in these houses: But what are the Sanitary Authorities doing? Is sanitary legislation a sham, and for what purpose have we a highly paid official, whose duty it is to see the bye-laws for new streets carried with operation? These are questions which naturally force themselves from the lips of the uninitiated. Let us look for an answer.

The Local Government Board have recently issued a set of bye-laws to be observed in the construction of buildings. Now, without entering into the details of those bye-laws here, it may be broadly stated that, carried out in a liberal spirit, they would work an immense amount of good; they would put a stop to the erection of houses that are the veriest wigwams and more insanitary than the huts of the Kaffir. But how are they to be administered? Take the case of West Ham, with its 2,300 new houses a year. To execute the model bye-laws, there are 52 pages of closely-printed matter contained in 99 bye-laws, to be observed, enough and to spare for any surveyor to have at his finger ends, and yet under these a house may be built without doors, floors, or windows, or restrictions as to the height of rooms, nor is there one word about plumbing. When the building surveyor enters the carcase of the house there are more than one hundred and thirty distinct provisions that the builder must have observed. Let us pause here before we proceed to discuss the other works necessary to make a house fit for occupation, Presuming that each house is visited only once a month, then 26,000 distinct operations must be observed and noted by the inspector; but once a month is insufficient. In many bye-laws the surveyor has to give a certificate that the bye-laws have been complied with. If that certificate has any value attached to it, its author must have watched every stage of progress during the erection of the building it refers to, so that once a week is by no means too short a period for visitation; then the observations in West Ham come to 104,000 a month. But the writer is of opinion that every house ought to be daily visited, to give a practical effect to the bye-laws. This multiplies the duties of the inspector by seven. The gravity of the case is such that neither exaggeration nor Utopian ideas are required to prove it.

To properly supervise a district having houses completed at the rate of 200 a month, at least six inspectors are required. They must be men of some technical education, and sufficiently well paid to keep them above temptation. This would entail a cost on the rates of, probably, £1,200 a year. This in itself is a heavy charge on the rates, which a Sanitary Authority would resent; indeed, few surveyors would venture to ask for such an increase of staff, nor does it appear that it is a fair charge on the rates. Sanitary Companies are offering to inspect houses for a guinea per annum. Very recently such an association has been formed in Brighton. It has been very pertinently remarked that not for one guinea per annum, but for one guinea the Sanitary Authority could and would exercise such a supervision over new buildings as would satisfy all practical requirements, without puffing patentees' special wares. When such supervision is demanded someone must pay for it. Why should the rates be burdened with the charge? Why should not the builder pay as he does in the Metropolis? One guinea would not add much to the capital sum expended on a house, nor would it exact much in the way of interest-rent. In Eastbourne and in London these fees are chargeable, and the ratepayers are recouped for their outlay by those persons whose works require supervision. Let such fees be paid for an efficient staff, to be provided in all towns, and it will be found that a great work has been done which now remains to be accomplished.

The PRESIDENT said Mr Ellice-Clark's paper was a most important one, and would justify not a day's but a week's discussion. He suggested that the reader should, through their parliamentary members, send a copy of the paper to the Local Government Board with a view to getting that Board to make some movement in the direction indicated The paper was full of suggestions, and the matter could not be moved at a better time than the present.

ON THE CORRELATION OF PUBLIC HEALTH & SANITARY LEGISLATION.

By B. Browning, M.D., F.C.S., S.Sc.C., Edin., &c.
Medical Officer of Health, Rotherhithe.

Possibly the title of my paper may appear almost a truism to some of the audience I have the honour of addressing; yet, after careful consideration, I venture to hope that you will not deem its subject an unprofitable theme, and, as in the words of a world-known oracle, "the bearings of this observation lie in the application of it," that you will accept my demonstrations of the intimate practical connexion between the health of the people and their obedience to the statutory laws of health.

As, in medicine, the broad principles of surgery and pathology are well learnt by studying the injuries and diseases of a single organ of the human frame, such as the eye; as, in a fleet or army,—one a collection of ships, the other of regiments,—the actual efficiency of the whole force is promoted or impaired by the same causes, which, for good or evil, affect a single unit; so, in every commonalty, especially an urban community, the standard of public health is regarded by the amount of illness prevalent in each of its constituent families, and, since the harvest field of disease-prevention is so extensive, and skilled duly engaged labourers in it are so few, the healthiest of populations, in the healthiest cities, are much more than decimated by preventible causes, three-fourths of which, if legislators and bread winners were taught the merest rudiments of sanitary science, would soon be extinct as the Dodo. And you will find, from the following facts, that the evidence of this statement, and of the great truth of improved public health (shewn by diminished death-rates and sickness-rates), being synchronous with improved sanitation, is incontrovertible.

In all England, and notably in the cities and large towns, from the Norman Conquest to the middle of the 18th century, the number of recorded deaths for any time usually equalled the amount of births in the same period, and often exceeded it; yet even then, in London and most burghs, some excellent sanitary laws existed, on which indeed, our present health code is based, though they mostly fell into abeyance owing to popular ignorance of hygiene.

Since then, contemporarily with the advance of health-knowledge, the birth-rate has gained on the death-rate till it now is ordinarily twice as high. When a ship or regiment formerly served, even in peace time, on a foreign station (usually near the capital city), its *personnel* not rarely had to be entirely replaced during a single tour or commission. Now, in spite of the Afghan, Zulu, or China wars, we see veterans with medals for "long service and good conduct," "thick as leaves in vallombrosa."

In the army at home, chiefly quartered in large towns, during the years 1870-80, the death-rate has fallen from 18·0 per thousand, which it averaged in 1860-70 to 9·388 per thousand, and in that in the colonies from 30·0 per thousand for the decade ending 1870, to 10·7 per thousand in the last one; whilst the Indian force, in similar years, has had its death-rate lowered from 69·0 per 1,000 to 20·0 per thousand. The total naval death-rate for the decade just ended is, however, for home service, the colonies, India, and foreign stations, from "Pole to Pole," and from China to Peru, only 8·6 per 1,000; though 100 years ago, a ship was defined as "a prison, with the chance of being drowned."

Yet, less than a hundred years since, the jails of England were generally such hotbeds of pestilence that a man placed therein was practically condemned to death; now, any one of our prisons, despite its depressing influences and the bad hereditary life-tendencies of its inmates, is always far healthier than the surrounding neighbourhood, and its death-rate is certain to be five times less: for it averages from 3·0 to 4·0 per 1,000, as against 16·8 per thousand of the healthiest country towns or districts.

In a Metropolitan parish, which, 25 years ago, was said to be one of the most insalubrious places in London, being marshy, with a scanty water supply, so contaminated as even to be refused by strange horses, almost unsewered, intersected everywhere by some fifteen miles length of fœtid open ditches, serving doubly as water sources and cesspools, with its population of 15,000, mostly compressed into a narrow river-side street, with blind alleys and courts, amidst which numerous offensive manufactories flourished, and where the various agues, fevers, and most communicable diseases, could at any time be seen with scarcely any seeking, with the total death-rate averaging 30·0 per 1,000, and the fever death-rate 23·0 per 1,000, with no public recreation ground, no public baths, no systematic removal of nuisance, and no provision for isolation of infectious disease, I find as I write, that its drainage, cleanliness, public bath accommodation, and water supply is at least equal to that of most London suburbs; that its 40,000 inhabitants had a death-rate in the last decade of 18·2 per 1,000 and a fever-rate of 1·3 per 1,000; that the former open ditches are filled up, that it has a park of 70 acres, that noisome trade factories are nearly abolished, and that while its numbers and density per acre of inhabitants have more than doubled, its mortality is diminished by nearly one half. At Salisbury, in the same time, the death-rate fell from 40 per 1,000 to 17, at Coventry from 40 to 20, at Croydon from 25 to 16, at Portsmouth from 28 to 16, at Dover from 26 to 14, and in London from 34 to 24.

During these years, the Legislature has passed the Public Health Acts, the Nuisances Removal Acts, the Metropolitan Management Acts, the Local Government Act, the Sanitary Act and its Amendments, the Vaccination Acts, the Contagious Diseases Acts, and various special Acts on minor matters; but, as in mediæval England, they have been imperfectly carried out, and have mostly fallen short of their aim, through being too permissive and not sufficiently obligatory,—the powers that be evading their responsibilities and duties, partly from ignorance, and partly for fear of unpopularity.

As you heard hinted by our revered President, the Local Government Board, in their annual report for 1880-81, state that during the four last decades in England and Wales the annual death-rate per thousand was—

	For 1841-50.	For 1851-60.
From all causes	22·4	22·2
,, 7 zymotic diseases		4·11
,, Fever		0·91

	For 1861-70.	For 1871-80.
From all causes	22·5	21·5
,, 7 zymotic diseases	4·14	3·36
,, Fever	0·88	0·49

"From the above figures it will be seen that, speaking generally, the death-rate of the country remained stationary from 1840 to 1870, but that in the period of 1871-80 it fell from 22·5 (of the previous decade) to 21·5, a reduction equivalent to nearly 4½ per cent. It may, therefore, be roughly estimated that about a quarter of a million of persons were saved from death in the 10 years 1871-80, who would have died if the death-rate had been the same as in the previous 30 years. If 12 cases of serious but non-fatal illness be reckoned for every death, and the earlier estimate was 20, it follows that about three million persons, or over one-ninth of the whole population, have been saved from a sick bed by some influences at work in the past decade which had not been in operation previously. Comparing, then, 1861-70 with 1871-80, it will be seen from the foregoing figures that, of the entire reduction 1·0 in the death-rate, more than three-quarters (4·14—3·36=0·78) comes under the head of "The Seven Zymotic Diseases;" of the diseases, that is, which are most influenced by sanitary improvements and most amenable to control by the action of sanitary authorities.

And of this three-quarters just half (0·88—0·49=0·39), or three-eighths of the entire reduction, is in "fever," the disease which more than any other shows itself in connection with such faults of drainage, of water supply, and of filth accumulation as it is within the province of good sanitary administration to remove. It is particularly significant that, since the year 1870, when the fever death-rate was 0·80 per thousand, it has fallen pretty steadily, year by year, as follows, down to 0·32 in 1880 :—

1871	·70	1876	·44
1872	·61	1877	·41
1873	·58	1878	·42
1874	·59	1879	·30
1875	·55	1880	·32

Thus in the five years 1871-5, the fever death-rate was 0·61; in the five years 1876-80, it was 0·38."

Yet the population of this country is largely and steadily increasing, especially in the towns; and increased population in a given area, unless sanitation is taught and practised, means increased mortality and sickness. The time at my disposal forbids my troubling you with many similar figures, which I have put together from the Registrar-General's Returns, respecting the decrease in many causes of death, especially tubercular diseases and the wasting diseases of infants, which are equally striking; but I must say a word on child disease generally. We know that the child death-rate is the best test of the sanitary condition of a population. We all have noticed how parents who have loss young children are apt to satisfy themselves with the idea that their loss was "God's will," and, therefore, unavoidable; but I say

"No," and maintain that if attributable to any one person's endeavours, the gap in the household should generally be ascribed to a very different agency, that of the Spirit of Evil. For what do we find? Of 100,000 children of all classes born alive in all England, 74,000 are living at the completion of their fifth year. Amongst a like number of the "Upper Classes," 87,000 survive their fifth birthday, 90,000 of the peerage, and 50,000 of the child population of the large towns generally, though in some of the latter only 40,000, and occasionally barely 10,000, are alive at the commencement of their sixth year! This loss of so many young lives, which both in town and country might, by proper sanitary education, have been saved, is chiefly due to infantile convulsions and diarrhœa (from impure water and improper or insufficient nourishment, in quality as well as quantity), acute chest affections (from impure air and faulty ventilation and clothing), and contagious diseases (from want of isolation of the sick).

The term "preventible, or communicable disease," broadly speaking, comprises these three great classes and some other maladies, such as typhoid fever, diphtheria, erysipelas, trichinosis, &c., which are mostly spread by means of sewer gas entering a house or polluting its water supply, or by persons partaking of diseased or putrid food. My colleagues will give you more details of their "*raison d'être*, and of their prevention," but, from personal observation, I may speak of the researches of Lister, Thudichum, Cheyne, Köch, and Pasteur, as calculated, in spite of anti-vivisectors, to speedily stamp out most of the communicable diseases, as thoroughly and completely as Jenner did small-pox, not only in his day, but for nearly a century subsequent to it.

"What man has done, man may do," and already their results are most encouraging. If the existing laws were carried out properly, there can be no doubt, as Mr Chadwick has ably demonstrated, that we could reduce the sickness and death-rate in most of our cities by at least one-third, that is, that the death-rate should not exceed 16 per 1,000 of the population, and the sick-rate, which, of course, represents a great loss of money, should stand at but 192 per 1,000,—whereas now, in London, with about one million three hundred thousand of the wage-earning class, the annual number of applicants to the Hospitals, who are presumably working men only, exceeds two millions.

Were a greater amount of sanitary knowledge diffused amongst all classes, we should no longer have nearly every dwelling acting, more or less, as a sewer ventilator, both by its house-pipes and water-supply. Over-crowding and ill-ventilated rooms, with insanitary houses, would be things of the past, and the communicable diseases being practically unknown (since the services of trained Medical Officers of Health, with proper staffs, must, when its occurrence was notified, at once stamp out each form of zymotic disease) the death-rate, excepting that from old age, would fall to some 5 per 1,000 per annum, and the sick-rate to 60 per 1,000.

But at present, in too many instances, the British householder is like Æsop's countryman with his cart stuck in the mud; instead of clapping his own shoulder to the wheel, he expects Hercules, in the shape of the Health Officer, to aid him, but he *won't* obey that functionary's orders, frustrates them to the best of his ability, and then reviles their giver; *he won't*, on any account, have his house disconnected with the sewer; he *will not* ventilate his soil pipe; he *will* give the inmates of his family less than 300 cubic feet breathing space for each; he *will* persist in drinking water poisoned in its storage by sewer gas, and using tainted and adulterated food; he *will* contract marriages of too near consanquinity, he abhors disinfection and isolation after communicable disease, and he prefers taking the chance of dying to being in *propria persona*, or in that of his family, properly vaccinated or re-vaccinated. Failing to realise the truth that "prevention is better than cure," he waits till illness, usually communicable as well as preventible, is rampant in his home before he takes any measures to stop it, suffers in person and purse thereby, and spreads it broad-cast around him. How many families, in their yearly estimate of expenses, assign a sum for medical relief, one-third of which, properly expended in home sanitation, would effectually bar the entry of such death-causes as enteric fever, erysipelas, diphtheria, tubercular disease, and rickets?

Had the ordinary principles of sanitary science been taught, like those of physiology, in even elementary schools, such sad events as the deaths from preventible complaints of our Prince Consort, of our Princess Alice, of Dean Stanley, of the late young Queen of Spain, and of some gallant officers in the Admiralty and War Office, would, humanly speaking, never have occurred. Until our country realises that. for its well-being, for the *Mens sana in corpore sano*, it requires a minister of public health armed with adequate power, equally with a minister of war and a home minister, money and life will be squandered as heretofore; but with the metropolis and each county, placed under the control of a sanitary force organised similarly to that which now protects it from crime, and a minister woh would authoritatively demand of his subordinates explanations of departures from the normas of health in any special locality, such scandals as *fever dens*, poisoning by polluted and impoverished milk, diseased meat, foul water, and adulterated food, and deaths from over-crowding, or breathing atmospheres vitiated with smoke and noxious gases, would soon cease.

In America, free though its people are, they are much more under sanitary surveillance than ourselves; vaccination with bovine or humanised lymph, compulsory notification of infectious disease, rigid isolation of the same in proper hospitals, an admirable building code, and strict supervision of builders', plumbers', and gas fitters' work, by skilled officers, are all fully carried out in most States; and, consequently, very gratifying results are already recorded, which must materially assist the endeavours of English sanitarians, such as those around me in this Congress, to abate disease and save money-waste by teaching the People to co-operate with sanitary proceedings, and showing them how to prevent the attacks of disease by themselves repressing its causes.

"Aide toi et Dieu t'aidera," says the proverb, but how can a man help himself if ignorant of the way to do so?

The phrase, "Sanitas sanitatum, omnia sanitas," may be a telling cry at an election time, but there it begins and ends, and will do, so far as politicians alone are concerned; for uneducated themselves in sanitary knowledge, and too often looking on the warnings of those who are better informed as "utter foolishness," knowing, moreover, that their constituents are, if possible, more unwise and obstructive than even themselves, and fearing to lose place and power, they will never undertake any really broad and obligatory measure of Sanitary Reform until they find that public opinion is pressing it upon them.

It is for you, ladies and gentlemen, to guide this public opinion in the right direction: to impress on your friends, neighbours, and countrymen that, beneath all our boasted civilization, much barbarism still remains in the arrangement of the common exigencies of living; and that it is the duty of every thoughtful and intelligent man to assist in removing this by directly and indirectly strengthening the hands of those engaged in public sanitation, and so augmenting the national health and prosperity.

SANITATION IN JAPAN: A COMPARATIVE STUDY.

By C. F. WALSH.

Though I have headed these notes "Sanitation in Japan," they are not an essay on Sanitary Science. I have set down a few notes on some manners and customs which I have seen, hoping they might not be altogether useless to those who are better able than I am to devote their attention to Sanitary Science.

Circumstances caused me to take much interest some years ago in the question of the disposition of sewage matter in this country; and when afterwards business took me to Japan, my interest in the matter did not cease. I did not know much of what was being done here in solution of the difficulties of the question; but I saw that the conditions of life tended always more and more to crowd our rapidly increasing population into the large towns, and that this tendency kept forcing the question of town sewage into the front rank of the problems demanding immediate attention.

Some years before I left this country a great scheme was in operation for the drainage of London. I firmly believed it would fail, and was interested in seeing how these matters were managed in a country which had reached a very complete state of social economy, but one a long way removed in type from ours,—for there can be no greater mistake (though it is a very common one) than to look upon the Japanese as an uncivilized people. Their civilization, on its own lines, had reached a very high development long ago; and in anything that we may find the Japanese doing it is never safe to assume that they do it in that particular way because they are not aware of any other; and also that, because the outside world knew next to nothing of Japan for 260 years, Japan knew nothing of the outside world.

Amongst the first things that strike a visitor from England are the universal, and I may say practically exclusive use of wood as building materials, the absence of smoke, and the dress of the people, which, unless they can afford silk, is made exclusively of cotton. The causes are not far to seek. There is coal in abundance, but no machinery to work it to advantage, and as wood is abundant, and the badness of the roads renders the carriage of heavy materials always difficult and often impossible, the universal building material is wood; the houses are of low elevation, and a town or village often occupies what we should consider a great extent of ground in proportion to the population. Their buildings are all above ground—there is scarcely any cellarage—and the drains are merely shallow open trenches. From the construction of the houses nothing that flames can be used as fuel, and so, wood being cheap, charcoal is used and chimneys are absent. The people are not choked by the carbonic acid gas generated during the progress of their domestic affairs, because, having no glass worth mentioning, but possessing a fine climate, they solve the window and ventilation difficulties at one and the same time, by leaving at least one side of the house always open by day, to be closed by more or less badly fitting shutters at night. The people dress with little variety as to the cut of their clothes, partly from convenience and partly from ceremonial laws, but they all dress in cotton—unless they can afford silk—because there are no wool-bearing animals available for the making of woollen cloth. Almost the entire population live upon rice, supplemented with fish and fruit, according to their means; but "butcher's meat," as we call it, forms no part of the food of the people, though they are learning to like it when they can afford it. Foreigners have remarked the rapidity and ease with which wounds heal amongst the Japanese, and physicians may be able to tell me if that diet has anything to do with it.

They have, however, from this manner of life—constant exposure to variations of temperature, against which they have only cotton protection—great liability to some complaints, from colds in the head to rheumatism, which latter in some form or other is perhaps the commonest complaint in the country. Small pox is one of the most dreaded scourges, and it has struck me that this extreme degree of ventilation may even act in propagating the disease, but I cannot presume to speak on such a point.

These diseases seem to me to be intimately connected with the conditions of life,—such as having to build in wood,—and the sanitary authorities (were there any) would most profitably have their attention directed towards the alleviation of the effects of the causes, rather than to such an almost impossible task, at present, as the removal of the real causes themselves.

The great prevalence of diarrhœa in summer,—another national complaint,—I attribute largely to the habit of eating nearly all fruit before it is ripe, or after an imperfect ripening after it has been gathered. The answer to my enquiries on this subject was, that insect life is so multitudinous, that no crop left to hang till it was ripe would be worth gathering. This also seems to be a matter the cause of which it is not very easy to remove by human regulations.

In my experience, fevers are very rare in any class of the community, native or foreign. In a foreign community, varying from 250 to 300, I cannot at this moment recall one case in seven years. Had any cases occurred they could not possibly have occurred from "drains," as drains, in the sense of sewers, there are none whatever;—which brings us to one of the most important things, from a sanitary point of view, and the thing perhaps with regard to which any people can do to the fullest extent what they choose. In Japan there is an open drain in nearly every street, and I found the foreign residents in a continual state of alarm at the danger to health and life of these drains—an alarm disproportioned to the reality of the danger, for these drains had nothing to carry off but kitchen and house washings, in addition to the natural surface water. They might have been kept cleaner than they were, for after a period of drought at the end of the summer they were apt to become unpleasant through the authorities neglecting their duties, but it is not the practice of the Japanese to allow any sewage matter proper ever to reach these drains. They have known well for ages the value of this matter. In the town I lived in—not a large one, but which may be taken as a type—the sewage was kept separate and undiluted, and the farmers and market gardeners removed it, as a return load, every morning when they had brought their produce into the town. This had to be done before a certain hour in the morning. It was taken to the fields, to cesspools built there, *which are protected from the rain*, till the operations of husbandry required its use. There are unpleasantnesses connected with this; but *health is preserved and nothing is wasted.* It is therefore clear that none of this sewage matter can remain in or near enough to any house sufficiently long to be dangerous, the poisonous gases which succeed the simply disagreeable ones having no time to generate before removal of the sewage to where they can do no harm; and further, as the said sewage matter never has any chance to reach the surface drains, *all possibility of the dissemination of waterborne poisons from it is absolutely eliminated.*

It appears to me that, if we look at home, we shall find that our greater deviation from primitive processes is not quite so satisfactory in its results.

We have an immense manufacturing population, and the nature of our available building materials enables us to supply the manufacturers' demand for a large population in a small area. Building in stone or brick, with a large supply of glass, we have less liability to suffer from sudden changes of temperature, but we have vitiated atmospheres and the class of diseases thereupon attendant; we have chimneys and cheap coal—and the smoke nuisance with them. These, and some other things, we may call partly unavoidable difficulties, arising from our circumstances (like the rheumatism and diarrhœa of the Japanese), which we can perhaps deal with in no better way at present than by ingenious appliances to lessen the extent of the evil. But I fail to see that we are in quite the same position with regard to our sewage. To my thinking, we have, by our system of town drainage, *unnecessarily* created many of the evils of which we complain, and having gone out of our way to create them, we could, by a return to a better system, do far more than could be done by any mere appliances for amelioration. In dealing with the difficulty in London (which I may take as a type), the most pressing part of the difficulty, as it appeared to our shortsighted minds—the difficulty of *getting rid* of the sewage—we accepted Bazalgetti's scheme, and tried to *waste* it. We did not say so. I can remember some glowing pictures of the value the stuff was to be when it was all collected down at Barking. But we appear to have set out upon that promising scheme in entire ignorance of what we ought to have known—that one of the first necessities, if the stuff were to have a commercial value, was that it should not be diluted beyond a certain point. So, in making the drains, we made them large enough to take not only the sewage and household water, but the surface rainfall as well, with the result that when there is a short supply of rain, we must either have under our houses an enormous continuous elongated cesspool, giving off fever-breeding gases at every trap, or we must flood—and then we get sewage matter so diluted as to be agriculturally valueless. We have now at Barking a constant arrival of this stuff, creating an indescribable nuisance and danger, and I see we have just been told that we must make a lake or two more at enormous expense. We have, in fact, with all our boasted civilisation, learned absolutely nothing in 300 years. 1860 was a wet year, and a healthy one. 1864 was exceptionally dry, and exceptionally unhealthy. In London, 1,064 died from typhus in the last three months, while in the corresponding periods of 1860 to 1863, the numbers were only 311, 624, 796, and 881. Froude, in his "History of England," states of 1563, that the deaths in July in London had been 200 a week, in August they rose per week to 700, 800, 1,000, and 2,000, where they remained till November, when the rains washed the sewers, and the death-rate at once fell. London is just as dependent now, as 300 years ago, on the accident of rain. It is no small thing that all this London sewage—equal to that of the whole population of Scotland—should be wasted, even if we could succeed in the attempt to waste it—but we have miserably failed. We ought to have cultivated cabbages; we tried to cultivate nothing; and we have succeeded in cultivating typhus.

The Japanese appear to have worked out their system on economic rather than sanitary grounds; and, in putting sewage to its most economic use, they have put it to its healthiest; we have departed from economic principles with an entirely opposite result.

In isolated houses in the country, the question presents comparatively few difficulties—it is, of course, the town question which has to be faced. We have hitherto completely failed to get rid of our sewage *without utilizing it*, and from what I have seen of the success of the Japanese system, and the methods by which that success is achieved, I do not expect to see the problem solved *till we can hand town sewage over to the farmers in a state in which it will pay them to take it*. It is not, perhaps, for me to venture to indicate how that can best be done, but I know what we must *not* do—that is, turn the rainfall into the sewers. It would be useless to advocate anything like the primitive system in operation in Japan. Reformers seem to be completely abashed by the revolt which they foresee against making a stench in the early hours of every morning. The attitude of the ordinary British mind is apparently to prefer to be poisoned, so long as the process be not unpleasant—as it often is not. I doubt, also, whether a return to this system would be economically desirable, town sewage having an exceptionally high value in Japan, owing to the comparative absence of other kinds, and human labour being extremely cheap—both of which conditions are reversed in this country. I am informed, however, that the quantity of household water used in England very rarely averages 25 gallons per head per day, and this might by regulation be much reduced. The quantity used per head of the population is at any rate both a fixed and an easily ascertainable quantity, and therefore presents no engineering difficulties. Neither does the question of the mere removal; for I am told again that even only 10 gallons per head, with a fall of 1 in 100, will do that. I am told further that town sewage has an agricultural value when not diluted with more than 25 gallons per head, which it seems is practically never reached, and it may not be beyond the power of engineers in most towns to provide that all sewage matter shall complete its journey in the drains under forty-eight hours, under which time, I understand, it does not give off the poisonous gases which succeed the merely disagreeable ones. I do not know what in other directions science may be going to do for us; but in the direction of entirely excluding from our sewage the rainfall, which apart from causing a dilution which destroys agricultural value, is in this country so uncertain in incidence as to make it beyond engineering calculations to deal with. I say in the direction of entirely excluding this rainfall. I think I see some light to guide us in this difficult and pressing question. Some residents of London may perhaps ask me if I would have the London drainage done all over again. That is a question for the London resident himself. I am not quite sure that in the meantime it may not be for the benefit of sanitary reform in this country, as a whole, that London people should be encouraged to go on poisoning themselves as a "frightful example" of what to avoid.

I have not told, nor attempted to tell, "experts" anything which they do not perfectly well know, or at any rate ought to know; but Mr Hollond told us, on Monday, that knowledge which is confined to experts has little practical value. He said that only from a general comprehension of sanitary principles by the people, and a conviction that these must be acted upon, could good practical results be expected; and he claimed it to be the chief merit of a Congress, such as this, that it brought these questions prominently before the public mind. If these notes should encourage any of the general public—like myself—to give more attention to these matters, I am satisfied.

WINTER RESORTS.

THE RIVIERA COMPARED WITH ENGLISH SOUTH-COAST WATERING PLACES.

By W. S. MITCHELL, M.A., LL.B.

I have been asked by your Committee to prepare for your Congress a paper on the health resorts of the Riviera, as compared with those on the south coast of England. I do so very willingly because, whilst the conditions of our own home winter resorts are well-known and hardly anything going wrong escapes discussion, the dangers of the Riviera are not so well-known as they should be. The principal places to which I am about to refer are Nice, Cannes, Mentone, San Remo, Bordighera, and Monaco. Before speaking of the dangers of these places, I wish in justice to say, that whilst there is much that is wrong which certainly ought to be put right, at the same time the blame for what is wrong should not be altogether thrown upon the inhabitants. It must be recollected that visitors have practically invaded these places, and that what were small villages a few years ago, have now developed into towns inhabited during a few months only. It is doubtful whether the money made during the season of each year is at all commensurate with the changes the invasion involves. The sanitary conditions, which were good enough for the people themselves, do not conform to our modern English requirements. It is, perhaps, difficult to speak of defects without blame being somewhere intimated, but, as the result of my own experience, I may say that all along the Riviera, information on sanitary matters would be welcomed, and that the defects arise from ignorance rather than wilful wrong. Whilst it is not so very long ago that in our own country we have made the changes we have, it must not be forgotten that the people in the places referred to can feel in a position to speak to us in terms of reproof, inasmuch as whilst we wastefully, by our system of sewage, allow much valuable matter to be lost, the more simple people of the Riviera practically waste none at all.

To those who have to decide between the alternative advantages of wintering abroad or on our own south-coast, there are questions which it is difficult to dispose of without knowledge of the facts. On matters of meteorology information is fairly good, as, not only has the meteorology of our own country been carefully attended to, but it has also received the attention—along the Riviera—of many amateurs, and possibly it has received more attention than is proportionately requisite. There are many considerations which would keep people in this country. Those who are unable to leave their duties entirely can find their requirements met with, to a great extent, on our own coast, which, in the recent improvements which have been made in railway accommodation (as is specially the case with Brighton) constitute a suburb of London. On the other hand, for example, on a bright winter afternoon, the Promenade des Anglais at Nice certainly offers attractions which no watering place in this country can. In a setting with the encircling hills on the one hand, and the sparkling sea on the other, the palm-bordered drive presents changing pictures of well-appointed equipages, characteristic of different countries, beauties of various types, and elaborate costumes mingling with those of the peasantry, and the pleasure of studying such a scene is, perhaps, even worth the risk of catching an illness. It is all the more important that the dangers should be pointed out, as the attraction is so great and the risk so difficult to be known. It will, perhaps, be the simplest course to give you my own experiences as they come, as it will then be seen that to gather any amount of information was not altogether so easy a matter as may be supposed. The question which was put to me was in a definite form:—What is the sanitary condition of those health resorts on the Mediterranean shore, where so many of our country people annually go? In order that you may understand some of the difficulties, let me tell you that I sought the advice of the authorities of the Local Government Board, but without learning much more than that very little was known. I made inquiries at the British Museum respecting the literature of the subject, and there also I found that, whilst many interesting books had been written on the different places, the facts that I was asked to give were in no way alluded to. The same results came from inquiries at the Bibliothèque National, and after visiting the Bureau des Ponts et Chaussés, and the sanitary authorities, I found that, with the exception of obtaining several letters of introduction, I had to commence my investigations practically without finding anything had been previously done in the matter. In fact, the only suggestions that were given to me at all were of a misleading character, because, so far from the arrangements in any way following those of this country, they not only are so different, but the defects which over-pressure has brought upon the systems as adopted are, as far as possible, kept unknown. I found it a matter of great difficulty to trace what absolutely were the facts, and I think it may be a matter of interest for me to tell you how I had to proceed in my work, and so enable you to form an estimate of the value of my facts. For the facts as I found them, and the so-called facts which were given me by the officials, very widely differed. I commenced at Nice with the introductions kindly furnished me in Paris. I was most courteously favoured with a plan of the *egouts*, which were copied for me at the Hôtel de Ville. M. Vigan also kindly gave me information as to the construction of the *egouts*, and the information respecting them was to this effect—that they were intended to carry off the rain-water and the *eaux de ménage*, but that they were in no way intended for any such purpose as the English sewers. And in order that you may better follow the steps by which I came to know the real condition of things, let me here state definitely that they certainly are in no way analogous to our English sewers. Close by the Jardin of the Proménade des Anglais is a solid piece of masonry, through which water flows, at times copiously, and at times in small quantities. This was the spot where my work began. Guided simply by my nose (not having then received a plan of the town), I supposed that I was at the end of a sewer which was not carried out to sea, and wondered that such a state of things should be permitted. Along the shore there are four other channels, and the indications which they gave forth led me to suppose that they also were sewers. This was the conclusion I arrived at independently, and, as I have just said, guided only by the smell, before I had the a plan of the town, with the *egouts* traced upon it. I was most distinctly informed when this plan was given to me that the house and hotel arrangements in the place were that each building had its own cesspool, and that these cesspools had no connection whatever with these *egouts*. It was exceedingly difficult for me to accept this statement as correct. Notwithstanding the statement of the Ponts et Chaussés and of the Hôtel de Ville, a statement also confirmed by hotel proprietors, that there did not exist any communication between the cesspool and the *egouts*; my own personal conviction was that there must be a connexion. I could not reconcile my own inferences from the smells with the statements which had been made to me. The form in which the question then presented itself to me was this:—"Here, on the one hand, you have a mass of official statements, on the other, nothing but your own individual judgment, based upon the sense of smell." In order to judge how far this sense of smell was to be relied upon, I made a point of obtaining, at one particular bed, a bunch of violets, with which to test the accurracy of my smell, and found no defects. I was informed that the reason there could be no communication between the cesspools and the *egouts* was because it was prohibited by a municipal bye-law, under penalty of a fine. At first, I naturally accepted the value of this, but information came from an unexpected source. In the course of my inquiries into the way in which laundry-work was done, I found it necessary to extend my researches into the suburbs, and in many places I saw that there was an *affiche* (notice) that washing was prohibited under penalty of a fine. But, as a rule, where his notice was posted, groups of laundry-women were carrying on their avocation. That such a mandate as prohibiting smoking or shooting rubbish should be disregarded can hardly be wondered at; but that laundry-women should carry on their work in direct violation of a bye-law led me to enquire how far bye-laws and regulations were regarded, and this gave me the first suggestion as to enquirles respecting the carrying out of the laws of the *egouts*. I had been so persistently told that the regulations were strictly carried out, that I had really accepted the statement as correct. The puzzle was becoming a greater one, but the proprietress of an hotel was pointing out to me, with some pride, her *inso laucions*, and, after complimenting her upon the tasteful arrangements, I turned to the practical question,—"How do you know when your cesspool requires empyting, and what happens if it is not emptied?" Each cesspool is one in itself, and so these arrangements do not entirely get rid of the English notion of sewage. The reply which she gave me was, happily, somewhat confused:—"It does not much matter when the cesspool is emptied. *Parce qu'il ya un très petit turgeau* (holding up her little finger to indicate the size of the tube) *comme cela*," and then added that she ought not to have mentioned it, as there was a fine for having such a pipe. Of course, I rapidly changed the subject; but, at the next hotel to which I went, in speaking about sanitary matters, I suddenly put the question, "Please tell me what is the size of your overflow from your cesspool." The size was told me, hardly with exactitude, but the fact was admitted, and after this second case, I had more confidence in proceeding more decidedly with others. It was not many days before I found the statements made by hotel proprietors themselves did not agree with those made by the municipal authorities. The regulation respecting cesspool overflow into the *egouts* was broken just as that respecting washing. The next step was to ascertain the nature of this connexion, which it was so authoritatively stated did not exist. Here I had considerable difficulty. There was not only the difficulty arising from the fact that people did not like to own that they were infringing the public regulations, but of finding a place which would be open for inspection, in consequence of the emptying of the cesspool. I was, however, enabled to do this, and I had the opportunity of seeing two. I do not know that I would recommend anyone to repeat an investigation of this sort; the gentleman who accompanied me left me with the remark that his wife had always requested him to keep away from such places. The man who guided me wondered at my wish to examine the place, and the anxiety which I had for getting the dimensions of the openings. I inhaled so much bad air that I was in consequence of this investigation laid up for several days, but the facts which I succeeded in obtaining were these:—That the cesspool had an opening of from three to four inches in width, and about two inches in depth. Assuming that these two which I saw open were of an average character, there is not the least doubt that a large quantity of cesspool matter finds its way into the *egouts*, which are supposed only to carry off the rain water and the *eaux de menage*. After having thus practically obtained ocular demonstration that such a state of things did exist, it then became simply a matter of enquiry as to how far this custom prevailed. It will be readily understood that here, of course, was great difficulty. To obtain facts concerning a custom which it is stated does not exist, is, of course, almost a helpless task. But, from what I could gather, somewhere about three-fourths of the buildings have their overflow pipes, and I have very little doubt (but here I wish to speak guardedly) that nearly all have.

The *egouts* were never intended to act as sewers. The work, however, is thrown upon them. I am here speaking of Nice. Cannes is in the same state; similar statements apply to such smaller places as Bordighera. The *egouts* have no flush; this is the important point to which attention should be directed. They receive in driblets, with the penalty of a fine, and they are, in consequence, far more susceptible of dangerous condition than the recognised, and therefore provided for, arrangements of English sewerage as matters stand at present. Wherever there is an *egout* there is overflowing cesspool matter; the only flushing of the *egouts* is dependant upon the rainfall. What is practically sewer air makes its escape at every hole or observancy to the *egouts*, and the consequence is that the exhalations can most rapidly reach either the places or the adjacent houses. The most frequented and fashionable streets are therefore the most dangerous; and it often happens that hotel gardens in the most popular quarters are exposed to dangers which are little thought of.

One practical piece of advice is, that at watering-places in England, which have regular systems of sewerage, it is best to keep on the lower ground near the sea, away from rising sewer air, while, where *egouts* exist, it is far safer to live on the hills. Whilst some older-established towns in the Riviera are built upon the flat parts near the coast, within tha last few years several excellent hotels have been built upon the hills round about the older resorts. There are, at present, certain attractions, both social and of a more public character, which induce many to select the lower ground, but there are indications, especially at Cannes, that the higher ground will yield all those requirements which visitors are in the habit of looking for. When visitors ask for statements respecting the health conditions, there is a tendency to neglect many important points. If visitors will only insist upon having information given them with respect to the houses they occupy, and when the sanitary arrangements were last inspected, many of the evils which are now prevalent would cease to exist. There are certain things to which visitors should give their own attention. Many people trouble over their supply of medicine, instead of attending to the causes which produce the want of medicine. If greater care were shown in enquiring into the health conditions, those who provide accommodation would soon learn that to have a healthy condition is even more important than artistic furniture, and the whole state of things would be changed.

Whilst people ascertain about average temperature, and average rainfall, and the condition of the air in which they are likely to be when seeking change, they are not always careful about knowing what is the water supply. One of the papers at this Congress was on the subject of the propagation of disease by foods by water. For people to guard against evils from water is a much more simple matter than is commonly supposed. We have advanced sufficiently far in our sanitary knowledge to know that filtered water is, in many cases, a matter of importance. The returns made respecting the water of many towns show that it is utterly unfit for use. Any simple method which a traveller can adopt to secure his own drinking water being in a fit state is one of the important things that he should look to. Many filtering mediums are advertised, and each maker states his own to be the best. Seeing that the filtering material is required for the purpose of removing from water that which we do not require in it, the material that we use should be such that we can rapidly throw away and replace. A filter must not be regarded as an article of furniture, which is to be kept as long as possible. The outward appearance of many filtering substances is very much alike, and it is only by chemical analysis that we can tell what they are capable of doing. The same is the case with different gunpowders; we cannot tell the difference until we have tested them, and no one would be able to tell the difference between gun cotton and ordinary cotton simply by their appearance. I have for years past urged that people should attend to their own cisterns and filters, because I cannot find that relying on servants for such matters is of the least use. Your servants can light your fires, or light your candles, and you can readily see whether the furniture has been dusted, but as regards your cistern and filter, unless you look after them yourself, you cannot be sure that they are attended to. I am frequently asked about cisterns and filters, and whether we are anywhere near the solution of the difficulties. When we look at the history of " filters which give no trouble," my advice always is that you must have something you can use yourself, and I think that Colonel Crease, C.B., has solved for us a question by the preparation to which he has given the name of Carferal It has this great advantage that whilst he as a naval officer, has the practical experience of knowing that whatever is to be done regularly should be capable of being done without needless trouble, he has also had the advantage of the experience of Professor de Chaumont of Netley Hospital, in testing that his compound does what he expected it to do. In the whole course of my experience, I know of nothing more convenient or more perfect. We progress from time to time, but, at present, I know nothing which I should more fully recommend to travellers than Colonel Crease's Compound. Fortunately, in this country we can obtain all the information respecting water, air, or temperature which we need, but in the Riviera this is far more difficult. There are physicians of recognised ability and practice, but it frequently happens that they are not sufficiently well acquainted with the natural defects of the place, and for this they are hardly to be blamed. It is not their business to undertake the part of sanitary inspectors. Such duties are frequently attended with serious risk, and it is their duty to be available when they are required by patients. It is satisfactory to see a town such as Brighton recognising that health should be considered from the point of view of guarding against danger rather than simply looking upon the matter of curing a disease.

As regards the Riviera, the system of *egouts* is that which I have shown. Right enough in themselves, they are turned to wrong purposes, which makes them a source of danger; a danger which exists in the *egouts* of Nice and Cannes. As regards our own country we have our dangers, but cpenly known and not disguised. The condition of hotels and privae houses and villas, of course, varies both at home and abroad, but a Congress is concerned with public rather than with private arrangements. Until the public arrangements of the Riviera are changed the condition of the centres of resort depends on the condition of cesspools. The health conditions of centres of resort in England depend on public arrangements, which are under real and not nominal control. That is practically my estimate of the relative value of health resorts here and in the Riviera.

SLAUGHTER-HOUSE REFORM.

By H. F. LESTER, Esq., B.A.

It is possible that some apology or excuse may be thought necessary on the part of one who introduces to your notice so unsavoury a subject as reform in the methods and appliances adopted in the killing of animals for food. The excuse which I offer for bringing forward such a topic at the Brighton Health Congress must be the grave and pressing importance of the question,—importance not only to those engaged in the meat trades, but to the whole community; and not only from the point of view of humanity to animals, but from that of the health of the people. In a few brief words I will endeavour to point out, first, the reasons which seem to render some reform with regard to our slaughter-houses imperatively necessary; and, secondly, what that reform, in the opinion of those who have studied the question, ought to consist of.

We are all of us painfully aware, especially those who live in large cities, of the nuisance which is occasioned by the driving of animals, intended for human food, through the public streets. In many cases, this practice has been attended with lamentable and fatal accidents, and it is occasioned solely by the fact that slaughter-houses are allowed to be situated in the centre of large towns—far from the Railway Terminus or the open country, from which the cattle are brought. This is only one small branch of the question, but it is one which is incessantly being pressed on the attention of the public by the sights which are to be seen nearly every day of the week in crowded thoroughfares.

Then I come to the larger and more important question—of the state of the meat which comes from our slaughter-houses; and intimately associated with this topic is that of the due and effective inspection and superintendence of such places. Now, with regard to the trade which is carried on in this country in bad meat, it is difficult to gain statistical information, which is of much value, as to the exact extent of that trade. But there is good ground for believing that very large quantities of diseased meat are sold, chiefly to the poorer classes, without the knowledge of the inspectors appointed to detect such practices. I will quote what Dr. Tidy said long ago to a meeting of Officers of Health. "Private slaughter-houses," said Dr. Tidy, "are atrocious nuisances. There are 110 slaughter-houses in Islington, and it is impossible to have a man at each place to see whether all the animals that go in and out are fit for food." The *Veterinary Journal* for May, 1880, contained a very interesting paper by Mr Fleming, Army Veterinary Inspector, on the amount of tuberculosis existing among cattle in England and on the Continent, in which the writer estimates that five per cent. of our British-fed oxen are infested with tubercular disease, which is excessively infectious, and which is pathologically almost identical with tubercular consumption existing in human beings. Professor Bollinger, who read a paper before the Munich Medical Society on this subject, drew attention to the very great danger ran, both from eating the flesh of such animals and also from the consumption of milk from tuberculous cows. In consequence of this and other representations, the Bavarian Government instituted an inspection of slaughter-houses with a view to getting at the truth about tuberculosis in cattle, and the result of the inquiry was that nearly six per cent. of Bavarian cattle were found to be infected. No such inspection has ever been attempted in England that I am aware of, and there are no data as to the exact extent of the disease. This, of course, is only one among the many diseases that bovine flesh is heir to, and which renders the flesh in question most dangerous for human food. Mr Fleming remarks in his paper:—"There is, in this country, no sanitary inspection of dairy stock; our public abattoirs are, I regret to say, exceedingly few, and I am not aware whether the carcases of all animals killed therein are inspected while being dressed, or what steps are taken to discover disease in them. The private slaughter-houses afford ample opportunity for killing, dressing, and disposing of diseased animals without observation; and until public abattoirs have been generally instituted,—placed under regular sanitary surveillance with regard to the condition of the animals killed in them, and statistics drawn up with regard to the diseases observed,—we shall have no conception of the extent to which this and other diseases prevail among animals destined for human food, especially in large towns."

I will take the case of London as a typical instance of the existing arrangements with regard to the slaughtering of animals. London, at the present moment, contains two public slaughter-houses, and considerably over 1,000 private ones. Of course, different parts of the metropolis are differently situated in this respect, for if Islington has 110 of such places, Chelsea boasts only 28. It would not be right for me to say, with regard to the whole question, that Parliament has totally neglected the subject of how to make our slaughter-houses satisfactory from a sanitary point of view. There have been various attempts made, beginning with the Towns Improvement Clauses Act of 1847 down to the Public Health Act of 1875, to grapple with the great danger to public health involved in slaughter-houses deficient in almost every requisite for securing the proper treatment of animals and the due inspection of the meat supplied. But, in the matter of the abolition of private slaughter-houses, legislation is in an utterly stagnant condition, and private interests conflict with the great main interest of the public health and safety.

London, unfortunately, in a great many ways, is in rather a backward condition, and it is so especially in this particular matter of abattoirs. I am afraid that Paris beats London hollow in the provision of proper slaughter-houses. If anybody visits the large abattoir at La Villette, in the northern suburb of Paris, he will find everything managed in as cleanly a manner as can be desired; in large airy buildings there all the appliances are first-rate, and the public is admitted everywhere. If the same person were to visit the London Cattle Market, near the Caledonian Road, and were to try to catch a glimpse of what goes on in the numerous slaughter-houses attached, he would find that the great majority are leased out to private butchers, and that inspection on the part of the public is simply a farce. The cattle are driven in and the doors are shut. I was informed that two of these slaughter-houses were public, but I was unable to discover any to which admission was granted, while I counted at least a dozen belonging to private owners.

As regards the great subject of how these places are to be inspected, here we find excellent recommendations in Acts of Parliament, but I fear that they are very little acted upon. Sanitary Inspectors and Vestries and District Boards are only mortal, and until public opinion demands that rigorous bye-laws should be made and enforced with respect to the management of slaughter-houses, little will be effected even by the best intentioned legislation.

I believe that it was the Metropolis Management Act of 1855 which first, in London, made the inspection of slaughter-houses compulsory. The Inspector of Nuisances is required, by the Slaughter-houses (Metropolis) Act of 1874, to carry out the bye-laws which are made from time to time by the vestries, "for the regulation of the conduct of the businesses, and the structure of the premises." The Metropolitan Board of Works also has its own inspector, and, in addition, there are special Privy Council inspectors under the Act to prevent the spread of disease among animals in England. No doubt the inspection which at present takes place does do some good, and a wholesome dread exists among butchers and dealers in meat of a prosecution for selling diseased meat, which generally ends in a heavy fine or imprisonment. Other towns, not under the the Metropolitan Acts, are governed by the Public Health Act of 1875, which gives ample power to the local authorities to form bye-laws, and to the inspectors to carry them out.

Unfortunately, the state of things with regard to the condition of private slaughter-houses in London leaves a great deal to be desired. Inspection had been going on merrily for some years, when, in the "Animal World," the excellent journal of the Royal Society for the Prevention of Cruelty, were published, in 1878, descriptions of London slaughter-houses, gathered from eye-witnesses, which are enough to destroy our boast in the exalted civilisation of the nineteenth century. I will read one of the descriptions given, vouched for by officers of the Society, which will show the fountain undefiled from which we unhappy Londoners are condemned to draw our meat supply.

This is a description of a London private slaughter-house:—

"The entrance is narrow, and down twelve steps; the slaughter-house measures five feet square; the lair, ten feet square, and not six feet high, is under the pavement; sheep, cattle, and calves are kept in this place. The animals are actually pulled through the entrance by leading ropes, and by tail-twisting and goading are forced down the twelve steps and into the slaughter-house."

This is not in any way an exceptional instance. I could go on repeating dozens of such cases, only I fear to unnecessarily give shock to delicate susceptibilities by the details of such horrors. Suffice it to say, that place after place is described as being "about the size of a pig-stye, and dirty in the extreme;" that in private slaughter-houses animals are forced through front steps, and down sloping passages two feet wide, and that often there are no lairs whatever, and they are kept in the slaughter-house itself till wanted.

Without dwelling on the cruelty involved, it is, I think, highly probable that animals which have been subjected to this horrible over-crowding and ill-treatment will, when killed, be found to supply meat in an inflamed and unhealthy condition. It is quite certain that the general dirtiness of the premises, which is borne witness to by these officers, cannot but have a most injurious effect on the quality of the meat which comes from them. It certainly does not say much for the efficiency of our present inspection that such revelations should be possible after Nuisance Inspectors have been carrying on their useful work for several years.

I hope that I have shown to a sufficient degree the necessity which exists for some alteration being made in the whole management and surroundings of slaughter-houses, not only in London, but in all large towns, and in our country districts. Now the question presents itself, what are the reforms which would best meet the exigencies of the case? First and foremost, in the opinion of all who have given attention to the subject, is the substitution of public abattoirs for private ones. The compulsory erection of public slaughter-houses would be productive of the following benefits: It would do away with the worst of the evils connected with the driving of cattle through the streets, for the public abattoirs would be situate on the outskirts of towns, or close to the great railway termini. Then it would render inspection to prevent the sale of diseased meat perfectly simple and efficacious. It would insure that the meat is kept in properly ventilated apartments, and that thorough cleaning of the places is constantly being practised. Lastly, owing to the experience which would be gained by the slaughterers in the constant supervision of the public eye, cruelty would be reduced to a minimum. I will quote one or two testimonies to the advantages of public over private slaughter-houses.

An operative butcher, who has been engaged in the trade all his life, states:—"The advantages of public over private slaughter-houses, in my opinion, would be these: 1st. That the animals would be slaughtered in proper, clean, and ventilated places, and would hang where a good draught of air could reach them—not, as in some cases, under the present system, where a breath of air seldom enters. 2nd.

That the refuse could be carted away every night by farmers, who would be only too glad to get such manure, and not remain to breed a stench sufficient to give anyone a fever. 3rd. It would be a family benefit to the master butchers personally, and there is many an act of cruelty committed in the slaughter-house, and sometimes witnessed by their children, which is sufficient to make them look upon dumb animals as mere blocks of wood, and not as members of God's creation."

Then the late Dr. Letheby, Medical Officer of the City of London, stated:—"There are advantages in every possible way to be gained (by providing public abattoirs) in the diminution of the nuisance, the better slaughtering of the animals, in the better condition of the meat, in the better disposal of the offal, and also in better supervision and examination."

And Mr Rudkin, Chairman of the Markets Committee of the City of London, added his evidence to the following effect:—"I do not think there is the slightest necessity for a single private slaughter-house within the boundary of the City. I am an advocate for the establishment of abattoirs. The Paris system is, in my judgment, admirable, and would be an immense improvement in London, and a boon to the public generally."

As a pleasant contrast to the descriptions of London slaughter-houses which I have read, this description of the public abattoir at Manchester comes quite as a treat:—"The site of the Manchester abattoir contains 12,840 square yards. There are wholesale and retail slaughter-houses, a general lair for cattle, and a common-room for drovers and butchers' employés. The ventilation is regulated throughout with wood louvres. The establishment is supplied by the Corporation with water and gas, each slaughter-house being supplied with a stop-cock, to which a hose can be attached for thoroughly cleaning the apartment. The establishment has been in working order for some years, and it is a source of pleasure to be enabled to state that it has fully answered the expectations of those interested. The slaughter-houses are let at a moderate rent to the butchers."

Why, it may well be asked, should not London, or every large town in the kingdom, be similarly provided? There exists power even now under the Public Health Act, for Corporations to abolish private slaughter-houses and substitute public ones, but the process of inducing them to use their power in this respect is laborious and almost hopeless. The assumed opposition of the ratepayers to the expense, and the actual opposition of the butchers to any innovation, prove obstacles such as Corporations could rarely be brought to face. Only a very few large English towns have succeeded in abolishing private slaughter-houses, though in Scotland this much-needed reform has been very generally adopted.

Besides this necessary change, we must also provide that inspection shall be constant and thorough, and directed not only to the question of diseased meat, but also to that of cruelty, cleanliness, proper construction of premises, proper lairs or waiting-places for the cattle, and so forth. Then another much-required reform would be the due training of slaughterers, and their instruction by a veterinary expert as to the speediest method of destroying the lives of the animals they operate upon.

I am convinced, however, that more than this can and ought to be done. The public opinion of the educated classes of the community shrinks instinctively from the infliction of avoidable suffering on animals. Experiments have been tried with improved weapons, and with such appliances as Bruneau's and Baxter's masks, all showing that the whole process of slaughter might be almost indefinitely humanised and improved. I may, perhaps, be allowed to mention at this point, and in conclusion, that an attempt has recently been made by some persons, who felt convinced of the necessity of slaughter-house reform, to introduce an improved apparatus which causes a perfectly painless death to the victims, under the valuable guidance of Dr. Richardson. The apparatus was constructed and experiments were successfully conducted, and the results will shortly be given to the public in a practical shape. There seems no reason in the world why, until public slaughter-houses are everywhere established by law, there should not be set up one or more model slaughter-houses, where all the arrangements shall be as perfect as modern science can make them, where every attention shall be paid to the quality and care of the meat supplied, so as to show the way and set an example to the numberless other slaughtering establishments throughout the country.

DISCUSSION.

The PRESIDENT said that the subject of slaughter houses had been examined by himself and Professor Owen, then on a sanitary commission, some 35 or 40 years ago, and they arrived at the same conclusions as had been put forth in the paper just read. As to the great superiority of the French system, one of the points which had been mentioned was a commercial result obtainable from the aggregation of cattle in large numbers in properly-constructed slaughter houses, namely, that many parts of the animal found useless in the case of single animals had, when accumulated in large numbers, a commercial value, and became a remunerative product. The obstacles which had to be contended with arose in a great measure from local ignorance.

Mr WASHINGTON LYON disagreed with the reader of the paper in a good deal that he had said about London private slaughter houses, and thought the paper was calculated to convey a wrong impression. He thought it was quite an exceptional thing to find a bad private slaughter house in the Metropolis, and referred to the excellent arrangements for slaughtering cattle provided at Deptford and Islington, where tons of condemned meat were prevented from coming into the market.

Dr. RICHARDSON said there were 1,200 slaughter houses in London, and there was no doubt they wanted dealing with. He had been interested in the question for many years past, especially with regard to securing some humane means of killing the animals. Electric discharges had been tried by him with success, but, while that was very well in the hands of experts accustomed to the instruments required, who could give the shock without danger to themselves, it was quite likely that, if an ordinary butcher made the experiment, he would perform it on himself instead of the animal. It was, therefore, dangerous. Another mode tried was narcotism. By administering carbonic oxide the animal was rendered insensible, the required result being obtained in from 19 to 50 seconds. It, however, required some skill. For carrying out that painless method they required properly-constructed slaughter houses, and the method, too, was more expensive than the ordinary way. While, at one time, he was of opinion that the operation of slaughtering cattle might be carried out properly in private slaughter houses, he had now come to the conclusion that it could only be efficiently performed in a properly constructed abattoir. He believed the time would come when the process of killing of animals for human food would be done away with. He thought a model slaughter house would be a good thing to establish in Brighton. It would be easier of accomplishment here than in the Metropolis, a suitable place could be more easily found, and it could be done at less expense. As a physician, he knew of nothing which would induce him more readily to recommend the town to invalids than the knowledge that to its other sanitary attractions it possessed the great benefit of such an institution. He knew the matter must, in a great measure, be left to independent effort; but he pressed upon the inhabitants of Brighton to set the example.

Mr C. F. DENNET (Brighton) said the question of an abattoir was raised here two or three years since, but it was eventually negatived. Feeling an interest in the matter, he sought the best information upon the subject, which he found in several places in America, especially Chicago, and in Brighton in the county of Middlesex, Massachusetts. If they wanted to see a model abattoir that was the place to find one, and it was found to be a benefit, not only to the general community but also to the butchers themselves. There was the greatest care, humanity, and perfect cleanliness in everything—the animals were well treated, fed, and watered both *en route* from the far west, and on their arrival at the abattoir, and they were killed by the most approved and speediest means. There was no waste; all the offal, &c., was utilised, treated in an especial manner at Chicago—for utilisation as a fertilizer and sold at a high price. The institutions were introduced by the butchers, packers, and shippers themselves—a Joint Stock Company—and he recommended the butchers of Brighton and other large towns to follow the example of their American *confrères*, to buy land, set up their own works, and thereby save themselves any sacrifice they might have to make later, perhaps.

Mr TANKARD stated that, while a member of the Town Council of Brighton some years since, the question of having an abattoir was discussed. He was upon the committee appointed to obtain the opinion of the butchers upon the question. It found no favour, however, and the answer obtained from one butcher was that he did not wish another to see what he himself killed. (Laughter.) When the committee presented their report, the Council were afraid that their contemplated action would interfere with the trade of the town. And so it would be to-day unless they got rid of their faint-heartedness.

The MAYOR said that the failure of the abattoir scheme was not owing to the faint-heartedness of the Town Council, but to the present state of the law, which allowed such a large amount of compensation to a butcher for being compelled merely to shift his workshop from one part of the town to another. No township could be expected to readily acquiesce in the expenditure of £30,000 or £40,000 for such a purpose.

Mr WINTER BLYTH, as a Medical Officer of Health for a large portion of the Metropolis, assured Mr Lester that the private slaughter houses in his district were in a very cleanly and well-kept state. He thought that gentleman's picture referred rather to the past of a few years ago. He went, however, with Mr Lester and Dr. Richardson as to the advantage of public abattoirs; but, at the same time, he believed the slaughter houses in the country were worse than those in the large towns.

Mr PARKER-RHODES supported Mr Lester's picture of the slaughter houses in the Metropolis, and said the public abattoir was the only means of meeting the difficulty. The municipalities he also thought should be able to establish abattoirs by force of law, and not be overruled by the power of the butchers.

The President then proposed a vote of thanks to the authors of the various papers which had been read, which having been carried,

The proceedings of the Section ended.

FOOD: ITS PRODUCTION, DISTRIBUTION, AND ECONOMIC USE.

ADDRESS

BY

JOHN ROBERT HOLLOND, M.A., M.P.,

PRESIDENT OF SECTION B.

In undertaking to deliver an address on so large a subject as that which is to be discussed in this Section, I am conscious that some apology is due from me for my apparent temerity in venturing upon so wide a field without the special qualifications for the task which, I fear, I cannot in any way claim. My excuse, however, must be found in the very largeness of the subject itself, which enables it to be treated from a variety of standpoints, and excludes it from possible appropriation by any one class of intellectual workers. Of the wide scope of the subject we may form some idea by glancing over the contents of one of the scientific works on food, such as Dr. Pavy's Treatise on Food and Dietetics, and the late Dr. Smith's book on Foods. We see there the whole subject mapped out before us. Beginning with the origin of food and the ultimate sources from which all life is derived, we are led on to a consideration of the different elements which go to constitute food, and to a chemical analysis of the various foods in common use among us. From chemistry we pass on to physiology,—the consideration, that is, of the mode in which the body in health can best assimilate what it needs, and of the proportions of the different substances which it requires. Next in order come the therapeutics of food,—the proper diet for the body in disease, and in connection therewith the proper dietaries for such public institutions as hospitals and lunatic asylums. When in addition to all this we find air and water included among the foods, and are thus brought face to face with the problem, —comparatively unknown in more primitive times, but only too pressing a one in our modern civilization,—viz., how to secure good air and good water to the mass of our population living in our great cities, we seem to see the horizons of the subject indefinitely broadening out. But the outline is not yet exhausted, for we have heard nothing yet of the political economy of the matter; of the production of food; of the sources of supply; of the means of distribution; or of the use to be made of the materials of food—questions, all of them, which raise further questions, such as whether the land of our country is made the most of in the production of food; whether the machinery of distribution is all that it might be made; and whether the consumer, when the materials are at his command, chooses and uses them to the best advantage. The subject then assumes still larger proportions, and is seen to embrace a large part of the economic life of the nation.

It is needless for me to say that I do not pretend to do more than deal with a very small part of this vast subject. The chemistry and physiology of food I must leave to the scientific and medical men, who are already ably dealing with it in a variety of ways—not only in the field of pure science, but also in the field of popular literature. There is, in my opinion, no more hopeful characteristic of this age than the persistent efforts which are being made to bring the results of scientific knowledge home to the mass of the people in a popular form. It seems as if scientific men had at length fully recognised that their mission is not only to discover truths, but to popularize them, and that until they have done this they cannot take their place as leaders of opinion and instructors of the people. I shall not go over ground already so well occupied, and in which we have other papers to-day, but I propose to make some remarks on (1) the production of food, (2) its distribution, and (3) the economic use of it; and I shall hope to deal with this last point without trenching on the ground of the faculty. The first two heads will lead me into matters of a semi-political character, but I shall endeavour to avoid anything which may be said to be political in the narrower sense of the term. In its larger sense, this will be impossible, for all laws and institutions which depend upon laws are political and affect all subjects of national importance.

My first heading is the production of food. Is the system under which our land is cultivated the one best calculated to bring out to the utmost the productive powers of the soil? Is the quantity of produce as great as it might be, and is it of a kind which, under present circumstances, it is most advisable for us to grow? To the first of these questions we can only have an answer in the shape of opinion, but opinions from recognised authorities are entitled to due weight. The first opinion I shall quote is that of Lord Leicester, first given some years ago, and reiterated so lately as 1879, that year so disastrous in the annals of English farming. In reply to the question whether he was still of opinion that the production of food in this country might be doubled, Lord Leicester wrote in words which deserve to be cited in full:—

'I adhere to the opinion still, although I did not intend my remarks to apply to each individual acre of arable land or to any particular county. I believe that if the pastures of the United Kingdom were thoroughly drained and efficiently farmed they would produce double the quantity of food they do at present, and in wet summers the very serious loss in sheep would be greatly diminished. But few of the arable fields are laid out to meet the thorough system of cultivation which is necessary for the production of large crops. In considerable districts of England a large number of fences and trees are neither profitable nor ornamental, and deduct considerably from the area available for cultivation and from the produce of the soil. Few farm buildings are adapted for the economical production of meat, or for the proper preservation of the manure, and much of the land is undrained or only partially drained. If to these obstacles we add the grievances from which the farmers of England are now justly seeking to be relieved—the insecurity of tenure, the insecurity of capital, the want of freedom for cultivation, and the injury from ground game—I think that if these and all other obstructions were removed and owners and occupiers of land had ample capital, the power to use it, and the knowledge how to apply it, the United Kingdom might, more especially in the production of meat, nearly double the present amount of food.'

Mr Lawes, another great authority, spoke in the spring of the same year to the same effect, using the following words:—'No one, I suppose, can doubt that the soils of this country are capable of producing very much more wheat and meat than they do at present; if not, indeed, all that is needed to support the population.' A different view is taken by Mr. Caird. In his 'Landed Interest,' he speaks of the (1) 'production of bread and meat within these islands appearing to have nearly reached its limit,' but from this general remark he, elsewhere, (2) excludes good lands capable of being rendered fertile by drainage. In face of this divergence of opinion, it would be rash to pronounce judgment in very decided terms, but there are some considerations which must present themselves to any one who looks into the subject. How much land, one may ask, has been treated in the scientific way in which Mr Prout has treated his farms at Sawbridge Mills? And yet there was nothing peculiar to the original condition of these farms to make his treatment one which was only applicable to them. Mr Prout himself does not think so. He has spoken with

(1.) P. 143.
(2.) P. 6.

no uncertain sound in this matter. What was peculiar in his case was not the condition of the raw material, but the terms on which he was able to use it. In other words, he was both owner and farmer; he could do what he willed with the land; he could alter its form, fill up ditches and cut down hedges, and rotate his crops as he wished, or not at all. His success has not produced its full result, because, in his opinion, the conditions under which land is held stand in the way. Until these have been modified, and a much larger portion of the land brought up to the level of the best farming, is it not premature to speak of the limit to the production of bread and meat having been nearly reached?

Another important question is what kind of produce is it most advisable for us to grow. The immense importation of breadstuffs from America are working a complete revolution in agriculture, and the area devoted to corn growing is diminishing, while permanent pasture is increasing. The country, in Mr Caird's words, (1) 'is becoming every ten years less and less of a farm and more and more of a meadow, a garden, and a playground.'

'The dairy and market garden system,' he says (2) elsewhere, 'fresh milk, and butter, and vegetables, and hay, and straw are every year enlarging their circle around the seat of increasing populations.' The produce that can least easily bear transport is, therefore, the kind it is most advisable to grow at home. Here it is difficult to avoid encountering the old question of large and small farms, with special reference to the kind of produce to which each is the better adapted. From this point of view it is unfortunate that comparison between England and France, as representing the two systems, have been always made to turn upon the gross amount from particular product only, viz., wheat, and that a product which, as we have seen, it has become less and less necessary to grow at home. England, we are told, can show an average wheat crop of 28 bushels to the acre, while France can only show one of 15. If this were so, the fact would not be conclusive till a comparison were made of other kinds of produce; but the fact does not seem to be quite accurate. It was, at least, pointed out in a letter to the *Times* of October 21, 1879, by the late Mr G. G. Richardson, author of "a work on the corn and cattle producing districts of France," that the averages for France were inaccurately taken by reason of each department being counted a

(1.) Landed Interest, p. 143.
(2.) Letter to the *Times*, May 14, 1880.

unity, whether its wheat-growing area were large or small, and that the true average crop was much higher. He added that wheat is grown in France just as it is in England by tenant farmers, not by peasant proprietors, so that the higher yield of the English wheat crop has nothing to do with the question of peasant proprietorship. Another correspondent at the same time showed that a great deal of poor land was brought into cultivation in France, which would be left uncultivated here, by the unpaid and unremitting toil of the French peasant, and this is borne out by the fact that the (1) area of cultivated land bears in the former country her proportion of 91 per cent. of the whole, whereas in Great Britain it is only 71·6 per cent.

A comparison has also been instituted between the meat produce of England and that of the land *par excellence* of small farms, Belgium. M. de Laveleye claims for Belgium a superiority in the number of animals kept. His conclusions have been controverted by Mr Jenkins, (2) Assistant Commissioner to the Agricultural Commission, and the rejoiner will probably be forthcoming. It is difficult to obtain trustworthy statistics on such a subject, as it is obvious that the quality and size of the animals must be taken into account, and the comparison then becomes difficult. It is admitted (3) however by Mr Jenkins, that in milk and dairy products Belgium is probably in a better position than England, and that its available home supply is probably double what it is with us. This is important, for milk and butter are among the products which will least easily bear long carriage, and which we should therefore produce at home. In general, I believe, it will be found that an increase in the number of small holdings will best suit our present requirements. The minor kinds of produce are often neglected by large farmers. Poultry and eggs, honey, fruit, flowers, vegetables, &c., can only be raised by minute care and attention to the smallest details. The extraordinary industry and minute labour of the Flemish peasant on a soil naturally sterile, which will grow nothing without manure, has been well described by (4) M. de Laveleye, and it is such attention that these minor products demand.

As to poultry, the experience of (5) France shows us that a greater aggregate can be produced from a number of separate centres than

(1.) L'Agriculture Belge, par M. E. de Laveleye, p. 172.
(2.) Agricultural Interest Commission. Report of Assistant Commissioners, p. 720.
(3.) Ditto, p. 721.
(4.) Systems of Land Tenure. Cobden Club, pp. 454, 457.
(5.) Agricultural Interest Commission, p. 816.

by attempting to keep large numbers in one centre, and though it may be that our climate is not in all parts so favourable as that of the Continent for this kind of produce, yet it should be recollected that our producers have the advantage of greater proximity to the markets. At any rate, the large increase in the imports of eggs, which have risen from little over half a million in 1861 to 747 millions in 1880, and in value from £550,557 to £2,235,451, suggests the question whether some part of this food might not be grown at home.

This view is borne out by a letter which appeared in the *Times* (1) two years ago under the initials H. T. F. The writer says :—

'I know of many men occupying from 10 to 50 acres of land, who are not only paying their way, but making money. They are mostly men who pay a high rent, but do not farm under the usual foolish and antiquated restrictions. They may take a crop of turnip seed or sell off a few loads of straw, or may substitute a crop of early Ryott potatoes for a dead fallow, if they treat the land liberally. They make (for them) a large amount by rearing calves, pigs, and cade lambs, and they have little or no labour bill, the work being done by themselves. My neighbour C, who farms over 600 acres, assures me that of the total produce of his farm last year he made 'nothing to the good,' and complains that he scarcely gets poultry and eggs for his own use. My neighbour D, who farms 30 acres, made this year of five acres of early potatoes £220. Last year his wife sold—

5 reared calves..	£25	0	0
32 pigs, at 16s	25	12	0
20 cade lambs, less cost at 5s each ..	43	0	0
18 turkeys, at 10s 6d	9	9	0
220 couples of fowls and ducks, at 4s..	44	0	0
	£147	1	0'

Another industry which I would suggest for consideration is the keeping of rabbits. Under the head of imports of game are included a large number of rabbits, some three hundred thousand of which are reported, according to (2) M. de Laveleye, to be shipped from Ostend every week, mostly for the London market. It is commonly assumed that rabbits are only a product of game laws; but M. de Laveleye tells me that in Belgium rabbits are mainly a product of the small

(1) Aug. 20. 1879.
(2.) L'Agriculture Belge, 1878, p. 138.

cultivators and workmen, many of whom have plots of garden ground, and whose wives and children busy themselves about it. At Ostend, I hear, that rabbits are kept in large shallow pits, paved with brick and concrete, so that they cannot burrow, but with room enough to run about in.

We hear little in England either of the goat, the most economical of all animals to keep in proportion to the cheese and milk which it produces. The British Goat Society reports that the system of supplying goats to cottagers, to be paid for by instalments, works well, and that the number of cottagers applying is considerable; but the difficulty is to find a large enough supply of goats. I know the objections that will be raised from the destructive nature of the animal, and there is no doubt that much damage has been done by it both in Greece and Asia Minor, and, to the eternal grief of naturalists, in St. Helena. But it is possible to keep goats under control. In his 'Économie Rurale de la France,' (1) M. de Lavergne reports that near Lyons the Mont Doré cheeses are all made from the milk of State-fed goats, some ten or twelve thousand of which are kept in this way, and yield abundance of milk. The supplies of milk to our rural population are already too deficient for it to be expedient to neglect any source from which the supply of so necessary an article may be increased. Taking a general view of the kinds of produce likely to be grown at home, it appears to me that where soil and climate are favourable, an increase in the number of small holdings is likely to take place, if, at least, the obstacles in the way of this transformation are done away with. No sudden or wholesale transformation is likely to take place, and there will always be room for large scientifically-managed farms, such as Mr Prout's, but the intermediate class is less likely to stand its ground. In this connection it is interesting to turn to America. There, in the Eastern States, a great transformation of agriculture has taken place. The rapid development of the West, and the importation of corn from the virgin prairies, have affected the Eastern States just as they are affecting Europe, and have brought about a change in the manner of cultivation of the soil which may well be looked upon as a forecast of what we shall see here. Mr Edward Atkinson, of Boston, in a pamphlet on the (2) 'Railroads of the United States and their Effects on Farming,' shows that though some land has been thrown out of cultivation in the

(1.) P. 244.
(2.) Boston. A. Williams and Co., 1881.

Eastern States, yet the aggregate value of the farm products of Massachusetts is larger than it ever was, and is annually increasing; so much so, that, at the last National Census, the county of Worcester, Mass., stood third among the county divisions of the whole of the United States in the value of its agricultural products. The explanation is that, while the more sterile lands and those remote from railways have been given up, the more fertile and favourably situated lands have been more highly cultivated. The character of the produce, too, has changed. The staple elements of subsistence are obtained from the great manufactories of grain and meat in the west, and the Massachusetts farmers devote themselves to roots, hay, and fruits, to poultry and dairy farming. This rapid adjustment of production to the changed condition of things has been made possible only by complete freedom, not only in the sale, but in the use of land; and one may well ask oneself whether, if the land of Massachusetts had been in the hands of owners unable to sell it, or, if able, bound either to invest the proceeds in other land or to fund them, and if the farmers who had the use of the land had been under stringent condition as to the mode of cultivation, the transition period would so easily have been got over. In this case, as in all others, perfect freedom of trade had enabled the inevitable changes to be made with the least amount of hardship.

To obstacles such as are to be found in our land customs, must be added those which have lately engaged the attention of farmers, specially in Kent and Sussex. There are still districts in England, mostly in these counties, where arable lands cannot be converted into market gardens without the payment of an extraordinary tithe, varying from 3s 6d to 13s 4d per acre. Since 1873, no new districts can now be made liable to this charge, but it is not so with hops. A liability to an extra tithe, varying from 2s to 22s per acre, may be said to hang over every parish in England (with trifling exceptions) for land newly cultivated with hops. No wonder that the Committee of the House of Commons, to which this matter was referred, (1) reported that this extraordinary liability was an impediment to agriculture, hampering new cultivation, and ought to be abolished.

I have now touched upon some of the obstacles which stand in the way of the use of the soil to the best possible advantage. We have, in the main, a system of large farms,—with the three classes of land-

(1.) Report of the Select Committee on Tithe Rent Charges.

lord, farmer, and labourer living out of the land,—when the changes, made by the facilities of transport, demand another kind of culture and the traditions, which we find among the class of occupying owners. We have a landed system, which, giving as it does an interest often to three generations simultaneously in the land, hampers the nominal owner in his power of dealing with it. We have a system of land transfer which, from its complexity and costliness in the case of (1) small plots, stands in the way of a ready change of ownership. And, lastly, we have insufficient security to the cultivator for the capital he puts into his business. Here these matters interest us as hampering the production of food, and my duty is done when I have indicated them. The task of remedying them must be relegated into the hands of the legislator.

2. Next to the production of food comes its distribution—the ease and readiness with which it passes from the hands of the producer to the hands of the consumer. Happily, we in England no longer live under a regime, which assumes that it is the duty of the Government to control and regulate the distribution of food. But it is well to remember that this has not always been so. France, before the revolution, suffered most severely from the fiscal barriers which it was thought the highest wisdom to interpose between province and province, and which prevented an article from circulating from one end of the country to the other without paying a number of separate customs dues. One of the most potent causes which induced the intractable spirit of the population of Paris during the revolution was simply famine,—famine caused mainly by the stupid restrictions put upon cultivation and transport by the Government of the ancient regime, and intensified by the equally stupid remedies devised by the ignorance of the revolutionary leaders. It is curious to read in the pages (2) of M. Maxime du Camp how the means taken by the authorities defeated their own ends; how the prejudices and the violent laws against forestallers so terrified traders that no one dared touch the grain trade; how the purchase of corn by the State and its re-sale to the people at a loss emptied the markets; how the penalty of death was declared against any one who dared to treat grain as an article of merchandise, and how the consequence of all this was constantly recurring famine. But this is an old world story. We are now living under a new regime, based upon the theory that the fewer restrictions there are

(1.) Systems of Land Tenure. Cobden Club, p. 209.
(2.) Paris. Ses Organes, ses fonctions et sa vil. Vol. ii., ch. 2.

upon the circulation of goods the better; that the whole world is to be put under contribution to give us of its best; and that that Government does best which interferes least between the producer and consumer. For a nation such as ours, which is dependant upon foreign importation for two-thirds of its corn supply, and for a large amount of its other food, no other theory would be possible, and from the point of view of the food supply, free trade is not only a benefit but a necessity. It is sometimes thought that free trade has increased the tendency to a fluctuation in prices, but this theory is not borne out by the facts. In France, (1) before the revolution, the price of a *setier* of corn—a measure a little over four bushels—varied in different parts of the country from 25 to 97 *livres*, and in England the price of a quarter of wheat never fluctuated more violently than it did in the first quarter of this century. What free trade has done is to make the market of the world more sensitive in all its parts, and by spreading the perturbations over a wider area to prevent them falling with special intensity upon any one part. As far as importations from abroad are concerned, we get the full benefit of the increased facilities of transport, but it is a question whether something does not remain to be done with regard to internal transport. The rates charged by railway companies for the conveyance of produce have presented a *primâ facie* case for enquiry, and a Committee of the House of Commons has been appointed to take evidence and report on the subject. Meanwhile, Mr Jenkins, whose report on Belgium agriculture (2) I have already alluded to, tells us that 'the rate for meat, dead poultry, dead rabbits, butter, eggs, fruit, and vegetables, from Ipswich to London is 4s. 9d. per cwt., including delivery within the usual limits; while the rate for the same articles by 'Grande Vitesse' from stations as far south of Brussels as Gembloux does not exceed 3s. 2d. per cwt., provided that at least 4 cwt. is sent at one time.' He adds that, 'as far as Belgium is concerned, these figures seem to bear out the charge that the English producer of perishable articles is unduly weighted with the cost of carriage.' I refer to this question, not to pronounce judgment, for it is still *sub judice*, but because it cannot be omitted from a review of the circumstances which affect the distribution of food, and there can be no doubt that on its solution the fate of farmers in remote districts largely depends.

(1.) Ib., p. 44.
(2.) Agricultural Interests Commission, p. 764.

In America the question of freights has also attracted attention, and Mr Atkinson shows, in the pamphlet I have before quoted, that a rapid reduction in the freight of corn from the west to the Atlantic has taken place within the last six years. Analysing the returns of thirteen of the main truck lines, he shows that the average per ton per mile has been reduced from 1·27 in 1873 to 1·02 in 1879, and that while there has been in the same period an 'increase of freight moved of 47·27 per cent., and in miles of road operated upon of 20·83 per cent., the increase in earnings from that source has been only 3·84 per cent.' One year's subsistence of grain and meat for a working man can now be moved 1,000 miles at a cost of five shillings, half a day or a day's wages, as the case may be, and the Massachussetts mechanic for one day's pay is placed next door to the western prairies. Thus has competition worked out the problem in America, and resolved it in the interest of the consumer.

But when the produce of the country has been conveyed to the town, a further process has to be gone through before it reaches the consumer, and in this process we are introduced to the question of markets. The importance of this question has been specially recognised of late in the matter of fish. A country like ours, no part of which is far distant from the coast, ought, one would think, to have a cheap and abundant supply of fish, instead of which its price is such that Sir H. Thompson, (1) is his book on food, is forced to rate it an expensive luxury. The revelations made before the Fish Market Committee of the Corporation of the City of London show, in the metropolis at least, why it is neither cheap nor abundant. One witness said it was cheaper, and it paid him better, to send fish from Hastings to Paris than from Hastings to London; another alludes to fish being used as manure; and there is a general agreement that fish is kept out of the market by telegrams to say that the market is glutted;—in other words, that there is danger of fish being too cheap. Fortunately, the attention of the public is now thoroughly aroused, and it is freely admitted that a new Fish Market—with, I hope, better regulations—is an absolute necessity for London. How long, however, (2) we may ask, are we to wait before we get anything like the Halles Centrales of Paris, covering nearly five acres of land, and connected by underground tramways with the principal railway

(1.) Food and Feeding, p. 30.
(2.) The Fish Market in course of construction by the Great Eastern Railway seems to promise something of the sort.

termini? This question is one which pre-eminently affects the mass of the people in our large towns, for whom it is of vital importance that provisions should be fresh, cheap, and abundant.

3. I come now to my third head—the economic use of food. We have produced the food, and brought it to the consumer's door, and now we want to know what he can do with it. In using the word 'economic' I do not mean to imply that everyone should live as cheaply as he can, regardless of how he lives. I use the word in the larger, and, I think, truer, sense—of getting money's worth; getting all the food possible out of the money spent on it. To the mass of people whose means are strictly limited, and to whom it is of great moment to make the most of what they have, this question is of vital importance, and to deal with it they must have a truer knowledge of the comparative merits of different kinds of food, and exercise a choice less governed by conventional habits. The neglect of vegetables, for instance, as staples of food, and the want of variety in them, both among rich and poor, is a theme on which writers on the subject readily and rightly descant. Sir H. Thompson, (1) for instance, says:—'For our labourer, probably, the best of the legumes is the haricot bean, red or white,' and he adds, that 'there is no product of the vegetable kingdom so nutritious; holding its own in this respect, as it well can, even against the beef and mutton of the animal kingdom.' Some of the expenditure on meat and bread might therefore, probably with advantage, be transferred to this quarter. It is also from this point of view—that of making the most of the means at command—that the question of alcoholic drinks must be approached by them who cannot lay claim to medical research in this matter. It is still, I believe, a moot point whether alcohol can be classed among foods, any part of it going to build up the waste of the system, or acting as a preventive of that waste. Without presuming to decide this question, one may fairly put it to one, whose means are limited, whether it is a wise expenditure of money to make a habitual use of alcoholic liquors. When one thinks of the limited fund at the disposal of a working man, and the large demands made upon it not only for feeding and clothing, but also for education and household expenses, we may, I think, fairly say that the outlay on alcoholic liquors might with advantage be made elsewhere. Putting aside the number of questions which rise up on the mention of this subject, one recognises it as a question of luxury.

(1.) Food and Feeding, pp. 32, 35.

and luxuries are justifiable only when one can afford them, and when other and more pressing wants have been provided for. It is difficult to believe that the large amount annually spent by our nation under this head comes within this description.

But no choice of the materials of food can be of use unless there is skill in using them, and we are, therefore, brought finally to that art in which we as a nation are admitted to be singularly deficient, and are never tired of proclaiming our deficiencies—I mean cookery. It is now generally allowed that there is a deceptiveness about the term plain cookery; that, while it seems to mean 'wholesome,' as opposed to 'rich,' it really means only a very moderate degree of wholesomeness coupled with a very large amount of monotony. Of much cookery worse may be said; there is too generally a lack of variety in the materials, waste in the process, distastefulness in the product, and unwholesomeness in the final result, and this in the homes of a large portion of the community. The sum of these daily discomforts, or lack of comforts which might be had, would, if it could be added up, amount to a large total, telling greatly upon the health and temper of the mass of mankind. It is from this point of view that the movement in favour of cookery schools is so much to be commended. Up to the present time the subject has not received from the Education Department all the favour that it deserves, though I do not know that the department has been much behind public opinion in the matter. Cookery has been hitherto included with a number of other matters under one generic name—domestic economy, and it has been rather tolerated or permitted than actively encouraged. Now, however, I am glad to say we have legitimate grounds for hoping that it may be ranked as a class subject, taught practically much more generally than it has been, and stand in its own name.

To show what may be done in this matter, I will give a short account of a cookery school in a country village, Bushey, near Watford, from details which have been furnished me by the Rev. Newton Price, who has been its moving spirit:—

'The teaching is given by a pupil teacher who has been trained at South Kensington. The instruction in cookery, which is altogether distinct from the lessons in domestic economy, is divided into three grades, corresponding with the upper standards of the school, thus:—

Standard IV.	(average age,	11), Cleaning.
V.	(,,	12), Cooking.
VI.	(,,	13), Marketing and Cooking.

'About 90 lessons in cookery are given in the course of a year, at the rate of two in each week, omitting the weeks immediately before and after the holidays, inspection time, &c. The days are Thursday and Friday, and the time, morning. Consecutive days are taken, that the work may be done more economically, and the morning is chosen that the food may be prepared for an ordinary dinner. The time for dinner is 12, when about ten persons sit down to the meal —the teachers, the cooks, the cleaners, and as many more as are required to furnish the table with guests. Each child who dines pays 2d. The teacher, in addition to her salary as one of the school staff, receives at the rate of 1s. for each cookery lesson, with the proviso that, whatever the dinners cost above 3d. a head, will be deducted from this payment.

'The average number of girls in Standard V. is taken to be ten, and one-half take kitchen duty alternately, so that each girl in this standard receives one lesson a week, and about 40 lessons in the year.

'The average loss on food has been £3 per annum, and it is now expected that no loss whatever will occur. The effect has been that the general work of the school has been helped by the cookery lessons, intelligence stimulated, and connexion between school work and duties of life shown. House work is elevated to the dignity of school work, an enormous gain to common sense.'

'The great difficulty is want of competent teachers, and the great danger is from the love of showing off. People *will* aim at training little girls of 13 to be cooks for rich men's houses. I trace all failure to this.'

It is to be hoped that under the impetus to be given by the new Code, similar experience to this will be the lot of many a school, and that the homes of our people will be brighter and fuller of comfort and health than they have been in the past.

I have now concluded this survey, which I feel to be very imperfect, of some of the more general aspects of this food question. I have been struck in dealing with it with the way in which it inter-penetrates all departments of our national life, and how matters seemingly remote all group themselves without effort round this one central point. But this itself is only one of the great divisions which group themselves around another central point, which gives its name to this Congress. And so the subject expands indefinitely, and the remoter links are seen in their connection with one common end—health

Mr E. CHADWICK, C.B., said he had heard the paper with great pleasure, especially for the advance of economy of which it treated. It was a great effort even if it had come from anyone in a private position, but it afforded him still greater satisfaction to know that it came from a member of the Legislature, where a knowledge of the kind displayed in the paper was so much needed. With regard to the productive power of the land, he said they had recent experience in different parts of the country, that where ordinary culture was used in a large market garden, the result was as $3\frac{1}{2}$, while with liquified manure culture it was as 5. If those results and circumstances were attended to, they might have towns made the centres of the highest cultivation by the proper application of town manures. If anyone had a doubt he advised them to pay a visit to Redford or Leamington, and compare the productive power of the land there through the application of proper manures, and they would find his statement verified. It was the same in Paris, where, though under high proprietary culture, the increased production of the farms was fivefold. All manures should be fresh and not decomposed, because all decomposition meant waste. All waste was avoided by immediate application, besides which they thus obviated bad smells, and it was therefore better both as a matter of economy and as beneficial to health. In that matter he thought the Brighton Corporation had committed an error by throwing their produce of manure into the sea. It had also been said by Mr Smith, an authority on the subject, that the waste of manure by the farmers throughout the country was equal to another rent. These facts rendered model farms extremely important for the instruction of the people. They might by that means also develop for food a variety of products not at present produced, which would serve as articles of food; and it was extremely important to promote such changes of production, in order not to be so entirely dependent upon one or two staple articles. The more they could extend the farming of edible productions the better it would be for the population. With regard to large and small farms, he thought there was more to be said than appeared on the face of the statement. He had found it to be the testimony of leading agriculturists that the whole theory of small farms was a theory of small productions, as was illustrated by the farms of poor Germany, the production of which was only about one half of what it was in this country. In conclusion, he said the paper of the hon. gentleman was one of the best he had heard, and was well deserving the hearty thanks of the Association, which he then proposed should be given.

Mr F. Merrifield seconded the motion, remarking that those who knew Mr Hollond, knew that if he undertook to deliver an address upon any subject he would be sure to provide himself with extensive information in relation to it, and that it would be marked by much care and thought. The subject treated was a most important one, and one upon which the public greatly needed to be well informed.

Dr. Richardson said he was struck with the importance of the subject brought forward in the paper, for in our isolated condition surrounded by sea, we might at some time be confined to our own resources, and then we might be placed in such a difficulty as could hardly be conceived, unless such lessons as had been indicated were taken to heart and acted upon. He admired the paper for its admirable terseness, and expressed his pleasure at seeing a member of the Legislature come forward and recognise their work. Dr. Richardson added that, in suggesting that particular section of the Congress to the Mayor, the latter gentleman entertained it as a happy thought, both of them thinking that it would make a particularly appropriate section. He (Dr. Richardson) had taken particular pains that there should be a good and thoroughly practical list of subjects brought forward, and that they should all have reference to the economy of foods, so that those present might gain some practical knowledge on that subject. No President could preside at any meeting with a finer list of papers before him than those before the honorable Member for Brighton, to whom he now resigned the chair. (Applause.)

Mr Hollond, in acknowledging the compliment, said he was conscious that a great many subjects were raised in his address which must necessarily be matters of controversy. He did not, however, think that that in itself needed any apology, because unless such subjects were introduced and discussed they would hardly attain the ends they had in view. (Hear, hear.)

CHEAP FOOD AND LONGEVITY.

By Dr. C. R. DRYSDALE,

Senior Physician to the Metropolitan Free Hospital of London, &c.

Although there has been an immense progress in modern times in a knowledge of the causes of early death among the masses, there still remains much to be accomplished before the health of even the most civilised communities can be pointed to with satisfaction. Let me take London, the city I am personally best acquainted with, for example, and we find that, with all the splendid efforts recently made to improve the health of that comparatively very healthy city, the death-rate there was 22·2 per 1,000 in 1856, and 22·3 per 1,000 in 1876, and, again, about 23 per 1,000 in 1877. If we turn again to all England, we notice—as pointed out by Dr. Fergus, at the Cork meeting of the British Medical Association—that the death-rate of England and Wales had remained nearly constant in the three decades 1841-50, 1851-60, 1861-70, and that it had shown the figure of about 22·35 per 1,000 in each of these. It is true that there has been a slight falling-off in this death-rate during the last decade, 1871-80, from 22·50 per 1,000 in the former to 21·27 in the latter; but this I attribute in great measure to the cause I propose calling attention to as the dominant one in producing low death-rates, *i.e.*, cheapness of food.

By cheap food, I mean food of the amount required to keep the body in full vigour, and which is obtainable with comparatively little effort. An example will better show my meaning, perhaps, than any amount of words. In the very flourishing colony of New Zealand at this epoch, in January, 1881, the price of mutton was, in Christchurch, 2d. per pound, fresh butter cost 7d. per pound, potatoes 1d. for seven pounds, bread 5d. per quartern loaf, and beef and dairy produce were also very moderate in price. At the same time and place, the wages of a carpenter for a day of eight hours was from 12s. to 14s. Comparing this with London prices, it will thus appear that the price of mutton (8d. per pound) is at least four times higher, butter much more than twice as dear, potatoes about seven times as dear, whilst bread alone is somewhat of the same price, milk being in London 5d. the quart.

But a London carpenter, who works 10 hours daily in place of eight in New Zealand, receives about 8d. or 9d. an hour for his work, or not so much as half (1s. 6d.) what he would in Christchurch; so that whilst a carpenter in Christchurch could purchase for one hour's work (1s. 6d.) three pounds of mutton, a quartern loaf, seven pounds of potatoes, half-a-pound of butter, and about a quart of milk, in London the same diet would cost the operative about 4s. 3d., or more than six hours' work. The man will work six times as long for his food.

This example will serve instead of a more lengthened definition of the expression cheap food, and I shall now endeavour to show that the death-rate of different classes in society is mainly influenced by the amount of effort which the individuals of that class are obliged to put forth to obtain the necessary amount of albumen, starch, fatty matter, &c., which are necessary to keep them in health, in the condition of bodily exertion necessary to perform their allotted tasks.

I have said that the death-rate of England and Wales during the last decade was about 21·7 per 1,000, a fact which I attribute mainly to the great importation of wheat and butcher's meat from America during the ten years, which has made the hour's work of the operative able to purchase a little larger amount of food than in the previous decades of this century; but when we compare this death-rate to that of well-fed New Zealand, we at once see how much we have yet to accomplish before our health is equal to that of so well-fed a state of society. In 1877, according to the Colonial statistics (Hayter) of New Zealand, the total number of deaths in that colony was 4,685, which was equivalent to 11·47 per 1,000 of the then population of the islands. This is little less than half the ordinary death-rate of the island of Great Britain (22). Nor can I admit that the climate of New Zealand is more favourable to longevity than that of England

and Wales, for, as I shall presently show, the death-rate of the well-to-do classes in England and Wales is equally low.

The infantile mortality of New Zealand, where food is so cheap, is only 10½ per cent. of all born in the first year of life, against 15 in Great Britain, 17 in France, and 30 in poor ill-fed Germany, where the birth-rate is so terribly high as 41 per 1,000. In New Zealand this is also the birth-rate.

Consumption is a disease far more frequent among the poor and ill-fed classes than among the well-fed. Hence, as might have been predicted when we knew the cheapness of food there, the deaths from phthisis amounted in 1877 to 82 per 100,000 inhabitants, against 257 per 100,000 inhabitants in England.

Again, the Australasian colonies contain less than 3,000,000 of inhabitants and more than 70,000,000 of sheep, whilst these islands of ours contain 35,000,000 of people, and less than 30,000,000 of sheep.

New South Wales is said to have 45 sheep to every inhabitant, whilst our latest statistics in 1881 show that we rear in these islands not quite 28,000,000 of sheep, *i.e.*, not much more than three sheep to four inhabitants, against 45 sheep to a person in New South Wales.

It would certainly appear from this that our home population presses terribly on its supplies of meat, as compared with Australasia, and accordingly the death-rate here (say 22) is much higher than that of Victoria (17), Queensland (17½), or any of the colonies of Australia, although I cannot doubt that, if we were equally well-fed here, our climate is much better suited to long-life than that of Victoria or New South Wales.

The well-fed classes in this country, I now proceed to show, have a much lower death-rate than the ill-fed; but I must define again what I mean by ill-fed classes. To do so, I shall cite from a most valuable paper by Dr. Edward Smith, on "The Food of the Labouring Classes," contained in the sixth report of the Medical Officers of the Privy Council for 1863. Dr. Edward Smith there tells us, as the result of his careful inquiries, that the food of the workers in silk in this country was found to cost only 2s. 2d. a week, that of a needle-woman 2s. 7d., of kid glovers 2s. 9d., of shoemakers 2s. 7½d., and of stocking weavers 2s. 6½d. a week. Dr. Smith sums up this melancholy recital by the remark—"No class under enquiry exhibited a high degree of health, The least healthy are the kid glovers, needle-women, and Spitalfield weavers. The average amount of food was too little for health and strength."

We need not be surprised (on reading this very accurate statement of Dr. Edward Smith) when we hear Dr. D'Espine say, in the Annales d'Hygiene, that the so-called superior mortality of some unwholesome trades is mainly due to the bad living of the operatives employed in them. Thouvenin, in an article on "The Influence of various Trades upon Health," arrived at the conclusion that, with the exception of cotton beating, dividing and carding of silk cocoons, of white lead, grinding, and one or two others, industrial pursuits do not exercise any directly injurious effects on the operative's health. That able writer attributed, with profound truth, the deterioration of the health of the working classes in towns, and their greater mortality, to defects in their dwellings, to hereditary and skin diseases, venereal and tubercular complaints, to the excess of their premature labours, the scantiness, above all, and bad quality of their diet, and to their irregular lives and drunkenness.

This summary of causes is but another way of naming the poverty caused by dear food, and D'Espine shows (Ann. d'Hygiene) that whilst tubercular diseases form the cause of death in 68 per 1,000 among the rich, these account for no less than 230 per 1,000 of deaths among the ill-fed classes in France.

The average age at death in England and Wales at this time amounts to 39 years; and I now propose to investigate how this figure is made up, or how long the rich or well-fed classes live in comparison with the poor. To do so I am enabled to refer to the most important tables furnished to the National Life Assurance Company by its able secretary, Mr Charles Ansell, in 1874, entitled "Statistics of Families of the Upper and Professional Classes." This is a most laborious work, and comprises statistics concerning 48,044 children of the well-to-do classes in England, including members of the legal, clerical, and medical professions, and the nobility and gentry.

Mr Ansell there shows that, whilst in the first year of life 80 infants per 1,000 die among the rich and well-fed classes in this country, the general death-rate of this class of infants is 149 per 1,000. In Manchester and Liverpool the mortality at this age rises to 239 per 1,000, and in the poor quarters of such cities to 330 per 1,000 in the first year of life. In Berlin, in 1872, 400 per 1,000 of all children born died in their first year of life.

Between the ages of 40 and 60, Ansell's tables give the mortality among the well-fed classes at 147 per 1,000 as against 199 among the general population, whereas Villermé found in Paris that between the ages of 40 and 45 persons in easy circumstances had a death-rate of 8·5 per 1,000, against 18·7 among the poor, and that between 1817 and 1836, the death-rate was 1 in 13 in the 13th arrondissement, the poorest in Paris, whilst it was but 1 in 63 in the 2nd, or one of the richest quarters.

Mr Ansell estimates from the figures in his tables that the mean age at death among the richer classes in England at present is 55 years. It is 39, as I have remarked, among the population in general, and I have roughly estimated it among the poorer artizan classes at not over 30, even at the present time. Thus wealth at the present day, or cheap food, as I have defined it, gives a person perhaps some 25 years more of longevity, than if he were born poor. Mr Ansell also estimated that among the well-fed classes of 100,000 births there were 53,398 survivors at the age of 60, whilst in the Registrar-General's tables only 36,983 attain that age.

One statement of Mr Ansell's shows the immense importance of being born to be well fed. It seems that, in the year 1873, there died 368,179 persons under the age of 60, and if these persons had lived as well as the comfortable classes contained in his inquiry, only 226,010 would have died. Hence in one year poverty destroyed 142,130 lives.

The ever to be remembered sanitary reformer, Mr Edwin Chadwick, writing in 1877 on sanitation, gives the following excellent remarks:—"A death-rate, which is a mean of the death-rate of the whole population of a city, is almost invariably a pernicious mis-representation. Thus we have part of a sub-district in London, comprising houses in good condition, where the death-rate does not exceed 11·3 in 1,000, whilst there are adjacent dwellings within the same sub-district where the death-rates rise to the extent of 38 in 1,000 in the year. A mean of the two is a mis-representation of both. It is now reported that there are particular localities in London where the death-rates are from year to year upwards of 50 per 1,000—overwhelmed and overlooked in the great general mean—which heavy death-rates are now the primary object for attention and relief.

The Metropolitan Free Hospital, of which I have been physician for many years, lies in one of the poorest parts of London—Whitechapel, Now the Sanitary Commission for the Metropolis in 1843, when the general death-rate of London was 24, drew up a most useful comparative account of the death-rates among the well fed and ill fed classes in that district, which should, I think, be universally imitated in future vital statistics. These tables are as follows :—

	Proportion per cent. of deaths from epidemics to total deaths of each class.	Proportion of deaths of children under one year to births within that year.	Proportion per cent. of deaths of children under ten years to total deaths of each class.	Mean age at death of all who have died, men, women, and children.	Mean age of all who died above 21.
Gentry, Professional persons, and their families	6·5	1 to 10	24·7	44	61
Tradesmen, Shop-keepers, and their families	20·6	1 to 6	52·4	23	50
Wage classes, Artizans, Labourers, and their families	22·2	1 to 4	54·5	22	49

It will be perceived from these tables what an immense mortality there exists among the children of the poor and ill fed classes in Whitechapel (in the rates of more than $2\frac{1}{2}$ in the first years of life and of $2\frac{1}{4}$ to 1 between 1 and 10). According to Dr. Rabagliati, in the *British Medical Journal* of this week, Dec. 10th, 1881, page 960, the late diminution of the death-rate from 1871 to 1880 relates chiefly to such children and young persons, whilst the death-rate of males over 35 and of females over 45 has risen. When food becomes, as we may fondly hope that human foresight and science will cause it to be, as cheap in England as in New Zealand, all these horrors will disappear from Whitechapel and the slums of our overgrown European cities.

We have seen that the mean age at death in Whitechapel among the wage receiving class was estimated in 1843 at 22, with a general death-rate of 24 per 1,000, whilst Mr Ansell's statistics give the mean age of the comfortable classes at actually as high as 55. This seems at first sight scarcely credible; but when we look at the statistics of such wealthy suburbs as Hampstead, in the north of London, we see that there is nothing very exceptional in this low death-rate of the well fed classes.

Dr. Gwynn, the Medical Officer of Health for Hampstead, shows that that suburb, with a population of 45,500 in 1880, and with 5,600 inhabited houses, had only 595 deaths, of whom 52 were non residents who died in public institutions; the birth-rate being so low as only 22·96 per 1,000, *i.e.*, lower than the general birth-rate of France, 26 per 1,000. The death-rate was 13·07, or deducting non-residents, 12·4 per 1,000. The death-rate for all London in 1879 was

23·3. In Hampstead in 1878, 78 persons died between the ages of 65 and 75; 48 from 75 to 85; 12 reached 85 and upwards, the oldest being 96. There were only 40 deaths from zymotic diseases.

The condition of Hampstead with regard to the age attained by so many of its inhabitants re n ds us more of France than of almost any other European country. In France (Stille) of 10,000 inhabitants, between 15 and 60 (the productive ages) there are 5,373 persons; in Holland and Belgium, 4,964; and in England, 4,732. And the mean age of those living in France is 31; in Holland, 27; in Great Britain, 26. There are also more old people in France in proportion to the population than in any other country, for of 100 deaths there, 36 are of persons over 60; in England, 30; and in Prussia only 19. But Prussia has a birth-rate of 41 per 1,000 against 26 in France. The value of the food grown in the United Kingdom is said to be some 200 millions sterling a year, and it is added that we import 112 millions more. It will thus be seen what a struggle there must be for food, and above all for the albuminous and fatty parts of food contained in butcher's meat, among that portion of our population to whom food is dearest, *i.e.*, who must put forth proportionately so much of their energies to acquire enough of it.

A certain number of estimable persons seeing the difficulty of obtaining a sufficient supply of animal food for our rapidly increasing population, will have it that man can get on better on vegetable diet than on mixed diet. Well, without for one moment contesting that many persons do live, and even thrive, on vegetable fare, it must be confessed that by common consent men have always been more or less flesh eaters, and, indeed, recent experiments on diet seem to give us the reason for our instinctive love of such food. Thus, in a work, "Die Neueste Ernæhrungs-Theorie," by Dr. C. A. Meineret (1880), I find some experiments which show how very much more digestible the albumen of butcher's meat is than the albumen contained in vegetables. The loss of nitrogen in the solid excreta in Dr. Meineret's experiments, expressed as per centages of the total nitrogen taken, was, in meat, 2·6; in eggs, 2·6; in milk and cheese together, 2·9 to 4·9; in milk alone, 7; in macaroni and gluten, 11; in macaroni alone, 17; in white bread, 19; in rice, 25; in peas, 28; in black bread, 32; in potatoes, 32; in whole lentils, 40. In mixed food with meat (mean of 14 days), 18.

Eggs, then, and meat afford an albumen which is almost all digested, whereas with a diet chiefly vegetable only some 85 per cent. of the albumen and often much less is digested. Dr. Wald

(Casper's Quarterly Journal, 1880) mentions that certain prisoners in Waltenberg in 1852 were fed for a time on a diet containing mainly white and grey peas and lentils. The mortality became quite enormous (380 per 1,000 in the year). Meat, milk, and coffee were supplied and the death-rate fell at once to the normal. Everyone knows also that in many diseases of mal-nutrition, meat and milk are the only articles of diet which can be assimilated. Hence it is clear that, if we wish to lessen the high death-rate among our poorer classes, we absolutely must see that they are better fed, either by conveying them to countries where food is easily obtained, by importing larger quantities of food, or, by proportioning, as the French attempt to do, the number of births to the capabilites of the soil to feed them.

Emigration is a remedy for all those who can pass over the Indian Ocean and the Atlantic, and brave the uncertainties of a life far from where they spent their early years, and is a cure for dear food; unfortunately it does not lower the price of food in any European State, for reproduction can always proceed so much faster than emigration. Nor does it seem probable that butcher's meat and dairy produce will ever become cheap in Europe, merely by the aid of importation, because it has to come a long way, and there are so many mouths at present and in the future to fill. The only chance, it seems to me, that there is for lowering our death-rate by food becoming cheaper, lies in the possibility of our statesmen and hygienists coming to the conclusion that high birth-rates are certain to be followed by high death-rates, owing to the pressure they cause of mouths on meat; and hence becoming convinced that, without discouragements being thrown on the production of large families, it is needless to expect much improvement in public health. The *élite* of the French nation show an example of prudence in this matter to Europe, since to 100 members of the faculty of medicine of Paris, I found there were only 174 children. These parents included the names of Trousseau, Nelaton, and the best men of France. It has hitherto been the policy of statesmen, even in the most crowded countries of Europe, to speak with enthusiasm of the rapidly growing birth-rate of their native lands. It was only in 1834, I think, that the Sardinian Parliament abrogated a law to recompense the parents of a numerous family. But, if it be wise statesmanship to encourage immigration and a rapid birth-rate in New Zealand, where numbers are wanted, it is clearly the highest wisdom to encourage a low birth-rate here by stigmatising the parents of large families with bad citizenship. That was the opinion of the late J. S. Mill, and I endorse it with all my heart.

NEW ZEALAND AS A SOURCE OF FOOD SUPPLY TO GREAT BRITAIN.

By A. FOLLETT HALCOMBE.

I AM encouraged by your learned President, Dr. Richardson, to hope that the few remarks which I propose to lay before this Congress with regard to New Zealand will not be unacceptable. There are indeed many reasons why this Colony of Great Britain may fairly claim the especial attention and sympathy of the inhabitants of the mother country, independently of any question of the present or future advantages which may arise from their connection with each other. New Zealand is England's youngest child, and as it was both troublesome and expensive in its early youth, it may be supposed to be held in most tender regard in the maternal mind. The two islands of New Zealand present a marked resemblance to the United Kingdom, both from the fact of their insular position, and because they occupy in the Southern Hemisphere a geographical position which almost exactly corresponds with that which Great Britain and Ireland hold in this half of the world. It may claim also to be more thoroughly British and more especially representative of the different classes and clans (if I may use the term) which make up the community of the United Kingdom than any other of the Australasian colonies. Its first settlement was started only forty years ago with the enthusiastic assistance of many members of the oldest English families, some of whom cast in their lot with the earliest settlers, and formed the towns of Nelson and Wellington. Shortly afterwards a body of Devonshire farmers founded New Plymouth. Then some prominent members of the Church of England started Christchurch, the capital of the Canterbury province, avowedly as a Church of England settlement. And lastly, a special migration from Scotland direct, including the families and followers of several

Highland lairds, formed the settlement of Otago, and, in affectionate remembrance of the ancient Edinboro', gave the name of Dunedin to their principal town. These divisions retain a permanent record of their origin in the nomenclature of their towns and streets, and in all their social surroundings very many of the peculiar characteristics of the original founders are still observable. In Otago, for instance, oatmeal and whisky are more largely produced, and more largely consumed, than in any other part of New Zealand, and the majority of the places of worship belong to the Church of Scotland. In Christchurch the largest proportion of university men is to be found, and the only Church of England cathedral worthy of the name is erected there, while New Plymouth is even now the only place in the Colony where the traveller can rely on finding really good butter and clotted cream, showing conclusively that the mantle of the Devonshire matron has fallen on worthy successors. Then, again, the climate of New Zealand is the climate of England, without its winter and without its clouds. The area of the Colony is almost identical with that of the United Kingdom. Its trade is almost entirely with the mother country. Its stock—both horses, sheep, and cattle—its fruits, its flowers, its birds, its game, the fish in its rivers, and even its bees, are all imported direct from this country. When the New Zealand colonist talks of making a visit to England, without even a thought of remaining there, he quite naturally speaks of "going home," and when contemplating the glorious future which he anticipates for his adopted country, he sums up all these points of similarity, and all his hopes and aspirations with regard to it, by calling it "The Britain of the South."

The great difference between the two countries consists in the fact that the one is old and the other new. The one with its teeming population has far outrun its powers of food production, while the other is anxious to increase its numbers, and is at a loss to know how to find consumers for the food which a fertile soil and most genial climate yield with exceeding generosity to the hand of man. It is because of these great points of difference that I venture to think the bonds of mutual sympathy which now exist between the two countries may be strengthened and cemented by the additional tie of mutual assistance. England, on the one hand, supplying the Colony with some of her surplus population, and some of the manufactures for which she now finds it so difficult to obtain a market; the Colony, on the other hand, furnishing raw material for those manufactures, and a portion of the food supply which England must necessarily draw from some point or other outside her own boundaries.

A very few years ago it would have appeared presumptuous in the extreme for anyone to suggest that so remote and so small a Colony as New Zealand could materially assist in the solution of the question of England's future food supply. But the rapid progress of the Colony during the last decade, and the successful application of modern science to the abridgement of distance, and the annihilation of time, have opened up new possibilities well worthy the attention of the political and social economists of the present day.

It will be found on reference to the appended statistics of the Australian colonies—

1879.	AREA.	POPULATION.	PRODUCTION OF GRAIN.	AREA UNDER CROP.
Australia.	1,909,367,040 acres.	2,750,000.	42,531,204.	2,973,794.
New Zealand.	68,000,000.	463,729.	21,424,051.	657,890.

that New Zealand has already attained a premier position among all the Australian group in respect of the production of grain. In 1879 —which is the latest date for which the figures can be procured from official sources—New Zealand, with its population of 463,739, and from an area of only 657,890 acres, produced 21,424,051 bushels of grain; while all the other five colonies of Australia, including New South Wales, Victoria, South Australia, Western Australia, Queensland, and Tasmania, with a population of 2,750,000, and from an area of 2,973,744 acres produced only 42,531,204 bushels. The production of New Zealand was therefore exactly half as great as that of all Australia, and was at the rate of 48 bushels of grain per head of the population, with a yield of 32 bushels per acre, while the production of Australia was at the rate of 15½ bushels per head of the population, and the yield only 14 bushels per acre.

Nor is it by comparison with the rest of Australasia only that New Zealand has proved that she is especially favoured in respect of her agricultural capabilities. Whilst the average yield of wheat in New Zealand over a series of years is found to be 28 bushels per acre, in the United States—with which, on account of the comparatively primitive manner in which agricultural operations are carried on, a fair comparison may be made—the average yield is only 13 bushels per acre; and in England, notwithstanding the application of unlimited capital, the most advanced science, and the greatest skill to the work—the result obtained is only an average of 25 bushels to the acre.

It may fairly be concluded from a consideration of these figures that New Zealand is essentially an agricultural country, and the question now arises; Are its agricultural capabilities likely to be developed to an extent which will materially assist Great Britain?

In reply to this it may be pointed out that the export of wheat to the United Kingdom increased from 548,095 bushels in 1875 to 2,518,457 bushels in 1879; and as (after retaining sufficient for home consumption and for seed) this export was the product of only 270,098 acres out of the 12,000,000 acres estimated as available for agricultural purposes, it will be seen that the extension of production is practically unlimited, and depends entirely upon the rate at which population may flow into the Colony.

The objection is often raised that New Zealand, on account of its distance, can never compete with America or Canada in the English market. This objection is, however, proved by practical experience to be a fallacy. Messrs Grant and Foster, delegates to New Zealand from the tenant farmers of Lincolnshire, state that the freight and all charges on a consignment of 10,000 bushels of Wheat from Canterbury, New Zealand, to London was 1s. 6¼d. per bushel; and Messrs Read and Pell, the Government Commissioners of America, estimate the freight and charges from Chicago to London to be 1s. 7½d. per bushel. The fact is, that all the wheat growing districts of America are a long distance from the Atlantic, and their produce, therefore, is weighted with a charge for land carriage which is everywhere far heavier in proportion to distance than carriage by sea. But even if the New Zealand farmer had to pay a heavier freight he could afford to do so. For not only is he producing twenty-eight bushels of wheat at the same expense as the American farmer produces thirteen; but he has the very great advantage of a climate which allows him to grow wool and mutton, or butter, cheese, and beef at the same time. Until I visited the United States after a residence of 26 years in New Zealand, I never realized how great an advantage the climate of New Zealand gives to the farmer there over his American neighbour. In passing through the grain growing districts of the United States, the absence of any stock, excepting a few working horses and milch cattle, is especially observable, and no fences are seen for hundreds of miles, simply because there are no stock to be kept within bounds. In the agricultural districts of New Zealand, on the other hand, the wheat fields alternate with enclosures of pasture land, covered with sheep and cattle. The reason is not far to seek. The long American winter, necessitating the housing and feeding of stock from four to six months in the year, prevents their being bred at a profit, and so the American farmer devotes himself exclusively to the growth of grain, which he raises year after year from the rapidly impoverished soil. But the farmer in New Zealand, after harvesting his wheat, puts in a crop of turnips, which he feeds off with sheep or cattle in the following winter, and not only renews the fertility of his land, but obtains a second profit from it within the year; or he sows it down with English grasses and clover, and leaves it in pasture for two or three years when he can again call upon it for a crop of grain.

It is essential to the right understanding of the capabilities of the country that some reference should be made to the processes by which the results referred to are obtained. For as they are crude and simple in the extreme, they prove that even higher results may be expected to follow on a more careful and scientific mode of husbandry. First, then, the ploughing of the land is done usually with double furrow ploughs; one man with three horses turning over three acres a day on the average. The grain is then sown, and the crop is afterwards left absolutely untouched until harvest time. The land receives no manure, and no weeding is done. Then, when the crop is ripe, it is cut down with the reaping and binding machines at a minimum of labour and expense. It is then, if stacked at all stacked without thatching in a corner of the field, thrashed by a steam thrashing machine, put into sacks, and straightway carried by road or railway to the nearest port, where it is shipped in bulk to England, and on arrival there commands almost the highest, if not the highest, price in the market. The bright clear sunny atmosphere and the constant breezes fresh from the Great Pacific being the farmer's best and most valuable friends in harvest, time, enabling him to get his grain straight to market in the best condition, without the costly and vexatious delay which rain and cloud impose on the English farmer.

Nor is the future production of the Colony less assured with regard to its powers of meat production. There are now in New Zealand no less than thirteen millions of sheep to a population of less than half a million; or more than twenty-six sheep to every man, woman, and child in the Colony. So small a number of mouths cannot possibily consume the produce of so vast a flock, and hitherto there has been no possibility of sending the surplus as meat to the English, or any other market. So hundreds of thousands of prime muttons are annually boiled down for their tallow; and the legs, which are almost valueless for the tallow they produce, are sold at a shilling and often for only sixpence apiece in the Colony.

The late discovery of the process of refrigeration, however, by which fresh meat and butter or cheese can be made a profitable export, even to the most distant point on the Globe, will act as an incentive to a greater production of cattle, and will stimulate the industry of the Colony in new directions. I refer especially to the production of butter and cheese, for which New Zealand, with its even climate and its rich growth of all the English grasses and clovers, is especially adapted. It has never yet grown beyond the limits of Colonial requirements, because neither the butter nor the cheese would stand the trial of a voyage through the tropics as ordinary cargo in the close hold of a merchant ship. The New Zealand Colonists are fully alive to the advantages which they are likely to reap from this new discovery. In every part of the Colony, companies are started and the means subscribed to give the process a fair trial; and as several of the regular trading ships are now being fitted with the refrigerating appliances, we may expect, if the first experimental shipments prove successful, that New Zealand mutton, butter, and cheese will soon find its way to English dinner tables; and as the extent of production in a new country like New Zealand very much depends on the profits arising from it, a large additional capital will undoubtedly be forthcoming for the purpose of turning a larger proportion of the fertile lands, now lying uncultivated and unproductive, into pasture for more cattle and additional millions of sheep.

But, it may be said, the picture drawn is a very rosy one for New Zealand, but where is the reciprocity as far as England is concerned? Wherein lies the mutuality of interests alluded to before? In one of his works on political economy, John Stuart Mill laid it down as an incontrovertible axiom that "the first and most profitable business of a new country is in the cultivation of its land." This axiom especially holds good with regard to New Zealand, and it is for many years likely to be acted upon there, both because the profits of agriculture are exceptionally great, and because, from the scarcity of population and the want of any great distributing centre, it is less likely than many other new countries to try its hand at manufacturing to any extent. England, on the other hand, is essentially a manufacturing country, and must find, or make, new markets as the old ones—America, for instance,—fail. Such being the case, it may fairly be maintained that England will benefit *pari passu* with the progress and prosperity of its best customers. Mr Webster, the other day, in the course of an able address delivered before the Royal Colonial Institute, asserted that the Australians were England's best customers, one Australian (in which term he included New Zealand) being as good a customer for English goods as sixteen Americans. Now, I find that in 1879 the direct exports from the United Kingdom to New Zealand were of the value of £5,302,823, or at the rate of £11 4s per head of the population; while the exports to Australia were £16,860,403, or at the rate of only £6 3s per head. New Zealand is, therefore, the best even of the best customers which the British manufacturer has; and if it is possible for England to add to the population of that distant Colony and increase its prosperity by taking a larger share of her food supply from it, there can be no doubt that it is to the interest of England so to do.

I may say, in conclusion, that there are, I deeply feel, large questions of growing importance underlying the facts which I have endeavoured thus briefly to bring to your notice; especially when it is borne in mind that more than half of your foreign food supply comes at present from the United States alone. There are questions affecting the commercial and political relations between England and her world-wide Colonies, which are pressing themselves upon the attention of all who desire to see the greatness and prosperity of England maintained. And I, as an old Colonist, feel justified in affirming that it is the heartfelt desire of the vast majority of England's Colonists that such a solution of these great questions may soon be found as may tend to bind the Colonies more firmly than ever to the mother country, not in the relationship of mere dependencies, but as integral parts of a United Empire.

BREAD REFORM.

By Miss M. YATES.

The subject of food has of late years attracted much attention Eminent physicians have made special studies of the characteristics of various kinds of foods. A National School of Cookery has been instituted which sends out teachers all over the country, and cookery has become almost a science. But the subject of the economy of food is still quite in its infancy.

To the working classes especially this subject is of the utmost importance, for health is their sole capital.

Sanitary houses and healthy occupations may at present be almost beyond their reach; but, as they can choose their own food, if we can only teach them to adopt what will nourish the body most completely at the least cost, there will be a chance of their resisting the injurious influences constantly surrounding them.

In these days of high pressure and mental strain, it is well to remember that to build up healthy bodies for children is a more precious gift than education, and that—

> "It is food which sends out those supplies,
> Which make us both strong and wise;
> If you would improve your thought,
> You must be fed as well as taught."

Surely it is a disgrace to our boasted civilisation that whilst farmers have learnt what mixture of fodder will enable them to obtain from their cattle the greatest amount of meat, milk, wool, or work, there should still prevail such dreadful ignorance on the right choice of human food, when deficiency of proper nourishment during the period of development and growth may cause much suffering and produce many diseases which might easily have been avoided.

Food is taken into the human body for the same reason as you put coals into an engine to produce the force which moves it. An ordinary engine gets worn out and you are obliged to have it mended, but the human body has the power of repairing the waste caused by work. Every movement, every thought wears away a certain part of the human body. It is, therefore, necessary that the food should contain materials to replace this constant waste. Three classes of materials are required to maintain life, namely, flesh-forming materials, heat-producing materials, and bone-forming materials.

Any single one of them alone will not maintain life. If you feed a dog on heat-producing materials alone, such as starch or butter, it will die of starvation.

If you feed it on meat from which the mineral part has been extracted by soaking it in cold water, the dog will die just as surely as if you gave him nothing. So that to maintain life, it is absolutely essential that the food should contain these three materials, flesh-forming, heat-producing, and bone-forming materials in right proportions.

An ordinary mixed diet of bread, meat, and vegetables supplies them all; but the present high price of meat prevents thousands of people, especially children, from ever tasting it. As bread is, therefore, almost their sole food, it is of the utmost importance that it should approach as nearly as possible to a standard food.

Experiments made by Drs. Gover and Magendie prove that white bread alone will not maintain life, for dogs fed on it died at the end of forty days; whilst those fed on whole wheat meal bread throve and flourished.

Many nations live almost entirely on bread when it contains all the substance of wheat, and are healthy and strong, and are capable of doing any amount of work. The reason for this is that the grain of wheat contains in almost the right proportions those materials which I have told you are essential for the maintenance of life, namely, flesh-forming, heat-producing, and bone-forming materials.

The examination of this diagram of the grain of wheat will enable you to understand the difference which exists between white flour and what we call wheat-meal.

The centre part is occupied with large thin cells, principally filled with starch, the heat-producing material of wheat.

Beyond the central starchy mass is a single row of squarish cells filled principally with gluten, which is the flesh-forming material of wheat.

Beyond these square cells are five thin skins, which formed the part called bran. These contain soluble albumen, a flesh-forming material; cerealine, a ferment which assists the digestion of starch; and the phosphates which forms bones and teeth, and nourish the brain and nerves.

White flour contains from 8 to 10 per cent. of flesh-forming materials, whilst whole meal contains from 10 to 16. But the most important difference between whole meal and white flour is the large proportion of mineral substances that whole meal contains.

One pound of white flour only contains 49 grains of mineral matter, whilst 1lb. of whole meal contains 119 grains. Professor Church states that in 100lbs. of white flour there is only ½lb. of bone-forming material, whilst 100lbs. of whole meal contain 2lbs. Everyone who keeps poultry knows that unless they are given lime in some form they lay eggs with soft shells, because their food does not contain the materials requisite for making shells. If you attempt to feed children on food deficient in bone-forming materials, the bones and teeth must suffer, for you cannot form bones and teeth out of nothing.

Another important advantage of wheat meal is the large proportion of phosphoric acid it contains, 1lb. of wheat meal containing 57 grains of phosphoric acid, whilst 1lb. of white flour has only 21 grains.

This element is so essential for mental work that a celebrated German has observed "No phosphorous, no thought."

It is useless sending children to schools and examinations unless their food will so nourish their brains, that they may derive benefit from such instruction.

This diagram shows you that the interior of the grain is nearly all starch. The flesh-forming materials increase as you approach the outside, whilst the bone-forming materials are nearly all on the outside.

Fine white bread is made from the central starchy part. Household bread contains more of the flesh-forming material; but the truly valuable remainder, which is so rich in flesh and bone-forming materials, is sold to feed cattle—a great waste, for cattle can be fed on many things not available for human food.

In the manufacture of white flour, the millers reject from 20 to 25 per cent. of the most valuable part of the grain. Ordinary brown bread is made from the sieved white flour and a sprinkling of the outermost course bran, which has very little nourishment, being nearly all woody fibre. Ordinary whole meal contains all the nourishment of wheat; but it is ground so coarsely that a very large number of people cannot digest it.

Wheat meal bread should be made from wheat which, after being thoroughly cleansed from the beard, dirt, chaff, etc., is ground, as advised by Dr. Campbell Morfit, fine enough to all pass through an 18-mesh sieve. When properly made, this bread is so palatable and digestible, and so different to the ordinary course, hard, heavy, brown breads, that the brown bread may be called the common soldier, whilst wheat bread, although the same colour, may be considered the Captain or King of Breads.

This bread ought to be considerably cheaper than white bread, and contains so much more nourishment, that if you had only 3s. to spend in bread, if you bought wheat meal bread, you would obtain as much nourishment as from the expenditure of 4s. in white bread--a saving of 25 per cent., besides a great improvement in family health and diminished butcher's bills.

When these facts are understood, it will be realised how necessary this bread is for those who have "little to earn and many to keep." Innumerable instances prove that when people give properly made wheat meal bread a fair trial, they soon prefer it to the insipid over-fermented white bread generally sold. As a proof that people are very willing to adopt it when they can obtain it well-made, I may state that a provincial baker, who last year only sold 50 loaves a week of ordinary brown bread, has now an average weekly sale of 2,500 4lb. loaves.

When we remember the bad harvests which have prevailed in our own country, and know that the wheat crop of America is also about 20 per cent. less than usual, surely it is our duty to use every effort to remedy a wasteful custom which serves to deprive so many of necessary food.

Let it be once distinctly known and felt that you are determined to be supplied with a bread which will sustain and nourish you—then you will obtain it. You can effect any reform on which you are seriously resolved, and you cannot exercise that power better than by insisting on the supply of a bread which will so greatly promote national health, and thus diminish pauperism, disease, and crime.

If clergy, doctors, and all who visit amongst the poor, would convince them of the advantages of wheat meal bread, they would confer a great national benefit; for, if we provide our people with food which will make them healthy and strong, there is a good chance of their becoming wealthy and wise. If ladies would also remember that the word *lady* means "loaf giver," they might exercise a woman's right which no one could refuse, by securing to their poorer sisters a true "staff of life," instead of the broken reed they now lean upon.

All who have listened to the noble and eloquent address delivered by Dr. Richardson must feel that it is a national disgrace that children, who are the brightest jewels of a wise nation, should be allowed to enter life maimed and unfit to battle with all its trials.

The prevention of this suffering lies in a great measure in the hands of the ladies, for Dr. Richardson has also assured us that if the women of England knew the particular kinds of foods required by the young during the period of growth and development, and utilized that knowledge as they might, "in a few generations rickets, with all its attendant miseries of bowed legs and crooked spines, would have disappeared as if by the spell of an enchantress."

Surely our cause must appeal to every woman's heart. We therefore beseech each one of you for the sake of these poor children who are ill-nourished from being fed on impoverished white bread, and not too much of that; who rarely taste meat food, whilst materials containing the phosphates and bone-forming materials which their bodies require are recklessly wasted and cast away,—for their sakes, we beseech each one of you to do everything in your power to promote the general use of wheat meal bread as a means of assisting the rising generation, at a small cost, to grow up in health and strength, as they will do if they have a true staff of life to sustain and support them.

ON THE PRESERVATION OF FOODS BY COLD.

By T. B. LIGHTFOOT, M. Inst. C.E.; M. Inst. M.E.

It has long been known that the decomposition of animal matter can be retarded for an almost indefinite period by maintaining it at a temperature more or less below 35 degrees Fahr., and there are well authenticated cases of carcases of animals having been found in good preservation embedded in snow or ice, where, by cold alone, destruction must have been prevented for many hundreds of years. In Canada, Russia, and some other countries subject to long and severe winter cold, it is the custom to lay in a store of fresh meat and provisions at the commencement of winter, to last till spring, preservation being effected by the action of the cold frosty atmosphere.

Notwithstanding this knowledge, the want of a simple and efficient means of artificially producing cold completely hindered the practical carrying out of any preservative system by its means, and it has remained to the present time to witness the inauguration on a commercial scale of the preservation of uncooked meats by cold, in relation not only to the all-important question of food—especially fresh meat—importation to this country, but in relation also to many matters connected with the storage of perishable foods, which would otherwise be wasted or destroyed.

It is proposed in the following paper to consider shortly—

1.—The general question of preservation by cold.

2.—The actual apparatus employed.

3.—The probable influence of this new and successful process upon the food supply of this country.

The importance of preserving foods by some means or other is of course obvious, and has long been recognized, and is clearly shown by the fact that, up to 1880, in this country alone, about 300 patents were taken out for various schemes involving the employment of heat, cold, or chemical antiseptic agents, while from time to time premiums of from £100 to £1,600 have been offered to the discoverer of a process for preserving fresh meat on a large scale.

It may be stated that, for the perfect preservation of foods, and in order not to depreciate their marketable value, it is necessary to retain at least the following qualities:—

a.—The natural colour and odour.

b.—The natural appearance and taste both before and after cooking.

c.—A complete freedom from taint of any kind.

d.—A freedom from any chemical or other change of structure or composition.

In the very important series of Cantor lectures, delivered by our President to the Society of Arts in 1879, it was set forth that the commencement of the actual process of decomposition is the resolution of the water in the material, or rather of a portion of the water in it, into its elementary constituents, oxygen and hydrogen, these gases combining with the other elements in the structure to form new combinations, and so to set up the state called decomposition.

In living matter this water, which on the average may be taken to form 70 per cent. of the whole of the animal body, is probably to some extent subject to the same resolution as in dead matter, but in living matter there is also a process of reconstruction taking place, by which decomposition itself is prevented.

The first step towards decomposition is what is known as coagulation of the blood, a change which takes place in one or more hours after death, according to certain conditions. Coagulation is in all probability due to the action of a ferment, which causes a rearrangement of the constituents of the blood, resulting in the formation of fibrin or clot, and the separation of the serum or watery portion. In living matter the existence of the ferment is either prevented, or its action counteracted in some manner by the influence of the blood vessels, but after death, more especially if the blood be taken from the body, it is produced without restriction, and in a short time causes the state commonly known as coagulation.

If fresh blood be kept at or below a temperature of about 35 degrees Fahr., which we may call the critical temperature, the formation of ferment is arrested, and coagulation is prevented. If it be frozen for several months and then thawed and maintained above the critical temperature, ferment is at once formed, and coagulation, succeeded by decomposition, follows. If freezing do not take place till after coagulation has occurred, decomposition is still prevented, but will ensue after thawing in less time than if the blood had been frozen before coagulation.

So far, then, as uncooked animal tissue is concerned, decomposition can be indefinitely retarded by continued exposure to a temperature of or below 35 degrees Fahr., but in order to properly retain all the qualities of the flesh, there must also be an absence of excessive moisture, or water in mechanical suspension, and of excessive dryness, in the preserving atmosphere; otherwise, in the one case, a slow destructive action, which injures the flavour of the meat, would occur, and, in the other case, particularly if preservation is maintained over a considerable time, the flesh would be desiccated from the continued evaporation of its moisture.

At the time of the first introduction of processes for preserving meat by the action of cold, the appliances were generally insufficient to produce a lower temperature of the preserving atmosphere than about 35 degrees Fahr., in fact, though many plans for producing cold mechanically were brought before the public, notably those of Tellier, and Mort and Nicolle, the most successful process was one in which ice was the cooling medium, currents of air being sent through stacks of ice, and so cooled and passed into the storage chamber at a temperature of not less than 34 degrees or 35 degrees Fahr.

American meat preserved on this system was largely imported to this country for some time, and was on the whole considered good. There was, however, one great objection to it, and this was that on removal from the cold chamber it speedily decomposed, even at temperatures at which ordinary fresh killed meat would have remained sound and wholesome for many days. There was also an unmistakable loss in flavour, sometimes greater and sometimes less, which though only observed by the more critical, certainly gave rise to the general impression that meat preserved by the agency of cold was deficient in respect of flavour.

From the nature of the cooling process used in the preservation of this American meat, I think the results just referred to are precisely those which might have been anticipated—and for the following reason:—

The capacity of air for holding aqueous vapour in solution varies very largely with its temperature (pressure being constant); for example, at ordinary atmospheric pressure. air if saturated will contain four times as much aqueous vapour at 70 degrees Fahr. as it will at 35 degrees Fahr., so that in cooling from the higher to the lower temperature, three-fourths of the vapour would be condensed into water, and would appear in the cooled air as mist. The process alluded to, involving the cooling of air to this extent, and sometimes even more, it will be seen that though the actual amount of water in the cooled air might vary somewhat according to its initial temperature and hygrometric state, yet water would always exist in some degree, and no doubt it was the slow decomposition, brought on by the damp air, that gave rise to the loss of flavour, as well as to the unwished for property of rapidly decomposing on removal from the action of the cold. If moisture in mechanical suspension be removed, there is no reason why air at 35 degrees Fahr. should not be as good a preservative agent as it is at a much lower temperature.

Upon the introduction of air refrigerating machines, a convenient means was provided for actually freezing the meat by exposing it in a dry atmosphere, kept considerably below the freezing point. Under this condition, all danger from excess of moisture, as well as from excessive dryness, is avoided ; for, although the surplus aqueous vapour is condensed during cooling, as in the ice process, it can, with proper apparatus, be nearly all abstracted in the refrigerator, and the little that remains in the air, over and above that in solution, being subjected to the intense cold, is converted into snow, which may be filtered out, leaving the cold air quite dry as regards water in mechanical suspension, and yet fully saturated with vapour in solution. This latter quality entirely prevents evaporation, for so long as air is fully saturated its desiccating action ceases. Even if, from heat absorbed after delivery into the storage chamber, the cold air be only partially saturated, the complement of moisture would not be taken up from the meat, but from the thin layer of fine snow, which not only covers the frozen meat, but which is found on the floor, sides, and ceiling of the chamber, as well as in the tubes for conveying the air from the machine.

An objection to the actual freezing of the meat, brought forward by some opponents of the scheme, deserves a passing notice. It was alleged that if the flesh was actually frozen, and its juices converted into ice, many of the cells would burst from the expansion which occurs at the change of state from the liquid to the solid form. If this was the case, it is obvious that the meat would be damaged, as the juices would be set free and escape on thawing, and the flesh when cooked would be dry and hard. Fortunately, it is found that no such action takes place. The meat cells are elastic and yield, being in this respect unlike the cells of fruit and vegetables, as will be seen later, and a microscopic examination of flesh which has been frozen for months fails to detect degeneration or change of any kind, either in the muscular tissue or in the fat cells, all of which are perfectly normal.

With regard to the palateableness of frozen meat, the following extracts from letters received from persons not in any way concerned in the question, beyond being consumers, will no doubt be interesting. The statements coincide with those expressed in a number of other letters I have received from various sources, and may, I think, be taken as setting at rest any doubts that may exist in the consumer's mind as to the effect of freezing by dry air upon the quality :—

"The mutton which I received on Friday, and had cooked on Tuesday, was in perfect condition. My cook, whom I have had four years (three in Buenos Ayres), would not believe that the meat had been frozen, but that it was just killed. She said it was exactly like the Buenos Ayres mutton in size and appearance. I am fully convinced that frozen meat is no longer an experiment."

"The saddle of mutton sent off on Thursday arrived all safe on Wednesday, and I had a few friends to dine with me last night to try it, and I must confess it astonished us all. It was exceedingly good, very tender, and perfectly sweet. The flavour was very nice, but rather different from that of our Irish mutton."

I have selected these two extracts as dealing not only with appearance and flavour, but also with the time such frozen meat will keep, under ordinary conditions, after being thawed. It will be seen that in the one case referred to five days elapsed, while, in the other, the saddle was no less than 6 days on the road to the West of Ireland in a hamper, and was cooked and eaten on the seventh day after leaving London. Such instances are valuable in combatting against the popular notion as to rapid decay taking place immediately after thawing, and if known, will perhaps help to further the introduction of this cheap imported meat among the poorer classes, who are indeed those most likely to be benefitted.

As a summary of the foregoing, I think it may safely be said that the dry air freezing process, if properly carried out, has no deleterious effect upon structures and tissues, and that it affords a convenient and satisfactory solution of the question of fresh meat storage and preservation for an indefinite period of time.

Fresh fish, milk, and other animal substances may also be preserved by the dry air process. Frozen salmon, from Labrador, was for some time on sale in London, and was found to be in no way inferior to freshly-caught fish, being quite free from the depreciation in taste so often noticed in fish preserved in contact with ice.

With all frozen meats great care must be exercised in thawing, so as to allow every portion to be gradually brought up to the ordinary temperature, otherwise, on being cooked, the flesh will be found unevenly done, and the interior may, perhaps, be but little acted on by the heat. Immersion in cold water is a good plan, as it avoids all chance of overheating, and if prolonged, ensures a thorough saturation.

Fruit and vegetables may also be kept in good condition by the action of cold dry air, but they must not be frozen, for if the juices are converted into ice, the cell walls are burst by the expansion, and the tissues are destroyed. By way of experiment, I recently froze some pears, grapes, and tomatos, and in each case on thawing, the flesh was found to be quite soft and unfit for use, from the exudation of the juices, while the pears and grapes were discoloured. This result is, no doubt, due to the material of the cell walls in fruit and vegetables, being harder and less yielding than that of the cell walls of animal tissue. This may be seen by squeezing in the hand a piece of pear or orange, and a piece of beef, the juice squirting out from the fruit at a very slight pressure, while the meat will remain comparatively uninjured from the more elastic nature of its cells. It is this hardness of the cell walls which renders fruit and vegetables, as a rule, much less digestible than meat, unless cooked, in which case the cells are burst and the juices set free by the action of heat.

It would be out of place here to more than briefly describe the apparatus employed in the preservation of foods by the cold dry air process, more especially as those sufficiently interested will find in the Tranactions of the Institution of Mechanical Engineers for January this year a paper on "Cold Air Machines" I had the honour of laying before the members of that Institution, in which paper both the theory of the production of cold, and a description of the various types of machines, are given.

The problem consists in taking ordinary atmospheric air, treating it in a specially devised machine, and delivering it cooled to about 50 or 60 degrees below zero Fahr., and deprived of its moisture, into a chamber with heat proof walls in which the meat or articles to be preserved are placed.

The cooling is accomplished without the use of chemicals by simply allowing ordinary atmospheric air to perform work against a piston in the manner of steam, used expansively in a steam engine. Its temperature is thereby lowered to an amount measured by the thermal equivalent of the mechanical work performed during expansion. In practice it is not convenient to expand air at atmospheric pressure, as to do this would involve the maintenance of a vacuum on the other side of the piston, and it is therefore usual to provide a compressing pump by which the air is raised to such pressure as will enable it to perform work notwithstanding the resistance of the atmosphere. But, as during compression the temperature of air is raised in heat by the conversion of the mechanical work performed during compression, to an extent precisely the same as the amount of cooling during expansion back to its original pressure, it is also necessary, in order to obtain after expansion a lower temperature than that from which we started, to take away the heat of compression through the medium of extended metallic surfaces. This is most conveniently effected by means of water, which is either injected into the compressing cylinder, or applied externally to the air after compression.

An air refrigerating machine, therefore, consists of a compressor, a water cooling apparatus, and an expansion cylinder, which are combined on one bed-plate, in much the same manner as an ordinary engine, together with a steam cylinder for giving the necessary motive power.

In addition, however, it is requisite to have some means for abstracting the moisture from the air, as, if permitted to remain, it would be converted into ice during expansion, and give trouble from deposition about the valves and in the passages. There are several plans for getting rid of this moisture, in a greater or less degree, all depending in their action on the varying vapour capacity of air at different temperatures, but, as they form the subjects of different and competing patented systems, they will not be further commented on. An idea of the necessity there is for some efficient moisture abstracting apparatus may, however, be got from the fact that, in the tropics, if fresh air is being used, with a machine of the size hitherto adopted for meat-carrying purposes, about $1\frac{1}{4}$ tons of water will enter in the 24 hours; indeed, in certain atmospheric conditions, nearly two tons would be taken into the compressing cylinder with the air.

Being deprived of its moisture, and cooled in the machine to a temperature of about 50 degrees below zero Fahr., the air is then discharged into a receiver or snow box, in which whatever water has escaped the drying apparatus is deposited as snow, and from this box it passes on through suitable pipes into the preserving chamber.

This chamber is constructed of any convenient form, with walls, floor, and ceiling of material as impervious to heat as possible. An outer and inner layer of $1\frac{1}{2}$ inch tongued and grooved boarding, with a 6 inch space of charcoal, shavings, or sawdust, forms a fairly good protection, but the nature of the non-conducting material must generally be determined for each particular case. A little extra care and expense bestowed on the insulation of the chamber is soon repaid, for it must be remembered that, after the contents are once reduced to the required temperature, the refrigerating machine has nothing further to do than to neutralise the heat passed through from the outside, so that, the more perfect the non-conduction, the greater the saving in fuel, wear and tear of machinery, and attendance.

If the meat is to be frozen or cooled after introduction to the chamber, it is of course important to arrange it in such a manner as to allow the cold air to circulate freely around, so as to enable it to abstract the heat as rapidly and uniformly as possible; if, on the other hand, as is generally the case with meat sent from Australia, the freezing has been effected beforehand, the stowage is best carried out as close as possible, always taking care to avoid injury through bruising.

The cold air is introduced by branch pipes at the roof of the chamber, and is distributed so as to fall at once over the meat. It is then drawn off at any convenient place, and may be led back to the compressors and used over again, after being diluted with a portion of fresh air, or it may be permitted to escape into a second storage chamber for vegetables, &c., or utilized for cooling water and wines.

Though the general description here given is more precisely applicable for the cooling and freezing of fresh meat, it is, of course, obvious that the same arrangement, with slight modifications, will serve also for the preservation of any perishable foods; but it must be remembered that, in dealing with fruit and vegetables, and butter also, it is not desirable to reduce the temperature in the chamber below 35 to 40 degrees Fahr., though for economy of space, as well as for other practical reasons, it will generally be best to use a cooling machine delivering the air at about 50 degrees or 60 degrees below zero Fahr.

Before leaving the consideration of the apparatus employed in the freezing process, it will be well to point out the very great importance of having the whole plant designed and arranged in a scientifically exact manner. No person would think of laying down a steam engine without first entering into calculations to proportion the power given off to the work to be performed, yet, with freezing machinery, it is the fact that, in more than one case, refrigerators have been erected without any idea as to their actual capacity, and in one particular instance a Freezing Company in Australia contracted to supply for shipment as much frozen meat in two months as their plant was capable of turning out in a whole year, with the result that some of the meat, being only partially frozen on the outside, was found to be quite bad and unfit for food on arrival in this country.

The value of an easy and efficient means of transporting fresh meat and provisions is two-fold. In the first place, the consumer will be benefitted by being provided with cheap, wholesome food, while, if prices are lowered, an extended consumption among the poor and more ill-fed classes will most inevitably follow; and, in the second, an outlet will be found for the large surplus stocks both in our Colonies and other countries, much of which would otherwise have to be boiled down for the value of the tallow alone. In Australia there are several stock breeders who could each annually provide for export 100,000 sheep and 12,000 head of cattle, representing when dressed about 15,600,000 lbs. weight of beef and mutton; while in South America, in certain districts, both cattle and sheep are at present raised entirely for the sake of the tallow, hides, and wool.

The following calculations, based on information courteously supplied by the Agent General for Queensland, will give an approximate idea of the effect the introduction of refrigerating machinery may possibly have in that Colony.

Up to the end of 1880, the average selling price of fat bullocks was about 65 shillings each, of which 16 shillings was the value of the hide, leaving 49 shillings, or about $\frac{3}{4}$d a pound, for the flesh, on a weight of 800 pounds. If by means of transport under refrigeration this flesh can be utilized as food, there seems no reason why a price of 1½d a pound should not be realized; and this, after allowing for cost of slaughtering and dressing, will give to the grazier an extra profit of about 45s per head of cattle. With sheep also the increase may be taken in the same proportion, a selling price of 1½d a pound, giving about 2s 6d extra per sheep, over and above the price hitherto received.

To ascertain the cost at which refrigerated meat can be delivered in this country, we must add to the prime cost of 1½d a pound the expense of freezing, transport to the shipping port, and putting on board the export vessel, and this may be taken at ¾d a pound; then comes freight, which at present is enormously high, reaching, I believe, 2½d per pound, or £23 a ton betwen Melbourne and London, but with competition and with improved refrigerating machinery and appliances, this will no doubt be very considerably reduced (probably to one half what it now is); and, finally, there are the port and dock dues, storage, and delivery charges at this end, amounting to ½d a pound.

The total of these figures is 5¼d, and this may, therefore, be taken as the present price at which frozen Australian beef and mutton can be profitably sold to the salesman in Smithfield. If, however, freight can be reduced to 1¼d a pound, the price of the meat would then be 4d a pound, and the retail butcher would be enabled to purchase at nearly one half what he now has to pay for home-grown meat.

In the Argentine Republic the cost of raising cattle is even less than in Australia, though the animals are at present smaller. There is no reason, however, why the size should not be altered by careful selection, and with the excellent grazing grounds and reduced cost of transport, on account of the shorter sea voyage, it certainly seems probable that a good supply of both beef and mutton could be placed in the market at even lower prices than those just named for Australian produce.

The following table gives some statistics in relation to population, head of cattle and number of sheep for the United Kingdom, and some other cattle grazing countries. It will be seen that, while in Queensland there are 13·99 head of cattle and 30·68 sheep to each inhabitant, in the United Kingdom the numbers are ·28 and ·8 respectively:—

	Population.	Head of Cattle.	Number of Sheep.	Cattle per inhabitant.	Sheep per inhabitant.
United Kingdom	35,000,000	10,000,000	28,000,000	·28	·8
United States	50,000,000	33,000,000	40,000,000	·66	·8
Argentine Republic......	2,877,000	13,000,000	75,000,000	4·52	26·07
Queensland	226,077	3,162,752	6,935,967	13·99	30·68
New South Wales	760,000	3,000,000	35,000,000	3·94	46·05
All the Australasian Colonies	2,900,000	8,000,000	69,000,000	2·76	23·8

Within the limits of a short paper on such an important subject there must necessarily be great omissions, but I trust that what has been said will be taken as showing that, with the large available supplies in foreign countries, and the system of preservation by dry cold air, there need be no further difficulty in supplying all the demands that this country can put forth for cheap wholesome fresh food, provided the matter be approached in a scientific and business-like spirit, and with a due appreciation of the several processes involved, and their relation one with another.

DISCUSSION.

In the discussion which then ensued upon the papers read,

Dr. Lane said the whole of the papers had been particularly interesting, the last one not the least so, inasmuch as it pointed to the time when they might reasonably hope to have a large stock of excellent meat brought to our doors at a small cost. With regard to Miss Yates' paper, there could be no doubt that Whole Meal was of an extremely wholesome and health-giving character. They did, however, find that sometimes it could not be digested, and that it caused irritation to the mucus membrane. With respect to the charming account they had had of New Zealand, he might add that the climate there, by reason of its dryness, was much better for longevity than the climate of England. Regarding the whole of the matters brought before them, he thought that they should, while accepting all as of great value, beware not to lose sight of the great general lesson to be learnt, that they could not expect to have health unless they were obedient to the natural laws of health.

Mrs Verrall, in answer to Dr. Lane's remark about "Whole Meal," explained that in the "Wheat Meal," which was now being recommended in the matter of bread reform, the outer skin of the "Whole Meal" was thoroughly separated, which was the portion which caused the irritation spoken of.

Dr. Richardson thought that the last experiment which had been made in Australia, of using dry air in the operation of preserving, had proved a success of a most astonishing character. He was invited to see the first cargo thus brought over from Australia by the process that had been described by Mr Lightfoot. He saw the meat unpacked, brushed away the thin layer of snow from it, and found that it was impossible to tell that the meat had not been killed the previous day in London. When examined microscopically, scarcely any difference could be detected between it and meat which had only been killed a few hours. He had had some of the meat sent to his house and cooked, and no one was able to tell the difference between it and fresh killed meat. He thought, therefore, that they might say that the question of the preservation of meat for importation was solved. He also agreed with Mr Lightfoot's figures, believing that Australian meat thus preserved might be imported and sold to the salesman at 5¼d. per pound. There were, however, two facts which they would have to keep before them in regard to the matter. There was the risk that, if meat was brought over in large quantities, it would cause a rise in prices in the colony; and, also, if they got the meat over at 5¼d. per pound, there would still be a great difficulty in London, because he recollected that, when the first cargo was brought over, it was secured by butchers, who sold it in the West End for 10d. per pound. As long as only one class benefitted by the importation of foreign food, it would not be satisfactory. There must be some provision found for securing the meat to the people generally, even if it took the form of co-operation—though he had great objection to that—to prevent the extortion which takes place before the meat can reach the tables of the poor. (Applause.) With that reformation made they would be able to help the poorer classes in a manner which would tend much to their health and happiness.

Dr. Drysdale said he had frequently tested the method of preserving Australian meat; but he had always found the meat seriously deteriorated, and hitherto the thing had been a failure. He had, however, no doubt that under Mr Lightfoot's process a very great improvement would be effected.

RATIONAL FEEDING; OR, ECLECTIC DIETETICS.

BY A. WYNTER BLYTH.

It is my intention under the term "Eclectic Dietetics" to give a brief sketch of a theoretically known, but, to a great extent, a practically ignored science, by which every person can select the food most suited to his age, manner of life, occupation, climate, and, I may as well add, pecuniary resources.

There is a proper and suitable food for the young, and one for the aged; there is a suitable food for the hand worker, and one for the brain worker. The same food used and appropriated under conditions of great muscular activity, such for example as that of a trained pedestrian, may be positively poisonous if taken in the same quantity by a sedentary student, or a clerk, working many hours a day in routine work.

Foods are divided scientifically and chemically into

1. Water.
2. Albuminous or meaty substances.
3. Carbohydrates or starchy matters.
4. Fats.
5. Mineral matters.
6. Alkaloidal peptones.

These substances mixed together in suitable proportions and taken into the system make up the fuel of life.

The functions of food are, broadly speaking, two-fold; on the one hand to subserve to internal work, on the other to external work. Internal work is the maintenance of the natural functions of the body; the keeping of the heart going, the ebb and flow of the respiratory wave, and the feeding of myriads of living cells in the blood and in the tissues. The simplest example of food doing internal work only is to be found in hybernating animals, *e.g.*, the coiled up dormouse sleeping through the winter does no external work, and the fat of its body suffices for the internal work. Thus, by this experiment, ready made for us in the laboratory of nature, we get the fact that fat alone will suffice for internal work. External work is all activity of mind and body, which in persons when awake is continuous.

WATER.

The enormous quantity of water in our own tissues, and the animal and vegetable tissues on which we feed, proves even in fault of experience the necessity of water. A man weighing 150lbs. made absolutely water free by the skill of a chemist would come out a shrivelled mass of about 50lbs in weight; a beef steak contains 75 per cent. of water; in buying a pound you really buy only a quarter of a pound of dry solid meat. Among vegetables the amount of water is enormous: cabbages, for example, contain 85 to 90 per cent., and succulent fruits often contain more than 95 per cent. of their weight, leaving when dried quite an insignificant residue.

The water is partly free and partly in intimate chemical combination. When we take it into our system, it without doubt assists in the building up of new tissues, the repair of old. I mean, it is not merely a dilutent of fluids; it does not simply play an inactive passive part, like a lubricant of machinery, but it is in the truest sense a food. There are plenty of experiments, both involuntary experiments—as among shipwrecked people—and experiments made for the purpose of experiment, showing that, so long as water is taken, the deprivation of all other food can be supported for a very long time. I may, for example, instance Dr. Tanner's forty days' fast; for, although this American fast has never been put in all its details beyond doubt, yet everyone is convinced that very little, if any, nourishment but water was taken. When deprived of food and water, it is the latter want we feel most and soonest. It has also been shown that the water to allay thirst must be taken into the stomach, or else the thirst is not allayed; for not to mention a direct experiment by Bernard, there is a case of a wound in the throat, recorded by Dr. Gardiner, in which, though buckets of water were swallowed, the thirst was insatiable, because the liquid all escaped by the wound. Nevertheless, shipwrecked sailors have found relief by dipping or rather soaking themselves in the sea, so it may be presumed that some small quantity can be absorbed by the skin. The amount of water taken as water, or in the shape of liquids,—such as in tea, coffee, soup, beer, and the like,—varies much according to climate and custom; but for temperate climates, two and a half pints daily, in addition to the water naturally in ordinary food, is sufficient. The water naturally in food may amount to about two pints, making a round total of four and a half pints. It is of course quite possible, by eating largely of fruits, such as oranges, water-lemons, and the like, to do altogether without other fluids and the experiment has been tried with success; but it has few practical bearings.

ALBUMINOIDS.

The second class of aliments is the albuminous or nitrogenous. It may be called popularly the "meaty" class; the type of the class is the white of a common egg, which consists almost wholly of albumen and water.*

Foods rich in albuminous constituents, and therefore called albuminous foods, are eggs and all kinds of fish and meat; all the important functions of the body are carried out by nitrogenous fluids or solids. The muscles abound with nitrogen; the brain, the nervous system, the blood, all the fluids of the body, and all the cells contain nitrogen, not as an accidental but as a leading character, and no manifestation of animal life or force appears possible without nitrogen. This being so, it was once the doctrine that the office of the "meaty" substance was to repair the muscles. Lean meat is muscle, and what more natural supposition than that muscle was required to repair muscle. But more exact experiment has shown that this theory has as little foundation as the idea of the New Zealand savage that when he eats his enemy he becomes imbued with all the good personal qualities of the man eaten. The ingestion of nitrogenous substances without doubt is of high importance, and would appear to be necessary to keep the blood of its normal composition as well as to take a part in new formations; but it does not supply food to the muscles so long as there is any fat from which the muscles can derive their food. Fat and fatty matter appears to be the proper food of the muscle in action, and supplies the necessary fuel which it burns up in its action; when all the fats and carbohydrates are exhausted, then albuminous matters may be attacked.

CARBOHYDRATES AND FATS.

These may be considered together. The type of the carbohydrates is sugar or starch, and examples of food in which carbohydrates

* White of egg consists of 12·67 per cent. albumen, ·28 fat, ·59 mineral matters, the rest of water.

abound are potatoes, flour, oatmeal, rice, and the like, popularly known as the farinaceous foods. Pure carbohydrates, such as sugar, contain carbon and the elements of water in intimate chemical combination, the fats are typified by purified lard; examples of fatty foods are butter, dripping, &c. The fats and carbohydrates were classed by Liebig together under the head of respiratory foods. He considered that they were mainly subservient for the purposes of respiration and as heat producers, for the theory was that they were wholly oxidised, the carbon being expelled from the lungs as carbonic acid gas. It is, however, now believed that, in addition to being a respiratory food, they, in conjunction with the fats, give force to the muscles.

The conversion of sugar or starch into fats is not chemically impossible, and the recent researches of E. Erlenmeyer and Planta-Reichenhan† have proved, by very well-arranged experiments, that bees when fed on pure sugar candy produce a large quantity of wax. The sugary or carbo-hydrate class of foods is so closely related to the fats that they are, to a certain extent, mutually replaceable, but not altogether. If supplied with plenty of fatty substances, life may be supported without the farinaceous food, but the converse, viz., starchy matters without fat, has not yet been proved.

MINERAL MATTERS.

The mineral matters necessary to life are certainly common salt, phosphate of lime, phosphate and chloride of magnesia, and small quantities of iron, with possible other mineral matters. These mineral matters are taken unconsciously, as it were, in our food, meat, vegetables, and water containing them.

ALKALOIDAL PEPTONES.

The last class is the alkaloidal peptones, which, to any of you who may be acquainted with the chemisty and literature of foods, will be a new class. I discovered in milk, some years ago, a very definite principle, to which was given the name "galactine;" it is neither an alkaloid nor an albumen, but between the two. A similar body I have recently separated from wheat, oats, barley, and indeed all the foods hitherto examined. I therefore consider, since it exists in milk, and always in a very definite proportion, and in wheat,—the two staple foods,—that these bodies are essential to life and development. It would be premature to discuss the value of these alkaloidal peptones

† Bied Centr. 1880, 191–193.

at present, and the part they play in the phenomena of nutrition. I am inclined to attach much importance to them and think them worthy of much study.

These classes which I have just sketched, are, then, the main constituents of food. The most complicated dinner or meal, which the unbounded hospitality of our Brighton hosts can put before us, can all be reduced, in a scientific point of view, to mixtures of the fatty, nitrogenous, or carbonaceous class. It is only by an analysis of each food, showing how much each class contributes to its composition, that food can be compared with food. But in this way, with the growth of chemical and biological science, such apparently dissimilar things as bread and meat may be compared together, and their value for nutrition formulated.

STANDARD DIET.

The food of civilised man is complex, but a vast number of experiments by Prout, Edw. Smith, Lyon Playfair, Frankland, and others in this country; Carl, Voit, Fick, Leibig, Wislicenus, and Ranke in Germany; Claude Bernard and Magendie in France; Hammond, Flint, and others in America, as well as a careful collection of what are called diets of necessity, have now laid down the true principles of diet in relation to physical work,—I say, advisedly, physical or muscular work,—for the diets necessary for mental exertion have not as yet been studied so profoundly. The standard diet for a man weighing 150lbs is as follows, the food being perfectly dry :—

	Ozs.		Grains.
Albuminoids	4·2	—	289·8 Nitrogen.
Fat...	1·6	—	4181·4 Carbon.
Carbo-hydrates	18·7		
Salts	1·05	—	461·0 Mineral Substances.

If it were at all practical to use as a food dry albumen, clarified fat, pure sugar, and mix the whole with the proper quantity of mineral matters, it would then be possible for the soldier to carry on his back in a parcel weighing about 32lbs the whole of his provisions for 20 days, always provided that he is able to get water. The actual diet of the soldier, consisting of 12ozs of meat, of which one-fifth is done, 24ozs of bread, 16ozs of potatoes, 3ozs of other vegetables, 3¼ozs of milk, 1·33 of sugar. with salt, tea, and coffee weighs 65·32ozs, and 20 day's provisions should weigh at least 81lbs. The diet mentioned, reduced into equivalents, would equal 266 grains of nitrogen and 4,718 grains of carbon. We thus have a basis of comparison to go upon and something definite to start from.

Nothing is more certain than an adult Englishman of 150lbs weight requires daily in round numbers 300 grains of nitrogen and between 4,000 and 5,000 of carbon, not, of course, in the elementary form of those bodies but in appropriate foods.

DIET ACCORDING TO AGE.

But now let us begin at the commencement of life and see what are the main principles of diet according to age. Time does not allow me to enter into full details, but I will endeavour to lay down the first principles. Eclectic dietetics, then, according to age. Instead of studying, primarily, the diet of the infant, let us go even farther back and study the diet at a still earlier stage. This can be done most conveniently in the hen's egg. In the eggs that we eat for breakfast lurks the whole mystery of development, and by artificial incubators every period of the development of the chicken may be watched. Now the main body of the chicken is formed out of the yellow yelk, in which there are a variety of phosphorised principles, fats, and albuminous substances. The white is the substance which, as it were, nourishes the yelk. Around all is the shell or skeleton of the bird, the part which is mainly to form the skeleton being at first outside instead of within. Some careful researches, made recently by R. Pott, show that in the developing egg there is a constant loss of weight day by day owing to the escape of carbonic acid gas and water; the loss attains its maximum at the end of the third week. The nitrogen in the albumen becomes slowly assimilated into the substance of the chicken, and lastly the shell is attacked and becomes thinner. It is interesting to see that in this process there is a continual transference of matter from the circumference towards the centre. But the point I wish to show is that, in the earliest embryonic life, the nutrition is not the carbohydrates, but belongs to the albuminous class.

If we consider that all the yelk is the unarranged chicken, then it is built up wholly by albumen and lime salts. But if, following the analogy, you attempt to feed fowls, when they are adult birds, with white of egg and salts they die of starvation. Tiedemann and Gmelin, indeed, tried the experiment with geese, but that same food, which would have given to the young embryo goose all the sustenance required, starved and killed the adult. I know of no more striking instance than this, showing how the young require very different treatment to the adult. Young infants, young kittens, bears, tigers, pigs, are all nourished by milk. The milk of animals varies in composition extremely. But all milk is built on a common type; all milk contains the classes I have enumerated, but it is noticeable that the carbo-hydrates are represented only by sugar, that no starch enters into the natural composition of the food of any young mammal. Hence in bringing very young children up by hand one of the first principles is to give them their carbo-hydrates in the form of sugar, never in the shape of bread, flour, biscuit, or substances of that nature; remember that babies belong rather to the carnivora than the omnivora. Young babies are excessively sensitive to any substance which is prone to become acid. Bread and flour generally are difficult of digestion by infants. Putrefaction sets in and gives rise to offensive gases, much pain, and diarrhœa. There are many thousands of chidren killed by starvation annually through being fed on bread and water, or water to which the milk jug has been shown. I have made children, starved in this way, quite fat in six weeks by giving them chopped up raw meat, and you will find, if you care to make the experiment, that infants will digest a certain quantity of raw meat very readily indeed. As the child gets older, carbo-hydrates in the shape of bread and potatoes are more readily digested, and growing youths, exercising their muscles and lungs, require not only a certain quantity of meat, but also carbo-hydrates in the shape of potatoes, bread, rice, &c. But through the whole period of youth there is a greater proportion of carbo-hydrates taken than in adult life. The respiration is more active, the muscles are continually at work, and the body is in a state of progressive development. Hence the fondness of all young people for sweetmeats, cakes, and pastry of all kinds.

The standard diet of the adult has been already laid down. We next come to the aged; he whose faculties begin to fail, and whose appetite is small. Here we must reduce the carbo-hydrates and give in proportion more meat. The proportion in the standard diet is 1 of albuminates to 0·6 of fat and 3 of carbo-hydrates, but in old age there is less fuel required for the respiration, less for the muscles, and it is of the greatest importance that old men should be preserved as much as possible from fatty degeneration of their tissues. All the men who have lived to patriarchal ages have been thin, with a few exceptions. The reason for this is obvious; external fat in age is very liable to be accompanied by internal fat, by fatty degeneration of the heart and the great vessels, so that all painters have truthfully depicted old age as meagre and lean. The bones get lighter in old age and more brittle from absolute loss of bony substance and possibly this is due to a deficient power of assimilating lime salts.

I would prescribe for old persons a diet in which eggs had a place at least three times a week and to eat sparingly of bread, but with those who have such feeble digestive powers that they require special treatment, modern science has now separated the actual principles of digestion, and, by aid of pepsin and pancratine, it is quite easy to prepare the food in a very easily assimilable form before it is taken.

DIET IN BODY AND BRAIN WORK.

What is the best diet for great muscular exertion, what for great mental exertion, and what for a quite sedentary life? With great muscular exertion we can all consume an enormous amount of meat. The same amount of meat which would be positively injurious if at rest, will be assimilated with safety by persons who are walking daily great distances or are doing external work of any laborious kind. It is not so with rest; too much meat leads to all manner of diseases, from gout to insanity. I remember very well some months ago seeing in Hanwell Asylum a young butcher who had suddenly gone mad without any of the usual causes. The history of his case showed that, leading a life of very moderate exertion, he had eaten immoderate quantities of meat, and appropriate eliminative treatment restored him rapidly to health. A person in very active exertion would take a diet equalling 440 grains of nitrogen and 6,300 grains of carbon. A diet containing pretty nearly the amount stated would be—

	Nitrogen grains.		Carbon grains.
30 ozs. of Bread	165·0	—	3,570
25 ozs. Beef Steak	256·7	—	1,600
16 ozs. of Potatoes	16·0	—	784
1 oz. of Butter	·2	—	313·0
·6 oz. of Sugar		—	98
	437·9		6,365

Total cost about 2s 4d.

And therefore not suitable for labouring men earning 30s a week and having to support families. The question of diets for the labouring classes will be considered subsequently. Such a strongly nitrogenous and carbonaceous diet as the above may be taken with advantage by those who cycle from London to Brighton. Of course its details may be varied very much, and coffee, tea, and the like may be added, nor have I taken notice of many little matters which make up the totals of a food, for such considerations would only complicate the subject. Large as the nitrogen is as compared with the standard, perhaps it is too low, for in one of Weston's walks, in which he walked 317½ miles in five days, I note that he assimilated 633 grains of nitrogen, so that, with excessive exertion, the meat may be increased, the bread diminished.

We now will take into consideration diets for those who, whether from indolence or necessity, lead vegetative lives, with but little physical and less mental exertion. One of the best examples of the small amount required to support life is that of the Trappist Monks. Their diet is interesting, not alone because it is well authenticated, but because it is wholly vegetable, and since the monks enjoy a fair amount of health, it proves that a wholly vegetable diet may be taken and health enjoyed, especially under circumstances which do not involve either great mental or bodily exertion. The diet practically consists of black bread and vegetables. There are three meals a day, and in the whole day the following amounts are taken per head :—17.5 ounces bread, two plates of vegetable soup, one plate of greens, and 17·5 ounces of beer. This reduced to equivalents would be 2·39 ounces of albuminates, four ounces of fat, and 16·5 ounces of carbo-hydrates, or 165 grains of nitrogen, and a little over 5,000 grains of carbon. It will be observed that the meaty substances are low in amount, but the carbon, to which the starchy substances mainly contribute, are quite the average. As another actual example of a diet in which light work only was done, let me cite what may be called a food experiment on prisoners, made some years ago in Glasgow. Ten prisoners were under sentence of two months' imprisonment each. They were all employed at very light work involving no great muscular exertion. At the commencement of the experiment eight were in good health ; two were in indifferent health. At the end all were in good health, and the average gain of weight per man was four pounds ; one had gained as much as nine pounds, and one had lost somewhat in weight. The diet consisted of three meals a day, and without entering into a full detail of the distribution of food through these three meals, the total quantity per man was 13 ounces of oatmeal, three pounds of boiled potatoes, and one and a half ounces of buttermilk. This diet, then, consisted almost wholly of vegetable food, and was equal in equivalents to 164 grains of nitrogen and 4,643 grains of carbon. The nitrogen is about half of the standard diet, the carbon is about the standard quantity.

Instances might be multiplied from a variety of sources, all showing that life is maintained in its highest health among people living sedentary lives with diets, the main source of which is the vegetable kingdom, and I have myself not the slightest doubt that a very large amount of disease of the liver and internal organs arises from the gross meat feeding habits of people who, from the nature of their avocations, cannot, or will not, take that exercise under which alone such a course of diet can be adopted with advantage.

I next come to diets for those engaged in pursuits demanding great mental exertion. One of the first laws to such men is, during work, whatever a man may take after work, abstinence from alcohol. Yet there is no fact proved better than to take alcohol for the sake of stimulating the flagging brain is suicidal, and is likely to lead to early disease. If a stimulus is required it is better to select tea or coffee, but all brain stimuli are, in their essence, wrong. When a man's brain is tired he must, if it is any way possible, rest it by sleep, or better still, by exercise of his body. The brain, together with the nervous system, is chemically composed of a number of phosphorised fats in an albuminous framework. It has never been satisfactorily proved that there is any real waste of the phosphorous compounds under prolonged mental exertion. On the contrary, as in the case with the muscular system, the more a healthy man's brain in reason works it has been supposed that its volume slightly increases as certainly as does its power. Nevertheless, whether it wastes or grows, it is only reasonable to suppose that a due supply of organic phosphorus is required. The diets most rich in phosphorus are fish diets and egg diets. The phosphorus in fish is loosely combined, and in such quantity that as you all know a putrid fish shines in the dark. Working brains require plenty of fat; intense mental exertion makes people meagre and hollow eyed. But besides phosphorus and fat there is another most important point required for the working brain, and that is purity of blood; for the brain matter is of that peculiar construction that it enters into chemical combination with even indifferent matters with the most remarkable facility. This purity of the blood can only be obtained by perfect digestion. I have long been of the opinion that when not only discomfort but illness arises from indigestion, such illness is not a mere local disorder but a true poisoning. Recent discoveries have shown beyond a doubt that putrefactive changes, especially in nitrogenous substances, may develop violent poisons, and in some forms of indigestion the food undergoes a fermentation or putrefaction. Guided by these principles, then, the food of brain workers should be light, easily digestible, slightly phosphorised, and not too highly nitrogenised. Plenty of butter, toast, one or two eggs for breakfast; soup and bread for lunch; fish with vegetables and light puddings, and, as a drink, the lightest table beer, at dinner, will carry a man safely through the most arduous mental work he is capable of. A diet disregarding minor matters, consisting as a basis of 20 ounces of bread, 10 ounces of fish, such as soles or cod, 16 ounces of potatoes, eight ounces of other vegetables, three and a quarter ounces of milk, one egg, one ounce of butter, and half an ounce of sugar would give daily 300 grains of nitrogen in a very digestible form, and 4,640 grains of carbon, with a fair percentage of organic phosphorus.

DIETS FOR THE FAT AND LEAN.

I next come to one of the greatest triumphs of diet: that is, the reducing of unhealthy and inconvenient fat, which was brought so prominently before the public by Mr Banting. The Banting system in its essence was known to Hippocrates, Celsus, Galen, and to Æsculapius and his school. The proper principles of decreasing fat were also fully laid down before Mr Banting was advised by his aural physician to enter upon the course of diet which was destined to be so famous in the "Physiologie Du Gout," published in 1843. Brillat-Savarin, after saying that the first cause of obesity is predisposition, continues, "The second and principal cause is in the flours and starches of which man makes the daily basis of his nourishment. The starch produces its effect most quickly when united with sugar." But that it was known and published before Mr Banting's work, that Mr Banting was not the author of the system, in no way takes away from the merit of Mr Banting in giving to the world so unostentatiously, so ungrudgingly, his remarkable experiences. The little octavo pamphlet, "The Letter on Corpulence," is of far greater value as an essay on food than many more pretending treatises. Mr Banting, a man of between twenty and thirty years of age, found his weight and size extremely uncomfortable. He weighed, indeed, 202lbs., or over fourteen stone. In a little more than twelve months he reduced it by 50lbs., and became 10 stone

12lbs., with the greatest advantage, without a single doubt, to both his health and his longevity; for fat people of forty are short livers. His diet was for breakfast: Beef, mutton or kidneys, bacon, or cold meat of any kinds, except pork or veal. He took tea or coffee and one ounce of dry bread. The total amount of meat was between five and six ounces, which with the bread makes six or seven ounces. For dinner, he took any fish except the fatter kinds, that is, salmon, eels, or herrings. Any meat and any vegetables, except potatoes, parsnip, beetroot, or carrot. He had some dry toast, he had some fruit out of a pudding, poultry or game. He took a little wine, and altogether seems to have consumed eleven or twelve ounces of meat and vegetables, and one ounce of bread. For tea, he had fruit, a rusk or two, and tea without milk or sugar. For supper he again had meat, taking about four ounces, and he finished the day with a glass of grog.

It is much to be regretted that Mr Banting did not record the weights of the foods and liquids he took day by day with scientific exactness, but if I have read his pamphlet aright, he took altogether of meaty substances something like 19·5 ounces; of starchy, six ounces. The small amount of vegetables we need not include, and the alcoholic drinks can scarcely have affected the result in either direction. This would equal about 338 grains of nitrogen, and 1,617 grains of carbon. The food was, therefore, extremely deficient in fat and carbo-hydrates. For example, in a standard food for a man of Mr Banting's age, the proportions between the different classes of food would be one of albuminates to 0·6 of fat and three of carbohydrates. But in his diet it was one of albuminoids to 0·1 of fat, and instead of eight of carbohydrates only 0·5. In other words, he took one sixth part of the fat and one sixth part of the carbohydrates which ordinary people do, and the consequence was that respiratory foods being cut off from outside, his own superfluous fat was burnt up in his muscles and lungs. People who are very fat cannot do better than follow the principles laid down by Mr Banting. But those who are only a little inclined most decidedly need not follow such a system, which to many would be worse than the fatness. They need only cut off sugar, eat sparingly of bread, pastry, potatoes, and heartily of lean meats, and take plenty of exercise to restrain their proportions within due limits.

It is easier to get thin than to get fat, but again it must be remembered that leanness and meagreness, always provided the person feels in good health, need cause no uneasiness. Of course, the principles of fattening people are precisely the opposite of the Banting system. Plenty of carbo-hydrates, of butter, but little meat, no exercise, and living an idle life in warm rooms, will fatten most human people just as the same course fattens domestic animals. How to make an animal fat in the shortest time possible has been the study of every farmer and breeder of animals for a length of time, and an immense amount of practical knowledge is gained upon the point; but when we come to human beings we recognise at once the fact that there are many persons who, feed them as you will, though in good health, and although they lay up a certain amount of fat, yet they cannot in the true sense of the word become fat. This is, I believe, not due to any want of assimilation of fat, but owing to their nervous organization; and this fact alone tends to support the view I have advanced that the nervous system obtains its force partly through the agency of fats. It appears to me that we burn up or consume in some way fat by our brains almost as readily as by our muscles.

DIET ACCORDING TO CLIMATE.

Time does not permit me to do more than refer to the importance in rational feeding in regulating our food according to climate. Whether in an English summer or under a tropical sun, we require very much less food, and it is a mistake to make dishes too attractive and tempting in hot weather ; the fear is that we shall eat too much not eat too little, it is more especially the fatty and carbo-hydrate class that is not so much required in hot weather. Light vegetables, juicy fruits, and plenty of aqueous drinks will keep men in good health when the temperature is 80 degrees in the shade. On the other hand, in cold weather, when the temperature is below freezing, the appetite of those who have muscular exertion, and exposure to the elements as well, is almost insatiable. All our Arctic voyagers lay stress upon the prodigious appetite they feel, and more especially an appetite for fats. Few stomachs can drink a draught of salad oil in warm weather, even though the oil be of the best description ; but the inhabitants of Russia in winter look upon such a draught with no disfavour. The well-known partiality of the Esquimaux for blubber, and the testimony of all northern travellers, without exception, amply prove that cold is to be resisted by internal fats as well as external wrappers. The deaths from cold in English winters are greater in number than the public imagine, leaving out of the question the seasonal deaths from chest diseases. It is not those only who die in the streets from evident exposure, but most of those who die from apoplexy in their beds which are to be added to the number. The way by which elderly people die from apoplexy in cold weather is in no small measure due to irrational feeding. Your aged friend comes to see you on a bitter night, and he must be primed with grog to resist the cold before he returns home. His arteries are a little weak in places from certain senile changes, and now a fearful strife commences, none the less fearful that the person is all unconscious of it. The alcohol acts upon the heart, and increases its force; the cold acts on all the blood vessels in the skin, and, by their contraction, drives the blood back into the internal parts of the system,—into the lungs, into the brain. It simply depends whether the vessels are strong enough to resist the pressure, whether one of the blood vessels on the brain gives way or not. If one does, it simply depends upon where it is situated whether he dies there and then from apoplexy, or has an attack of paralysis a few days' hence. The point of this is that the old must beware of taking alcohol in cold weather and then exposing themselves to cold. If a glass of grog is taken by an old person in winter time, after taking it he should not move away from his own fireside until he goes to bed. As for going out into the air, the consequences are always more or less dangerous. This caution does not apply to the young, whose vessels are stronger.

DIETS ACCORDING TO INCOME.

I will now speak very briefly of rational feeding according to the pocket. A man does not want to be very rich in the present day to live very well, so far as food goes. An excellent dinner can be obtained for 1s. 6d., and at some of the public *table d'hôtes* for 3s. 6d. such a meal in variety of dishes is put before the guest as in a former period of our history could not be obtained in its money equivalent for as many pounds. We must, then, in feeding according to the pocket, put on one side all those who can afford to pay 1s. 6d. for a dinner,—they have the produce of all the world before them—let them choose. But let us take the labourer doing hard labour and having moderate wages, say 30s. a week,—rent to pay out of that, and to buy nitrogen and carbon for himself, a wife, and family. At what price can he buy what he wants? and what must he select?

Now, first of all, I am not going to reckon in any alcoholic drinks. The general concensus of all who have studied the subject is that it is unnecessary for those who work with their hands. It may be a luxury, I am not disposed to deny; it may do some auxiliary office in the economy, be one of the "Genussmittel." I take i myself in small and moderate quantities; but, if it is a luxury and really no assistance, the labourer with 30s. a week and a family to keep must not be so selfish to take anything which tends to impoverish his progeny. Now, he may support life on bread and cheese. Professor Ranke, a perfectly trustworthy observer, studied recently the diet of some Italian tile-makers, who took all the year round polenta and Allgaier cheese. The polenta was made out of ground maize. This diet, in its uniformity, is almost unique among the working classes of Europe. They eat this food in enormous quantities, taking as much in equivalents as 5·87 ozs. of dry albuminates, 4·1 ozs. of fat, and 23·7 ozs. of carbo-hydrates, equalling 405 grains of nitrogen and 7,387 grains of carbon. An English labourer, if fed on bread and cheese, would require about half-a-pound of American cheese and 38 ozs. of bread.

Such a diet expressed in water, free equivalents, would be: 2·74 ozs. of albuminates, ·66 ozs. fat, 19·00 ozs. carbo-hydrates, ·92 ozs. salts; or in nitrogen and carbon, 393 grains of nitrogen, and 5,818 of carbon. It would cost about eightenpence a day. It is, however, unnecessarily nitrogenous and too high in carbon except for the most laborious occupations, and in place of some of the cheese and bread, fresh vegetables, such as potatoes, green stuff, with a little tea or coffee, could be inserted.

The cheapest diet would perhaps be a pound and three-quarters of oatmeal and a quart of good milk. This in equivalents is equal to 4·48 ozs. water, free albuminates, 2·27 ozs. fat, and 18·87 ozs. carbo-hydrates. The cost would be about, or nearly, sevenpence.

Now let us feed a working man on oatmeal for his breakfast with milk and a little bread, bacon with potatoes for dinner and tea, and bread and butter for supper. This is a very common diet. What is the cost to an average workman, premising that he must have sufficient, but no more than will keep him in a due state of efficiency? He will require 20 ounces of bread, three-quarters of a pound of lean bacon, a pound of potatoes, half an ounce of butter, half an ounce of sugar, three and a quarter ounces of milk, four ounces of oatmeal, he can also have a little tea. This diet would give in equivalents: 5·33 ozs. water-free albuminates, 2·48 ozs. fat, 17·48 ozs. carbo-hydrates, 0·7 ozs. salts, and would cost about 10½d.; or if expressed in nitrogen and carbon, he would have 368 grains of nitrogen and 4,981 grains of carbon, both very near a standard diet.

Thus the important practical fact is, I think, established, that however economical a working man may wish to live he has to spend in food alone from 8d. to 1s. a day, for I have left out of the reckoning all the little accessories of food; and though you may calculate the bare figures out in the way I have done, yet in practice the cost will always be a little more. If he is a drinker you will easily imagine how soon, how very soon, he sinks into poverty. According to my calculations, the ordinary English labourer, if he only knows his own resources, cannot afford but to be of the most temperate and self-denying disposition and habits, and as for the farm hand, he really cannot get quite enough to eat, that is, enough to keep him in the highest state of efficiency.

Lastly, I will touch upon the important subject of the rational selection of meat in a pecuniary sense. It must have struck every housewife that joints, although of very similar price, yet are widely different in real value, the amount of bone especially varies. I have got from the butchers the calculation of the amount of bone sold with various joints of meat. The butcher then calculates, and I know his calculation is correct, that the average weight of the leg bone in a leg of mutton of eight pounds in weight is one pound; it is now about 11½d. the pound, and therefore the meat, for we do not eat the bone, is 13d.; similarly the shoulder of seven pounds will generally have a pound of bone, price 10½d., but really 14d. per pound; in a sirloin of beef weighing 40 pounds five of the 40 is bone, and though the apparent price is 10½d. its real price is 1s. In this way it may similarly be shown that the wing rib of beef, sold at 1s. a pound, is really an excessively dear joint, one fourth of it being bone, and the actual price no less than 16d. per pound. It is then quite as cheap, nay, even in many instances more economical, to purchase steak and portions of the carcase perfectly free from bone, where you see what you buy and get what you ask for, and not really at a higher price than when bone and meat are bought.

I must now bring this paper to a close. I certainly believe that rational dietetics has a great future before it. By appropriate starving and by appropriate repletion a physician has powerful remedies against many diseases, which resist the whole pharmacopeia, but are at once conquered by diet. One third of all medicine and drugs would be unnecessary if people would only know how to diet themselves, or indeed if there were only a race of diet doctors to advise them. It is true that fevers cannot be cured by diet, but can they not in a great sense be avoided? A person with a suitable diet will often not catch a fever, which another badly or improperly fed will at once succumb to. There is no better known fact in medical history than that outbreaks of typhus have ever occurred in badly fed and starving people. At the present time, the miseries of the sister country Ireland will infallibly bring disease in their train. Already, indeed, fever has broken out among the Irish London colonies, fever due entirely to the habits, and poverty, and neglect of the people themselves. If ever life is to be prolonged indefinitely it is by selecting a suitable food, or that mixture of substances best adapted to nourish the individual.

WATER REFORM.

By C. E. PARKER-RHODES.

In all regions where water has to be obtained from below the surface, its constituents are dependent upon the formation of the soil through which it percolates. Such water contains minerals, chalk or carbonate of lime, clay or alumina magnesia, in different degrees and proportions, or separately, either in suspension or in solution, likewise organic or other matters. Surface water, whether taken direct from streams or from the storage beds of local supply, must, besides the constituents here described as contained in well water, be seriously affected by the drainage of land and the natural vegetation contiguous to it, as also that produced in the water itself, whether stationary or flowing. It must, therefore, be obvious that water for every use should previously undergo proper treatment so as to remove the impurities and those constituents injurious to health, and to reduce the hardness to a minimum for our bodily wants, and for the prevention of incrustation in the production of steam. Great destructiveness of the boiler plates and tubes is produced by the carbonate of lime or chalk, which rapidly forms a coating or an incrustation on the iron, to remove which great power is required, and then, after a few days' deposit, the solid coating or incrustation brings off with it the surface of the iron plates, which, in that alone, is damaging to the boilers, and results in serious loss. As to the tubes, which become completely choked, they have to be replaced by new ones. While this serious result is being brought about, the increased cost of fuel, and the delay in the production of steam, are two important factors in the annual expenditure where steam is the motive power. But let us not overlook the ever constant peril to those who work by steam power—the frequent explosion of boilers—steam being checked in its passage through its proper channel violently destroying everything within its shock.

Chemistry has provided a method of treating all calcareous waters to reduce their hardness to a minimum, and with mechanical aid the difficulty of applying it is now overcome, and such water can be rendered in every way suitable for health. The samples of water for examination have been taken from the Brighton wells or sources.

Mr Parker-Rhodes showed specimens of water obtained from the well at the Brighton Railway Works, which had been treated by the Atkins process for softening water, and referred to some traces of organic matter in it, which he stated to be removed under the treatment. He believed the water of Brighton to be as pure as any in the Kingdom or in the countries he had visited on the Continent. There was no doubt, however, that it would be safer for all—men would live much longer, and would not be continually having complaints about gout and rheumatism—if, from the water they are compelled to drink, the constituents were removed which are injurious to health.

Mr E. H. Moore said he was the public analyst of Brighton. He would corroborate all Mr Parker-Rhodes had said in relation to the value of softening water. He had been deputed to watch over the experiments of softening the water by the process alluded to, and he had nothing but praise to say of it. But he did not think Mr Parker-Rhodes had been perfectly clear in associating the well-water at the Railway Works with the magnificent water supplied at the Goldstone Bottom Waterworks. (Applause.) He analysed that water every week, and, as a matter of fact, it was absolutely free from organic matter, and stood third on the list of the waters of the Kingdom, and only stood third in consequence of its hardness. (Applause.) The total hardness of it was not really more than fourteen. Mr Parker-Rhodes ought to have said it was the water of the well at the Brighton Railway Works.

The President: I am glad Mr Moore has made that correction.

THE ARTIFICIAL DIETING OF INFANTS.

By ED. GEO. WHITTLE, M.B. Lond. F.R.C.S. Eng., Physician Brighton and Hove Dispensary, Senior Surgeon Royal Alexandra Hospital for Sick Children.

I MUST at once state, in order to anticipate any false impression that may be roused by the consideration of my future remarks, that I look upon milk in some form or other as the main basis of an Artificial Dietary for Infants, and whilst advocating that its use should be supplemented by other foods, I have no intention of assigning other than a subsidiary position to these. To imitate Nature is the truest line of Art; to study Nature is the only safe method of scientific enquiry, and the most productive of lasting results. Every practice of Art and principle of Science is either identical with or has its type in some working or production of Nature. With these views, therefore, there need be no fear of my underrating milk as an article of diet. It is Nature's own food for the young. Its composition is practically identical in most species of Mammalia, though the proportion of its constituents is subject to extensive variations specially adapted to the nutritive necessities of the animal.

The main constituents of milk, I may at once mention, are arranged under three heads, viz.:—

(1) The Albuminous, represented by Casein, which forms the substance of cheese and milk curds.

(2) The Fatty, represented by Cream.

(3) The Saccharine, represented by Sugar of Milk.

Held in solution by a large amount of water are certain inorganic salts. All the details of an Alderman's banquet can be arranged under one or other of these heads, so that the infant appears to be as well provided for as at any time of life. Cow's milk contains the same substances as human milk, but in very different proportions, which I need not now describe. It is very well suited for the calf but not at all for the infant. If a child be fed from birth on pure cow's milk, or milk very slightly diluted with water, the probability is that it will rapidly waste, or die in two or three months from starvation. Such cases occur not infrequently amongst the poor of large towns, and often form the subject of coroner's inquest. Death by starvation from over-feeding is a fact.

But if an infant from any cause be deprived of its mother's milk, and putting aside the question of wet nursing, what food shall be given? Cow's milk has to be specially prepared before it is fit for use. The usual recommendation is to dilute it with twice its bulk of water, and care has to be taken that anxious mothers do not reverse these proportions. About a dessert spoonful of sugar of milk should be added to each pint of the mixture. Now although this is poorer than the poorest mother's milk, infants often thrive on it for months without its being much, if at all, strengthened. With these cases we are not concerned, but with those in which the milk does not agree from the first, and the child makes no progress. I should have mentioned that although the casein of cow's milk is chemically the same as of human milk, yet it is not so digestible. Some infants seem incapable of digesting it however prepared, and this I regard as the real difficulty of artificial nurture,—to secure the proper digestion and assimilation of this most important constituent of milk, the only one which contains nitrogen, without which the body cannot be sustained. It may be vomited in curds, it may excite stomach disturbance with offensive green and white motions, or the child may simply cease to thrive. Of course errors of adminstration may be the source of these troubles, and I will at once proceed to a brief resumé of the precautions necessary in the use of a milk diet in order to make sure that it is food and not feeding which is to blame.

The milk should be supplied fresh and pure twice daily (its purity may be fairly estimated by the lactometer, sold for this purpose). It is desirable that it should not have travelled far: the nearer it is the less churning does it get before coming to hand. In hot weather it readily changes, and may be converted into what is practically an irritant poison. To prevent this, it should be kept in a cool, airy place; not handy in the nursery, or bedroom, or on the mantel-piece, nor shut up in a safe with cheese, meat, and other provisions. Absolutely clean vessels should be used to contain it, and none of the old should ever be mixed with the new. No importance need be attached to getting it from one cow, so long as it is a healthy one.

Bottles are a universal bother, and often an abomination; the task of keeping the tubing clean is usually far beyond the powers of average intelligence.

The most common and serious errors in milk feeding are the insufficient dilution already described, and *too frequent administration.* Too frequent feeding always ends in mal-assimilation, by which I mean that process beyond gastric and intestinal digestion by which the food becomes incorporated by the body so as to form a living part of the tissues until it perishes and is replaced by other particles similarly derived and selected. After food is given, time should be allowed for these processes of digestion and assimilation. It is a pernicious custom to feed a child merely for the purpose of allaying its irritability. Its cry may arise from the pain of undigested food accumulating in the stomach and bowels. The stomach has an impossible task assigned to it; that of working incessantly! No organ in the body can do this. Even the heart rests between its pulsations. The stomach's time for rest is when it is empty. The real peril of infants in this direction, and a serious one it is, is a full for exhausted stomach, not an empty or a hungry one. By the too frequent stimulation of the contact of food it becomes exhausted, and, instead of secreting the digestive fluids in proper quantity and quality, equal to the clean digestion of the daily food supply, a scant amount, of limited digestive power, is secreted together with mucus; and a fermenting irritating mass passes along the bowel, producing pain and spasm, to secure relief from which more milk is given! Better give sawdust and water; anything rather than milk. Total deprivation of food during the action of a teaspoonful of castor oil is the best way to get out of this plight.

But how often should the babe be fed? I usually advise every two and a half hours while awake and never more frequently than every two hours. The longer the child sleeps the better for its stomach. Once or twice during the night should be enough. The meals should never exceed six in the twenty-four hours round. The child should never be laid down for sleep with the bottle teat in its mouth. Thrush is almost certain to result from this practice.

Although it is difficult to frame and adopt rigid rules in all matters referring to the household tyrant, it is urgent to secure regularity in feeding at the onset, as it is then usually easy to maintain.

We must bear in mind that this milk and water mixture is an *artificial*, not a *natural* food, and is therefore imperfect. We must be prepared for evidences of its imperfections, as seen in the condition of the child. How to compensate for these deficiencies is the practical problem of artificial nurture.

The signs of health in an infant are that he sleep well, feed only at regular and infrequent periods, look content, and grow rapidly. All going well by the 4th month, he evinces an interest in his surroundings, displays a taste for more than milk, and finds solace in a wholesome crust; by the 6th month, he can sit in a child's chair at table, seize and hold things firmly, and toss them about vigorously; he recognises friends and strangers quite intelligently, and gives attention to their movements; by the 12th, he is walking about, eating well of everything wholesome, as mashed potatoe and gravy, small quantities of underdone meat, bread and butter, &c. A great variety of signs and symptoms is more or less rapidly unfolded when the diet does not suit so well. There may be stomach disturbance with avidity for food that never gives content; restlessness and irritability, little or no growth, pallor of face, coolness of skin, smallness of limb. These symptoms may be very marked, or, on the other hand, may be so slight that they escape the notice of nurse and mother. Thus, at the time of vaccination, the child may be small, though proportionately so; it may, indeed, look but little larger than at birth, though it could not be mistaken for a newly-born child. It may take food well, and with no signs of gastric disturbance; the temper may be good, and, as the child complains not, no suspicion is entertained of anything being amiss. The face is small but not pinched; the expression placid but not happy or content; the skin is mottled and dull with a thick cuticle, but wanting the warm, full, elastic feel and uniformly pinkish tint of a thoroughly well nourished child. It is not shrivelled, though the muscles of the limbs are small in volume and the bones too easily felt.

Now, here is defective nutrition, although an orthodox milk diet in sufficient amount is used, and apparently well digested. It is more easily corrected by introducing some new thing into the child's dietary than by varying the strength of the milk, or the frequency of its administration.

When the babe does not thrive on the milk, sugar, and water diet what is to be done? There are many devices to render the mixture more satisfactory, such as the addition of lime water or a little carbonate of soda; the change to Anglo-Swiss condensed milk is often successful. Thousands of children are now brought up on this milk, and in some respects it has advantages over cow's milk.

But I must now speak of farinaceous and nitrogenous foods as aids in the nurture of children, and I may at once warn you that in this direction I may be rather unorthodox, and it is on this account that I have so far given such a prominent position to milk.

Many maintain that it is bad practice to give anything but milk for the first eight months. The opinion obtains in the profession that farinaceous foods are specially unwholesome during the first three months, and that they should be given in no form. In some forms such is the case, but I have again and again derived the best help in the first month from such foods as Savory and Moore's. The wheat grain contains the albuminous, starchy, fatty, and saline matters. Whilst the great difficulty with milk is the indigestibility of the albuminous element, the casein; the difficulty with farinaceous food is the indigestibility of the starch In the preparation of farinaceous foods the starch granules must be broken up by cooking, and in such processes as Savory and Moore's there is a further conversion of the starch into two nutritive and digestible compounds. The other constituents of the wheat grain appear to be easily digested. For an account of the structure, constitution, and nutritive properties of the wheat grain I cannot do better than refer to the paper on Bread Reform, read by Miss Yates in this morning's proceedings of the Congress. Medical opinion is that farinaceous foods cannot be digested, because the glands, whose secretion is essential to the process, are not developed in the infant. I used to consider their action was mainly mechanical, that they soothed the stomach like many indigestible medicinal powders, as Bismuth, relieving spasm and allowing the digestion of milk to proceed better: but, until recently, I never dreamt that a child could be well reared on farinaceous food solely, without the help of milk, but literally on meal, sugar, salt, and water only, and thrive beyond every other member of the family. Two tablespoonfuls of fine oatmeal were made into a paste with a little water in a basin; a pint and a half of water was boiled in a saucepan and added to the paste; it was then retained for two hours at a rather high temperature, and after the addition of a little sugar and sometimes salt, it was usually strained and used in the bottle like ordinary milk food. Without a drop of milk this was the sole diet for several months; at the fourth month the child could hold and eat a crust.

Another child was born a few weeks ago of the same mother, and took well to this food at once, though, at my recommendation, a little milk was added. The ordinary milk and water diet was uniformly rejected.

Some little time ago I narrated before the Medical Society of this town, a case in which the first four children of a perfectly healthy and robust mother perished on an orthodox milk diet, whilst the fifth, evidently going the same way as his predecessors, was rescued by Liebig's Extract of Meat. Naturally some scepticism was evinced as to the child having been exclusively reared on Liebig's Extract, a substance which is now supposed to be a mere non-nutritive stimulant, and I don't wish to deduce much from the case prior to further observation on the value of the extract. It is, however, in my opinion, a very valuable agent, and appears to be nearly always well taken and digested by infants. It may be, as was suggested by Dr Gasquet at the meeting above referred to, that it acts by stimulating the liver and stomach secretions, and thus securing the more complete digestion of other foods.

Although I cannot too strongly condemn the too frequent feeding of infants, I am disposed to advocate as great a variety of foods as a child is capable of digesting. When a child after the fourth month can take a varied diet, digestion is more perfect, feeding is less frequent, and the child is more content than when kept on a monotonous milk diet.

It is a great boon to get rid of bottle and tubing and get on to spoon and platter, and there is no better way of accomplishing this than early to accustom a child to a varied diet. The case above described, brought up on meal and water at the fourth month, could eat bread and butter, and was a most robust specimen. Practically, all children at the fourth month can digest a little beef-tea or gravy, and whatever a child can digest that is wholesome and nutritious I maintain should not be withheld. I have before pointed out that it is the casein or nitrogenous constituent of milk that is usually badly digested, and that the difficulty is to compensate for this. Infants digest sugar very well, and fatten on it. One may often see large and fat children who have been fed on condensed milk largely charged with sugar, whose blood and tissues are impoverished from want of nitrogenous food. It matters not whence this comes. Whether from home-made beef-tea, Brand's or Liebig's Extracts, gravy, underdone meat juice, or any other source. Such aliment is urgently needed, and is easily digested by artificially fed children, with rapid improvement in nutrition. It seems clearly to compensate for the imperfect digestion and assimilation of the casein milk either by its own nutritive powers or by its promoting the better digestion of milk or probably by both.

In advocating a varied diet for children, I do but advocate Nature's own design. Milk itself is a most complicated food; it is several foods mixed together in one dish. If the dish be well digested, as is very often the case, all goes well; but, as I have again and again pointed out, the dish is likely to contain some indigestible constituent, which spoils the whole lot, and deranges the digestive machinery. The casein is the usual disturbing factor, but as it is the only nitrogenous constituent, and so essential for the formation of muscle, blood, and bone, we must find its equivalent in some other food. Such, I maintain, is provided in a digestible form in meat juice or extracts. But a little is needed, and that little may be digested at a very early age. In all cases there comes a time when a milk diet is inadequate to the wants of the system, and the soundness of the constitution is seriously impaired by its exclusive continuance. The symptoms very closely resemble those of over-suckling. The period of their onset is variable; it is common by the eighth month, often by the sixth, or even earlier, but it is by no means prudent to await the onset of such symptoms before improving the diet. The very object of finding out as early as possible what a child is capable of digesting is to anticipate the risk of this failure in health.

The period between the eighth month and the second year I regard as a distinct nutritive epoch in life, during which the morbid conditions, traceable to errors in diet, usually make their appearance, to avoid which it is urgent that everything that is necessary for the formation of healthy blood, sound brain, strong bone and muscle, should be supplied. Flesh food in moderate quantity is always required, but I urgently recommend that it be in moderate quantity. The well made milk, rice, bread, or other light pudding, bread and butter, oatmeal, &c., form the basis, but if flesh food be withheld, an anæmic condition arises, associated with a progressive debility. This may develope from the condition of slight mal-nutrition, early described in this paper; or it may arise independently about the eighth month, without any evidence of a milk diet having been inefficient. Hence there is every degree and variety of symptom in detail, but the essential element is the anæmia. This poverty of blood is not usually seen in pallor of the lips and inside of eyelids, so much as in a peculiar straw or light saffron tint of skin on the cheeks near the nose: the more prominent part of the cheeks may be rosy; the skin round the eyes is pale; the eyes are often bright, but may look deep set. Superficial veins appears about the temple and root of the nose.

The progress of this condition may be arrested by careful dieting, but I consider that flesh-food is eminently beneficial.

If not arrested, these slight symptoms may undergo more or less rapid development. Stomach disturbance is almost constant; the child is dull and listless whilst still, but usually irritable on being moved. If it be about the 12th month, instead of walking he appears to get weaker about the legs, just as in over-suckling; or, having once walked, now ceases to do so. He will probably now refuse flesh-food but will take milk freely. This, let me remark, is another reason for the early introduction of nitrogenus food, that, when children ultimately suffer from the want of it, is the very time they are most averse to it. These symptoms may end in rickets, the debility showing itself in head-sweating, restlessness at night, large head, distended abdomen, small limbs, and flabby muscles. Various inflammations of a sub-acute or chronic character may be superadded. I have seen an indolent inflammation of the eye in a child aged 14 months remain intractable until a meat diet was adopted, when the eye cleared up perfectly and the child began to walk.

Although medicinal agents are of great service in the condition described, an all-round diet is of prime importance. Gravy and underdone meat I perfer when practicable to beef-tea, which children of all ages often object to. I have often met with children of two years of age and more who resolutely refused meat, but on their being induced to take it in some form or other have been rescued from a condition of serious debility and ricket.

In conclusion, I may state that milk contains all the elements necessary for healthy nutrition and growth at an early period of life, but that a large number of infants are incapable of digesting it.

That farinaceous foods represented by the wheat grain are highly nutritious, and, when properly prepared, are very digestible.

That in all children nurtured artificially it is highly desirable to introduce a varied diet as early as possible, with the special view of compensating for any defects existing in the constitution or imperfect digestion of the artificial food mainly relied on, and of anticipating any infirmity of muscle, blood, or bone likely to arise from such defects.

That such supplementary articles of diet from varied sources may often be used in small quantities as early as the fourth month, usually by the sixth, and always by the eighth, regular and infrequent periods being fixed for meals.

That prolonged milk diet may be attended even to the second year or beyond by an extreme aversion to other foods, and, in the absence of these, may result in arrested growth and anæmia before the sixth month, and that after the eighth and ninth month, signs of tissue infirmity and general debility are betrayed in low forms of inflammation in specially exposed structures. Between the eighth and twentieth months inflammation of the skin, of the air tubes, of the lymphatic glands, commonly arise from want of nitrogenous food, Stomach disturbance is more or less persistent, the bones are soft, and the child walks late. The central nervous system is often congested, giving rise to convulsions, night screaming, restlessness, false croup, &c.

These and other troubles of children, leading to a weak and sickly constitution and often to a premature death, we must include in that long list of bodily derangements preventible by Domestic Sanitation.

DISCUSSION.

Dr. AXEFORD said he had been exceedingly interested in the paper; it was one of very great interest. It would have been sad to have kept back any discussion upon it; but he hoped the paper would not have the effect of inducing others indiscriminately to try that diet of milk and sugar, and so forth, on infants. (Hear, hear.) He was willing to admit that milk could not be digested by all infants, just the same as they found idiosyncracies in grown-up persons in the reception of diet, some of whom could not take meat. Dr. Whittle was perfectly right in saying that caseine was the great objection in milk food. That, of course, was the great difficulty. He thought Dr. Whittle had not laid sufficient stress upon the amount of caseine in various milks. The amount in mothers' milk was quite small; that in ass's milk was more than in the mother's, and less than the cow's; and goat's milk had less than that of the ass. It was well known to everybody that infants who could not do well on cow's milk frequently throve on asses or goat's milk. Had it occurred to Dr. Whittle to remove the caseine? It could be done by a very simple process indeed. By merely adding rennet they could remove the whole of it from milk. Women's milk contained a certain amount of caseine and he should object to its entire removal for that reason. (Hear, hear.) Let them take milk fresh from the cow and set it on one side for twelve hours and then skim. Then by using an extract of rennet remove the caseine, but they must be careful to restore the cream afterwards. In that way they would obtain the nearest approach to mother's milk. If Dr. Whittle would try that process in some instances in which he found milk fail, he would find good results arise from it. He protested, however, against the indiscriminate use of artificial food. (Hear, hear.)

Mr Wanklyn said the paper contained some remarks of extreme interest. It surprised him very much to find that a medical man should venture to advocate the giving of starch at an early period in the child's life. He was delighted at his audacity; he believed it was right. He objected, however, to starch being given in granules. He had seen multitudes of children poisoned, as if by strychnine—not so suddenly but as surely—if given in that form. In a modified form it might be given at an early age. As the child grew it required starch food in some form or other, and in administering it the essential thing to do was to burst the granules. With regard to cow's milk, one extraordinary thing about it was that, if they really inquired into its constitution, they would find it enormously surcharged with nitrogenous matter. If they were to try the food of milk or milk and water daily, they would soon see the effect of it.

Dr. Drysdale remarked that he had been exceedingly interested in the paper as one who had very frequently to consider the food of children; but he was a little sorry to find they were talking about the artificial feeding of children in that Congress. (Hear, hear.) They knew that the Parisian ladies were extensively in the habit of feeding their children artificially, to the great detriment of the infants' health. He was afraid that their London ladies were not now so much up to the mark in giving nourishment to babies as they used to be. He sincerely trusted nothing would go from this Congress to encourage artificial feeding; but, rather, that mothers would be induced to make themselves so healthy that they never would require in any way to make experiments upon the diets of babies. (Applause.) He could not imagine a more dangerous thing. If the mothers of England proceeded as they were doing at present in London, in 20 or 30 years they would have a great many Parisian mamas (laughter), which would be a great detriment to the health of the offspring. (Applause.)

Dr. WHITTLE hoped he should be acquitted—after the reading of that paper—of any desire to advocate extreme views. He had not advocated the indiscriminate giving of artificial food, and he had devoted several pages to the recommendation of milk as the basis of food. Common sense principles were more applicable in the rearing of children than abstruse scientific ideas. With reference to the amount of caseine to be found in different milks, he had not deemed it necessary in a paper of that length to introduce the subject. Of course, asses and goats' milks were generally obtained near at hand, and, therefore, not having to travel far, they had less churning, and he believed that in a great way accounted for their agreeing so well. He never recommended a mother to bring her children up on artificial food when she could do it from the breast (hear, hear); but there were many cases in which a mother's milk failed after the first month, as in the case he had referred to.

HONEY AS AN ARTICLE OF FOOD.

By THOS. WM. COWAN, F.G.S., F.R.M.S., &c.
Chairman British Bee Keepers' Association.

If we carefully examine the writings of ancient authors, we cannot help being struck by the frequent mention of honey as one of the most ancient articles of food. Long before man began to keep bees he had discovered the value of both honey and wax. We have no record of the manner in which Noah kept the bees in the ark, nor whether Abraham's bees were in straw hives or wooden ones, but we know that Canaan, the land where Abraham dwelt, was one "flowing with milk and honey;" and when the Patriarch sent his sons into Egypt to buy corn, he sent as a present to the Egyptian ruler some of Canaan's honey. We may assume that the honey of that country was as famous then as in later times was that of Mount Hymettus in Greece.

In the Mosaic law we find many statutes regulating the ownership of bees, and in the tithes of the Jewish priesthood we find honey enumerated. Solomon evidently relished honey, for he gave this advice,—"My son, eat thou honey, because it is good."

Then again Isaiah mentions "The bee that is in the land of Assyria," and declares that bees were abundant in the land, that "butter and honey shall every one eat that is left in the land."

About 600 B.C. we find bees systematically cultivated, for Solon enacted a law requiring that bee hives in cultivated fields must be 300 feet apart. We also find that the Persians, Grecians, and Romans used honey quite extensively as an article of food; they also used it largely in preparing their food, and by it most of their beverages were sweetened. Pramnian wine, produced near Smyrna in Asia Minor, was, when mixed with honey, a favourite and celebrated beverage. Virgil calls it "The gift of heaven," and Pythagorus used and praised it. Even to this day, honey is used in sweetening what is called "Malaga Wine." On the statute books of ancient nations, laws are found for the protection of bees. The theft of a swarm of bees, according to old Saxon law, was punishable with death.

Coming to more recent times, we find bees extensively cultivated for their honey and wax until the 17th century, when sugar was introduced, and as its use increased the use of honey decreased. The various bee masters' guilds were abolished, and the skill and experience of the old bee masters were lost. On the Continent of Europe bee keeping has never been so much neglected as it has in England, and we find the South of France has always produced large quantities of honey, which it has been able to export to other countries.

Different ways were employed for obtaining the honey from the bees. The custom of brimstoning them to get at the contents of the hives was then prevalent. Different qualities of honey were obtained in the following way by bee keepers:—The light coloured combs were pressed and strained first to get a light coloured honey, then the combs which contained brood and pollen were in turn pressed and produced turbid honey of inferior quality. These primitive methods were afterwards improved, by subjecting the combs to the heat of the sun, which would melt the wax, and the honey could be separated from it.

Such a product became a staple article, and helped the sale of the different qualities of strained honey in the French markets, the dark honey being used to make "pain d'epices," a sort of gingerbread manufactured in every town. The demand for honey being, however, greater than the supply, Europe was obliged to import strained honey from Chili and Cuba, and lately extracted honey from California. Honey fresh from the combs is clear, translucent, slightly amber coloured, and becomes granulated in time with whitish transparent crystals. In taste and smell it is sweet, agreeable, and aromatic, and its peculiar flavour is so decided that it can be readily detected when mixed with other articles of diet. Honey is not made but gathered by the bees from the nectary of flowers, where it is secreted in fine weather. Each flower yields honey of its own peculiar flavour, which, if not gathered, is soon evaporated and lost. In districts producing a great diversity of plants and flowers, those which decidedly predominate determine the quality of the honey gathered. In no country is honey produced that can excel that gathered in England. From its temperate climate and varied pasturage, England is particularly favoured as a honey producing country.

Up to within the last twenty years, bee keeping has been sadly neglected here, and we had to depend almost entirely upon the produce of other countries. There were a few who had adopted a more improved and humane system of bee keeping; but it was not until 1874, when the British Bee Keepers' Association was first formed, that really much progress had been made. The object of this Association was to develop the honey resources of this country, and introduce honey as an article of food by making it plentiful and cheap. The success which has attended our efforts has surpassed our expectations, and we now find honey not an article of luxury only but plentiful enough to be an article of food.

The improved methods of bee culture which have been introduced have enabled bee keepers to produce pure honey at a less cost than formerly. Instead of destroying the bees and crushing combs, brood, and pollen together, and calling this disgusting heterogeneous mass honey, the bees are not destroyed at all. Moveable frames in which the combs are made have taken the place of the fixed combs, and instead of crushing the combs the cappings of the cells are pared off with a knife, and the combs placed in a machine called an extractor. A few turns of the handle drives all the honey out by centrifugal force from one side of the combs. The combs are then reversed and the other side extracted in the same manner. The combs can then be returned to the hives uninjured to be refilled again. It is estimated that it takes 20 pounds of honey to produce one pound of comb, so that by returning one pound of comb we secure 20 pounds more honey than we could otherwise do. The honey taken out of the combs by means of the extractor is perfectly pure and free from any admixture of brood or pollen.

If we require honey in the comb we place small boxes on the top of our hives, and each of these boxes is made to contain one or two pounds of honey comb, but honey in this form costs more to produce and must always be a fancy article. It is also not as wholesome as extracted honey, as the wax is certainly not digestible.

Among the thousands of insects there certainly is none the product of whose industry is more pleasant and tempting to the palate, more nutritious and health giving to the body, or more valuable as an article of commerce than the product of the honey bee—deliciously pure honey. How appropriate its name, derived from the Hebrew *Ghoneg*, which literally means delight.

Its early history shows that it was for ages man's principal source of nourishment, and wherever civilization extended its sway the "Little busy bee" was carried as its companion and co-worker in the cause of elevation and refinement.

Instead of spreading disease and death promiscuously amongst those who indulge in its use, as do many of the adulterated foods now in use, honey gives to man in the most agreeable manner both food and medicine. It is a common expression that honey is a luxury, having nothing to do with the life-giving principle. This is a mistake. Honey is food in one of the most concentrated forms. True it does not add so much to the growth of muscles as do some other foods, but it does impart other properties no less necessary to *health* and vigorous physical and intellectual action. It gives warmth to the system, arouses nervous energy, and gives vigour to all the vital functions. It gives strength to the labourer and mental force to the business man. Its effects differ from ordinary alcoholic stimulants, which ruin the constitution and dull the intellect, as it provides a healthy action, the results of which are pleasing and permanent, a sweet disposition, and a bright intellect.

Pure honey should always be used freely in every family, and honey eaten on bread is very wholesome, and children would rather eat it than bread and butter. One pound of honey will go as far as two pounds of butter; it cannot, therefore, be called an expensive food. It has, moreover, the advantage that it is far more wholesome and always remains good, while butter soon becomes rancid, and is then decidedly injurious to health.

Pure honey has the property of preserving for a long time anything that may be laid in it or mixed with it and to prevent its corruption in a far superior manner to sugar. It can also be used to replace sugar as an ingredient in the cooking of almost any article of food. In recommending honey as an article of food I am sorry caution in its selection must be exercised, as there are large quantities imported into this country which are fearfully adulterated. Much of the so-called strained honey from America is adulterated with glucose. Consumers have an idea that pure honey will not granulate, but this is not so. Pure honey will granulate on the approach of cold weather, and granulation is the best test of its purity that the consumer has, for as yet the adulterators have not found the means of imitating the soft granulation of honey with any of their compounds. Much of the American jar honey sold and warranted not to granulate is a very inferior article, and is composed principally of glucose.

Granulated honey can be reduced to its liquid state by placing the jar in warm water.

To give you an idea to what an extent the adulteration of honey in America has been carried, I will read you an extract from the *American Bee Journal* of February last, written by Mr J. Muth, who is a large honey dealer in New York :—

"In an age like ours, when one invention follows another, it is not surprising that a common swindle, as practiced by New York and Chicago honey dealers, of putting a piece of comb honey in a glass jar and pouring on it *pure glucose* could last as long as it did. I had a number of those beautiful packages analysed, and found that it was not like Mr Hoge states on page 37 *American Bee Journal,* present volume, 'that so much glucose had to be used to keep it liquid,' but it was found that the comb was the only honey in the jar, and that the liquid was *pure glucose,* which had partaken of the flavour of the comb honey. Such is its dangerous character that, not having any flavour of its own, it partakes readily of the flavour of a very small admixture. A gallon of pure maple syrup is sufficient to manufacture ten gallons of choice maple syrup."

Fortunately in England adulteration has not commenced, and the Association is so vigilant that I do not think it will be attempted. We have now 14 county associations affiliated to the central society, and six other associations are at the present time being formed for the purpose of spreading a knowledge of bee culture, and encouraging the production and sale of English honey. There is no pursuit which yields a better return for the capital invested, and those who can spare a little time and are in a position to do so will take a deeper interest in works of nature if, by keeping a few hives of bees, they adopt a pursuit which, as it must be followed in the open air, is likely to improve their health and increase their strength, while it may afford them an opportunity not altogether to be despised of adding to their income by producing a wholesome article of food. I would call your attention to the Bee Department in the Exhibition, where will be found different samples of English honey and all the modern appliances used in obtaining it. I would also take this opportunity of stating that an association is now being formed in Sussex as a branch of the British Bee Keepers' Association, and I would invite all those who take an interest in developing the honey resources of this county to become members of it.

LESSONS ON FOODS AND THEIR PREPARATION FOR SCHOOLS.

The PRESIDENT then said Mr W. S. Mitchell would abreviate his paper, as the hour had come for the closing paper to be read.

Mr MITCHELL said: The point of my paper is this. There is a difficulty in getting physiology taught in our schools where the subject of cooking has been taken up. We have a National School of Cookery which is under very distinguished patronage; but although there is that school of Cookery, the physiology of what we want for our daily lives is not taken into consideration. The object of my paper was to bring before you that matter. I would just detain you only a moment to say that at a meeting at Devonshire House, held in June last, when the Duke of Devonshire placed his apartments at the disposal of the School of Cookery, a very distinguished writer in the *Illustrated London News*, who every week signs himself "G. A. S.", (laughter), hoped we should have no physiology taught to our Cooks; we simply wanted them to do our cooking. I said physiology should most distinctly be kept prominently forward in our cookery schools. (Hear, hear.) That is the exact point I want to bring before you.

FOOD PLANT IMPROVEMENT.

By MAJOR F. F. HALLETT, F.L.S.

The food question may be divided into two parts. 1. Its production (raw material). 2. Its preparation when produced. It is my intention to consider the first part only—food production. This, again, seems naturally to divide itself into: 1. Plant-food. 2. Animal-food. And again, I propose to speak mainly of the first alone, alluding only incidentally to animal-food, upon which I will commence by making what remarks I have to make in order to clear the ground for the consideration of *plant*-food, the subject upon which I have been invited to address you. The improvement effected in the production of animal-food by the careful breeding or long repeated selection of sheep, cattle, and swine is so well known as to render it quite unnecessary to occupy much of our time in its consideration: I will only adduce one or two striking illustrations to show the *kind* of change which has been thereby accomplished. There is very strong ground for believing that the celebrated improved breed of shorthorn cattle is descended from a race originally black. Now black seems to have been in the eyes of all the best breeders of it a colour to be got rid of or wiped out, and this most certainly has been effected, for no single instance of it is now to be found. The improvement in the outward form of the animals has been carried almost to the breeders' ideal of perfection. These are external changes. Early in the history of shorthorns the breeders in Yorkshire made the production of milk their chief point, while those in Durham saved for breeding purposes the progeny of those cows only which showed the greatest tendency to lay on meat, and the result is the "Improved Durham," the pride and glory of the modern cattle show, but which are very poor milkers; while the "York" shorthorn is synonymous with a cow specially productive of milk. These are internal changes effected in *animals* by selection. When we turn to plants what do we find? The first thing, and which is apparent to everyone, is that each produces "fruit after its kind." But close observation shows something more than this, viz., that, although each produces "after its kind," no two plants of any kind are absolutely alike. I speak not of monstrosities of which the characteristics are not heritable, but of that ever present tendency throughout nature to variation, of which the horticulturist has availed himself. These variations, of which we can profit through the great principle of inheritance, are generally slight; so much so, indeed, as to be quite inappreciable by the untrained eye or hand, but they are, nevertheless, striking enough to one competent to observe them. I will give a familiar illustration of this. Nothing can well seem more alike to an ordinary person than the sheep composing a well-bred flock, but the shepherd knows them all apart as well as if each had a name. To him they are no more "all just alike" than are the members of his own family. That these differences, apparently so slight, can be practically availed of, the existing improved breeds of sheep prove beyond doubt. I have already said that no two plants are absolutely alike. Of any two, then, one must be (in the direction of the difference between them) superior to the other. This fact, coupled with the principle of inheritance, is the very key-note of all possible plant improvement. But, it may be asked, do plants offer opportunity of improvement by breeding equal to that presented by animals? Surely much greater. A cow or ewe produces at a birth one (or two) only—a single grain of wheat has produced a plant, the ears upon which contained 8,000 grains all capable of reproduction. Now we can plant all these, and of the resultant 8,000 plants reserve only the best one of all to perpetuate the race, rejecting every other. Can anything approaching such a choice as this be afforded any breeder of cattle or sheep, no matter how extensive his herd or flock? The advantage on the side of the wheat becomes almost infinite when it is considered that in the case of the above animals three years (instead of one) are required for each reproduction.

Before giving a few examples of results already obtained in cereal development, I will mention analagous improvements obtained in vines and in beetroot cultivated for sugar. Many years ago an old friend from Piedmont, having a relative a vine grower in Italy, carried back with him from here a sufficient knowledge of my system of selection to enable him to explain its principle. Some seven years after, upon my friend again visiting me, he told me that his relative, knowing him to be in London, had written to ask him if he could arrange there for the disposal of his wine, and that he, without reading this letter through, at once replied in the affirmative. This he did, as he knew the small extent of his relative's vineyard—some 12 acres. "You may judge of my astonishment," said this gentleman to me, "when upon reading his letter to the end, I found that he had, without having increased the extent of his vineyard, three times the quantity of wine he formerly produced, and this simply through having followed the plan of selection I had suggested to him." The cultivation of beetroot for sugar is a very important one, and any increase in the percentage of sugar contained in it is of very high value. The following from Toronto, Canada, appeared in the *Gardener's Chronicle and Agricultural Gazette*, of March 22nd, 1873, under the head of "Foreign correspondence":—"The most vital point, however, of the beetroot grower is the quality of the seed he uses; when beets were first grown for sugar five per cent. of sugar was the amount obtained, now 15 per cent. is obtainable in favourable instances. This has been attained entirely by the improvement of the pedigree principle of the seed. The quality of richness in the root was attained by Vilmorin in the following manner:—Each root is a perfect plant, and, therefore, in the examination of each root for the production of seed, the quality of it had to be ascertained. For this purpose, Vilmorin had a set of most delicate instruments made for the determination of specific gravity, and he found that the specific gravity was indicative of the sugar contained. The cups he used were no larger than a lady's thimble, and the saccharometer or measure of specific gravity equally small. The roots were first selected according to the best ordinary rules, then a small portion of each root was punched out of it in such a part as to injure as little as possible its future growth; the pieces were reduced to pulp, and the juice was extracted. All the roots which did not yield juice up to a certain standard were rejected, whilst those which reached the standard were planted for seed; the roots produced from this seed *were found to be constantly increasing in richness*, and a few years of the process produced the great per centage of sugar which is now attained." I may here mention in reference to the foregoing that I had, so long ago as 1860, come to the conclusion that vigour of vegetable growth was identical with the power of supporting animal life, and that specific gravity was the measure of both. The difficulty of determining the specific gravity of a grain of wheat without impairing its vital vigour was, however, found insurmountable.

I will now refer to results obtained in cereals by selection, taking wheat as the illustration. The chief points to attain are vigour of growth, hardiness, productiveness, and quality, and these have become as permanent characteristics of the pedigree cereals as are the good points of a thoroughbred animal, and reproduce themselves as surely. I begin with a report from near Perth, Western Australia, in 1862, nineteen years ago. "The English Wheat (Hallett's), sown before I came, produced when drilled 29 bushels per acre; and when dibbled, 35 bushels per acre. The average crops about here are under 10; ours were 6; and our neighbours' opposite 4½ bushels per acre. The largest ear produced 113 grains. The greatest number of ears on one 'stool' was 72." And next I give the *last* report received *of the same wheat*, from New Zealand, published in the Otago *Daily Times* of June 3rd, 1881:—"We have been shown two samples of wheat grown by Mr. M. C. Orbell, at Waikouaiti, and we do not remember to have seen any to compare with them in this country. They are known as Hallett's Pedigree wheat, Hunter's white, and original Red. The yield exceeded anything ever grown in the district before. Mr. Orbell sowed 1¼ bushels upon one acre, and the yield was 72 bushels (or 9 quarters) of good marketable wheat. Many of the plants consisted of over 90 ears, some of which contained as many as 132 grains each. Hallett's Pedigree white Canadian oats, introduced by the same importers, have, we understand, been cultivated by Mr. Shannan, of Conical Hills Station, with the same success as the wheat grown by Mr. Orbell." Thus, after 18 years (not without further selection, but the selection, having been continued annually at Brighton throughout the interval), the *same wheat* is found not only to have maintained, but to have further developed its vigour of growth, producing over "90" ears (instead of 72 ears) upon a a plant, with 132 grains (instead of 113) in an ear. In England, 1876, 105 ears on a plant contained more than 8,000 grains. (The average number of grains in an ordinary ear is 22 only). From Essex in the same year as the date of the report first given, a crop of the *same wheat* was reported of 27 quarters on three acres, or nine quarters per acre, exactly the same quantity as that just given as obtained 18 years later in New Zealand! Can illustration further go that there is no deterioration if only the selection be continued? Here is another experience in another year and country:—Monsieur Tréhonnais, editor of *la Revue Agricole de l'Angleterre*, writes Oct. 9, 1865, from Brussières, France—"I am now staying here, a large farm where your wheat is extensively cultivated.

The average this last harvest was at the rate of seven quarters to the English acre; the average of the other sorts in the same district did not exceed three quarters per acre.'

Thus far as to vigour of growth and productiveness. I will now give examples of the other two points named, hardiness and quality. Report of the Minister of the Interior, Belgium: "I continue to sow the varieties of wheat improved by Hallett, above all the 'Red,' and 'Victoria' white. These varieties are very hardy. During the winter, 1875 and 1876, many of our varieties of wheat have been destroyed by frost. The Hallett Red has successfully withstood the frost. It has been the same with the Victoria. On the other hand, the variety 'Galand' has been completely destroyed, not a single plant of it left. We have seen many fields of even our 'little red' variety, very hardy, which have greatly suffered." Lastly, as an example of sustained quality, a report from Linlithgow, Scotland, dated 23rd Nov., 1878: "I have again, making now 10 years in succession, had the honour of topping the Edinburgh market with your Hunter's white wheat. I sent some of your barley to Australia, and in a few years it spread and gave immense satisfaction." The pedigree cereals having been grown in upwards of 40 different countries in Europe, Asia, Africa, America, and Australasia, it is, of course, impossible to give, in such a paper as this, any idea of how widely *extended* has been the success of selection as exemplified in them, but I may mention that, in acknowledgment of that success, the Minister of Agriculture at St. Petersburg placed at my disposal the collection of all the agricultural colleges of Russia; and the Minister for Hungary sent through the Austrian Embassy at Vienna, and published, a most flattering communication showing results obtained by his Government by adopting my system. From Italy, Holland, Denmark, and Sweden, I have received similar acknowledgments. The Government of the United States published my system *in extenso* in the report for 1874 of the Department of Agriculture. The English Government, too, as will presently be seen, did me the honour to appropriate and apply my system in India.

A very practical acknowledgment has been made by less distinguished persons at home. When I commenced my system, now nearly 25 years ago, nothing had been done or attempted in the matter of the systematic improvement of food plants. One searches the advertising columns of the newspapers of that day without finding any of those announcements with which they now positively bristle, of seeds of all kinds, "of repeated selection," of "the latest selection," &c. But now many persons and firms, supposed to be of the highest respectability, and among them, as is always the case, some who ridiculed my work at the outset, unblushingly try to identify their productions with my own, a sure and certain evidence that the reputation resulting from my system of selection has a very practical value.

In the case of the potato, next to the cereals in importance as a food plant, I have also applied my system, starting every year with a single tuber, the best of the year (proved to have been so by its having been found to produce the best plant), for now 14 years. My main object here has been absolute freedom from disease, and these potatoes are now descended from a line of single tubers, each the best plant of the year, and absolutely healthy; and concurrently with the endeavour to wipe out all hereditary tendency to disease, I have always kept in full view the point of increasing productiveness. The result may be thus shortly stated. Dividing the first 12 years into three periods, the average number of tubers upon the annual best plant selected was, for the first period of four years, 16; for the second period of four years, 19; and for the last period of four years, 27, or nearly double the number produced during the first series of four years. And if, as I might very fairly have done, I had confined the first period to the first three years (instead of four), the last period would have shown an average of 27 tubers against 13 in the first period, or more than double. Here, exactly as with the number of grains in the ear of the cereals, we reach in the last period of a long series of years a standard altogether higher than in the first years of the series, *and this no matter how we divide it into "periods."* In the latter "periods" of a series of years the results vary according to season and circumsances; but (except in a case of disaster) in no year of the last years of a series *do they drop back to the standard of the earlies years!* Can it possibly be conceived that all this is mere chance or accident? Is it not the fair conclusion, rather, that nature offers to us—nay, tempts us with—on every side rewards for intelligent observation, if we will only learn the lessons and avail ourselves of the variations which she presents to us?

I have hitherto spoken of food plants only, of vines, beetroot, cereals, and potatoes, but in a Health Congress such as this, I may be permitted also to refer to plants destined for clothing; of little, if of any, less importance than food to the health of mankind. I will take the cotton plant as an illustration. In *The Times of India*, November 6th, 1869, an article headed "Cotton Report," says: "The Cotton Administration Report for the past year concluded with an interesting notice of the experiments made last season, and of others which are now in progress in different parts of the Presidency, for growing cotton of an improved quality. To those who remember the conclusions recorded by Mr. Walter Cassels, in 1862, in his work prepared and printed on account of Government, it may seem strange that such experiments are now undertaken at all. These conclusions, drawn from the past history of cotton cultivation in Bombay, were (1), that 'exotic cotton cannot be successfully cultivated on a large scale in Bombay Presidency, except in a limited portion of its southern districts'; and (2), that 'Indian cotton may be improved in cleanliness and somewhat reduced in cost, but the general characteristics of the staple will not be materially altered. Because lacs of rupees had been in a long course of years expended in cotton experiments, and these had resulted in a long list of failures, it seems to have been supposed that the utmost had been tried in vain, and that the question had been finally set at rest." The article, having referred to Mr. Cassel's opinion that the failure of exotic cotton when cultivated on a large scale was due to the violence of the Indian season, continues thus:—"The climate of Hindostan is, we admit, in nearly all that relates to cotton, very different to that of any but the most arid districts in our Northern Deccan collectorates. But it is plainly a fallacy to attribute to climatic influence results for which other causes can be found independent of the climate, and, unlike the climate, quite within our control. One of these causes is indicated in a Minute by the Governor of Bombay, dated January 10th, 1868, in which his Excellency, who attaches great importance to the subject as one 'of vital interest to this Presidency,' remarks that 'the experiments that have hitherto been made by the order of Government with a view to improvements in the cultivation of cotton, do not appear to have been hitherto carried out with sufficient presistence or sufficient method. So that, in fact, as remarked in the report before us in the matter of Indian cotton improvement, we are yet but on the threshhold of our experience, but let us hope that the course will now be distinctly mapped, and that we may be saved from the task of beginning our experience again and again. What is still wanted, not only in the N.W. provinces and Upper India, but in the far more favoured cotton fields of our Presidency, is an adequate testing and full authentication of some inexpensive method of treatment or cultivation, which shall be equally applicable to the exotic, hybridised, and good indigenous varieties, and which the ryots themselves will be able to appreciate alike under their present simple methods of tillage, or under any improved system they may eventually be induced to adopt. There is at last, we think, some prospect of this *desideratum* being attained. The minute of his Excellency suggests more than simply a systematic method of operation in future experiments. It describes what is known at home as *Hallett's pedigree system*, which consists in the selection by hand of the finest seed from each successive year's crop, and the annual reproduction of the plant only from such seed; and it enjoins the adoption of this plan in experiments both with exotic and indigenous cotton, as the best means of acclimatising the one and improving the other. The advantage of this system appears so very manifest that the wonder seems to be that it has never yet been tried. A cultivator selecting the finest bolls in his field of cotton, and putting them aside, extracting from them at leisure the seed for his next sowing, is a thing that has never yet been heard of; but the matter is so simple, so reasonable, that we have little doubt that the system will be generally adopted when the ryots come to be acquainted with it, and its advantages are explained to them." The same article then goes on to say: "The pedigree system was begun last year in different parts of the Presidency, but cannot be said to have yet had to any appreciable extent a trial, as it is obvious that the effect of it can only be judged by the character of the produce of successive years. In the experiments now being conducted in accordance with the plan suggested by His Excellency, there is yet another element of success in the efficient character of the agency employed. The Cotton Departments are assisted in the work by four practical horticulturists, Messrs Shearer, Stormont, Strachan, and Milne, who have been sent out to this country for the purpose by the Secretary of State, who, we believe, selected them from a number of applicants on the recommendation of Dr. Hooker, of the Botanical Gardens at Kew." I wrote to my friend Sir Joseph Hooker, who, in reply, says the men were sent out from Kew in 1869, but that he has no statement of the results beyond a newspaper cutting, stating that their services were highly approved of, adding "cotton is coming down from the country much better in quality and in much larger quantities." I therefore wrote to the India Office requesting to be furnished with a copy of the Minute above referred to, and with information as to the exact plan adopted and the results obtained. I can only suppose that there is some difficulty in doing this, as, although I stated that these particulars were required for the Congress this day, they have not yet reached me.

Had the Government, when thus appropriating and applying my system, done me the honour to consult me upon it, I should have pointed out that mere horticulturists, however skilful, would not (unaided) be likely to accomplish very much. It appears that in India there are thirty different kinds of cotton grown, in as many separated districts, for the Liverpool market. In each district the kind of cotton grown there is said to be that most suitable, and indeed the only kind that can be cultivated there with advantage. If this be so, then there must be thirty selectors—one in each district—in order to improve to the utmost the cotton most suitable to it. I do not profess any special knowledge of the growth of cotton, but I know something of the growth of wool, and I apprehend that fineness, and length and strength of fibre are qualities equally desirable in both. I have seen a buyer of wool, when blindfolded, tell by the touch the age and sex of the animal from which the fleece in his hand came, and I have tested beyond all possibility of doubt his ability to do this. I am told there are men in Liverpool who have an equal gift in judging cotton, but that such men soon make their fortunes there. But these are exactly the men who are wanted for cotton selectors in India. The available differences of plants are slight, and when out of a number the selection has reduced the competing plants to two or three, the difference is very slight indeed, but still very real. With many different points to take into account, I have occupied weeks in studying the final best two plants. It is evident that if there is anything at all in selection, a selector, ignorant of the one thing needful, may pedigree in the wrong direction, as the first Napoleon did unconsciously when his conscriptions left only those men who were quite impossible for soldiers to be progenitors of the future Frenchmen with the result of the standard in the army having to be lowered by five inches. I must not, I suppose, be surprised if the Government has imperfectly understood my system when such a man as Mr. Darwin, in his "Cross and Self-fertilization of Plants," can thus write of it :—"Loiseleur-Deslongchamp (Les Céréales) was led by his observations to the extraordinary conclusion that the smaller grains of cereals produced as fine plants as the large. This conclusion is, however, contradicted by Major Hallett's great success in improving wheat by the selection of the finest grains." Here finest evidently means largest; but size of grain is not even an element in my system of selection.

If then we can seize upon these variations in plants, and by means of the principle of inheritance, perpetuate, increase, and accumulate year by year the original variation in the desired direction, what a field does it open to us for increasing this world's plant food! And how vast is this field compared with that presented by the food-producing animals, in mere number probably not equal to the food plants upon a single English farm; for while these animals supply food for man alone, and for him only in part, plants may be said to almost wholly support both them and man. Vast, indeed, may this field be called, for it includes not only the plants destined for food and clothing, but also every kind of plant which contributes to the welfare and happiness of mankind; surely a field, then, worthy of any man's labour!

Since this paper was read, the following has been sent to Major Hallett by the direction of the Secretary of State for India, together with reports extending to 1870 only. The receipt of later reports will probably be delayed.

INDIA OFFICE.

[Extracts from Administration Report of the Cotton Department for the Year 1868-9.]

Minute by His Excellency the Governor of Bombay, dated 10th January, 1868.

The experiments that have hitherto been made by the order of Government with a view to improvements in the cultivation of cotton, do not appear to me to have been hitherto carried out either with sufficient persistence or sufficient method. The great importance I attach to this subject, which is, indeed, of vital interest to this Presidency, induces me to request the Inspector-in-Chief to devote his special attention to it during the forthcoming season.

2.—The objects to be kept in view are two-fold: the improvement of the indigenous cotton, and the permanent introduction and acclimatization of the best exotic varieties

3.—Great advantage has, no doubt, been obtained from the attention that has been paid to the growth of foreign cotton, and the co-operation of the Cotton Supply Association, which has facilitated the obtaining of the best seed from different quarters; but the idea seems to me to have been too readily adopted at home, that the sole means of improving our cotton is to encourage the growth of the best known foreign varieties, and with this object to import and distribute every year large quantities of exotic seeds. Gentlemen interested in the supply of cotton at home have said to me that the simple duty of the Government is to introduce American cotton into India, as if it were likely, or possible, that the same kind of cotton would succeed in districts varying, as our cotton districts do, in every particular of climate, soil, and elevation, or that the variety which can be successfully cultivated in the dry air of the Deccan will answer equally well in Guzerat, or the coast of Kattywar.

4.—In England I have had opportunities of seeing on my own land, and on the properties of other gentlemen, how much can be effected in the improvement of cereals by a continued attention during successive years to the selection of the best seed only from crops of a common variety. The pedigree wheat, which bears the name of Mr Hallett, a Sussex gentleman, is, in fact, a new variety which he has produced by the constant selection each year of the finest ears produced on his farm near Brighton, and by his never permitting any seed from small or inferior ears to be sown. None but the best ears selected by hand were set aside the first year for seed; from the produce of these the best were again in the same manner selected by hand, and this course was continued for several successive years; the final result was the introduction of Hallett's Pedigree Wheat, which I have known in my own experience to produce a crop nearly 50 per cent. more in quantity, and 50 per cent. more valuable in quality, than that produced from the best seed that could be purchased in the market, and this in the same field, under exactly the same circumstances, and with the same care taken in the cultivation.

5.—I believe the same result may probably be obtained if the same process is adopted with our indigenous cotton. At any rate, I desire the experiment to be carefully made, and will take care that funds are placed at the disposal of the Inspector-in-Chief for this purpose. The experiment should be tried not only in different districts but in several parts of each district, and a sufficient breadth should be sown in each case to ensure a fair and satisfactory trial. I need not say that I do not desire to diminish the distribution of exotic cotton seed in the way which has been adopted for several years past; on the contrary, I desire it to be vigorously continued, and every encouragement given to the cultivators to avail themselves of it. But I wish the same process of selection of the finest bolls only for seed to be carried out,—on land taken up for the purpose on behalf of Government,—in the case both of Egyptian and American cotton. If possible, Peruvian should also be tried; but I am afraid it may not be procurable this year. Unless this is done, we may go on year by year growing cotton from imported seed with varying success; but, in my belief, we can scarcely hope to acclimatize in perfection the exotic varieties. It seems absurd to expect that we can perpetuate a foreign product if we propagate from seed taken from weakly or ill-grown plants. If the seed be taken only from robust and well-grown specimens, we may hope each year to obtain a produce more and more adapted to our soil and climate, but possessing all the peculiarities and advantages of that produced from imported seed.

6.—The Inspector-in-Chief is, therefore, authorized to make the same experiments as those I have suggested as to the indigenous cotton,—with all the exotic varieties he may receive,—in the same manner and on the same scale. Even if they are not successful to the extent and in the manner I anticipate, they will serve to show us, if carefully continued for the next three or four years, what are the exotic varieties of cotton which we can with confidence encourage the cultivators in each district to adopt, as being best suited to the particular circumstances of their lands.

7.—A circular should be issued to the different Inspectors and their subordinates explaining what is required, and the Inspector-in-Chief should put himself into communication with the collectors of the districts, in order to secure their aid and co-operation.

8.—The views of the Government will also be communicated to them through the Revenue Commissioner.

9.—If the measures indicated above are systematically and perseveringly followed, I am sanguine that even during my tenure of office a great advance may be made towards improving and increasing the supply of cotton grown in this Presidency, so as to meet the urgent and growing requirements of the home manufacturers.

W. R. SEYMOUR V. FITZGERALD.

10th January, 1868.

EXTRACT FROM

ADMINISTRATION REPORT, COTTON COMMISSIONERS' DEPARTMENT, For the Year 1870-71.

[*Received by Major Hallett 9th January,* 1882.]

From Major A. T. Moore,
Acting Cotton Commissioner and Inspector-in-Chief.

Bombay, October 31st, 1871.

Advantages of "Selection,"
As desired by His Excellency Sir Seymour Fitzgerald:—

Paragraph 35.—"Taking everything into consideration, I think the fact of the heavier yield,—by more than double,—being in favour of the 'Pedigree,' goes to show that 'selection,' as desired by His Excellency Sir Seymour Fitzgerald, should be carefully carried out; that the cultivators should be supplied from the Government crops with as much seed as possible, and, at the same time, that the necessity for selection should be earnestly pressed on their notice; while the Superintendents themselves, by carefully and steadily pursuing the same plan year by year, by selecting from all their crop, and again selecting from that selection, will be able apparently, if the present results may be relied on, to increase the production and fruitfulness of the plant, and in the course of a few seasons to establish a veritable 'Pedigree Cotton,' as unlike its parent as the 'English thorough-bred,' with his long stride and fine skin, is unlike the stock whence he originally sprang."

Paragraph 36.—"It remains for me to notice the avidity with which our surplus seed was purchased by the cultivators. Mr. Wilkinson *(District Inspector for Kandeish)* says this seed 'was sufficient for the requirements of two villages, and that the crop produced was an abundant one.' He further adds, 'I was informed by the Patel of one of the villages that this seed had given great satisfaction; yields being reported of 96lbs. to 150lbs. cotton per acre, according to the amount of care in cultivation.'"

Paragraph 37.—"This gives an average of 123lbs., but I will only take 100lbs. as the *average* product, and even then I find the figures loudly speaking in favor of carefully picked and selected seed.

	PER ACRE.
Average Yield of our Departmental Seed	100lbs.
Average Yield for Kandeish	$82\frac{2}{3}$lbs.
Difference in favor of our Seed	$17\frac{1}{3}$
	or about 20 per cent.

"If only this 20 per cent. could be established as the increased out-turn, by the efforts of our Department, it would bring wealth to thousands, and unspeakable benefit to the Presidency generally.

"It would represent an increased produce, valued at last year's rates, of Rs. 26,365,979 = £2,636,597 18s.; a result and a prize worth striving for, and, it would appear, possible of attainment!!"

Paragraph 68 remarks upon the Report of Mr. A. Stormont, Superintendent of Experiments for Surat and Broach:—"Although, as it is justly remarked, 'the benefit arising from selection cannot be expected to show itself at once,' still, a good practical test of its value, and the confidence reposed by the ryots in the process, and in the Superintendent, is obtained from the fact that in the locality of the experiments they 'bought up every pound of our spare seed.'"

DISCUSSION.

Mr WASHINGTON LYON said they had had vegetable production referred to, they had heard what could be done in that direction, and he had hoped they would have had proved the importance of animal production. The President in the morning touched upon the Fish Inquiry in London. He considered that that question had been a little lost sight of in discussing the food supply of this country. At this Congress some allusion had been made to the necessity of the brain being attended to. It was an admitted fact that nothing did more towards this than fish food.

The PRESIDENT reminded the meeting that what they had to discuss was the paper that had just been read. (Applause.)

Mr C. F. DENNET said no person had listened with greater pleasure and instruction than he had to what Major Hallett had said.

"It was a wise man that made two blades of grass grow where only one grew before." (Hear, hear.) What then should they say of the man who had developed the little germ with such satisfactory results as Major Hallett had done with his pedigree cereals. If he (the Speaker) were a member of Parliament, he would advocate Major Hallett's interest in what he had done and the great object he had in view, and that was the propagation of a better article. The system might be applied to the production of cotton. Strangely enough, he had that very morning received from the United States a paper containing a speech of Mr Edward Atkinson, who had been attending the great International Cotton Exposition at Atalanta, Georgia. Mr Atkinson spoke of the importance of bringing the cotton grower and the spinner into more immediate connexion. Mr Atkinson said "there has been the greatest need of closer communication between the cotton grower and the cotton spinner, in order that the mind of the cotton grower may be disabused of the idea that dirty or bad cotton is as profitable as clean and well prepared staple. What we need most is uniformity of staple, be it long or short, and freedom from trash. As we extend our work to fineness and variety, this requirement becomes urgent. Everywhere cotton was deteriorating, and the demand was increasing. What was wanted and what must be had was uniformity—fine long cotton, midway the American sea island and the upland—for a great variety of use." The next best was Egyptian. There was not, however, sufficient to supply the requirements of the age. If they could get from any country each kind as it grew—each separate from the other—the work of the spinner could be improved; but under the present methods of dealing in cotton, uniformity of staple was more difficult. If a better plant and staple can be secured,—which means cotton improved in length, quality, and strength,—there will be better seed, yielding better oil, and also better cake for consumption by the beast. Therefore, if Major Hallett could by his system secure such improvement of the quality of cotton, as would bring about the uniformity so much desired, with eventually an increased supply, he would be a benefactor for all ages to come. (Applause.)

Mr W. S. Mitchell thought, late though it was in the day, they ought not to allow Major Hallett's paper to pass without recognising its value in a way that had not yet been alluded to. As he heard the paper read, he naturally expected that somebody would thank Major Hallett for the way in which he had made known to them how the theories of Charles Darwin could be practically carried out. No one had made allusion to that. It seemed to him this was a work of a very important character. It was one thing for a theorist or hypothesist to throw out hints as to what might be done and another to take them in hand to practically carry them out as Major Hallett had done. They had thus practical work of the world linked with science.

Major Benett-Stanford inquired what had been Major Hallett's experience in regard to practical results of pedigree wheat grown in different parts of England? That was to say, what results had been achieved by his wheat grown in the eastern and western parts of the country—whether a wet or dry climate was most suited to it? There was another question he wished to ask. Major Hallett did not tell them whether it was the choice grain, or grain of some other peculiarity he selected for his pedigree wheat.

Major Hallett said he could not give any information that would be valuable in answer to Major Benett-Stanford's first question. The fact was when he looked through his reports from different places, he found, if he quoted from them, his paper would look like an advertisement and the difficulty was to cut down results from different places. The results obtained in England, Scotland, and Ireland depended a great deal more upon the character of the year, than upon the nature of the district. For instance, the season of 1879, which was one almost enough to destroy anything, did not destroy his wheat. Although the yield was reduced, it was not then brought down to the point whence it started. With regard to the question as to the size of the grain, he did not give in this paper what he professed he had discovered —"the law of the development of the Cereal,"—because he gave it before the British Association in 1869. He selected grain for its quality. He would much rather have a small grain of good breed than a bad grain as big as himself. (Laughter). If they wanted a long ear, a long ear must simply be selected and so with regard to a long straw. The straw would always be in proportion to the quantity.

Mr Mitchell: By best you don't mean the largest producing in the way of grain?

Major Hallett: By best I mean best in the direction which you desire. For instance, the best wheat a farmer can grow is that which produces the most money per acre. If you want a wheat that is large in the berry, you must go in for that which will improve that quality. But take care you don't pedigree in the wrong way. (Laughter and applause).

DOMESTIC HEALTH.

ADDRESS

BY

ALFRED CARPENTER, M.D., C.S.S.,

PRESIDENT OF SECTION C.

A LATIN author tells us that—

> Tempora mutantur et nos mutamur in illis.

Or, as an English author puts it—

> Men change with fortune, manners change with climes,
> Tenets with books, principles with times.

What an illustration of this proverb is produced at this moment in this town of Brighton.

That the rulers of a vast suburb of London, whose very existence has been caused by its health-giving breezes, should promote a health exhibition, should organise a series of lectures upon the general principles of health, is not extraordinary, considering that we look upon the frequenters of this suburb as belonging, in a great measure, to the representatives of both intellect and wealth; but that they should condescend to consider those minor matters which regulate domestic economy, domestic health, and educational training, is a proof of a great change in public esteem as regards sanitary science. This change must be acceptable to all those who, like myself, have had to bear the brunt of adverse popular opinions; to fight for the apparently small things of sanitary work against the heavy weight of official antagonism which arises from a venial ignorance on their part in consequence of public indifference. It is a common thing for men of intelligence patronizingly to commend the work which the sanitarian promotes. It is usual for the educated Englishman to tacitly agree to the tenets enunciated in what are called the principles of preventive medicine; nay, he will even eulogise the promoters and pat them approvingly on the back; but it is not usual for him to go down to the parish polling place and support the promoters of public health by his vote at the annual elections when our local parliaments are reinforced by new aspirants for municipal honours. As a consequence of this indifference, the ignorant opponent of sanitary work, or the hidden participator in some parish job, or the promoters of some commercial undertaking, said to be sanitary, but which is usually the contrary, is placed at the head of the poll, to the serious detriment of good sanitary work.

A series of meetings in different great towns like to these which are being held this week in Brighton, will assist to checkmate such results by enlarging the mental calibre of the British ratepayer who elects our common councils and our local boards, and will thus diminish the chances of his being made the tool of designing knaves, or the supporter of self-satisfied ignorance.

My theme this morning is "Domestic Health;" a consideration of the means by which individual health is raised or lowered, and the period of life lengthened or shortened by domestic agencies.

That individual life is uncertain is a truism which everyone acknowledges; and yet in the aggregate its value is known almost to a day. The statistician can tell to a positive certainty how many among a given number of men, women, and children *Pallida mors* will call his own within the next twelve months, provided the area is large enough, and the habits and character of the population understood. If a man takes his wife and family to live in a particular district, say in Liverpool, Manchester, or some other great commercial centre, there is a certainty that their chance of living a given number of years is less than one-half that which would belong to them if they came to live in Brighton. If a man determines that his sons shall become publicans or grocers (with wine licenses), or shall go into any business which brings them constantly in contact with the manufacture or the sale of intoxicating liquors, he takes away from the lives of those sons a number of years which would be theirs if he put them into the trade of a gardener, or sent them into the church as parish priests. We know some of the reasons for this result. They are clear and unmistakeable.

Then, again, taking aggregates of children collected together. There are, or were, some streets in Liverpool in which 90 out of every 100 of the children who were born into the world died within the first five years of their existence, whilst the children belonging to the same class of people taken from their wretched homes and sent to such schools as those at Anerley, or to the Beddington Female Orphan Asylum, have a mortality of about 3 in the 1,000 per annum. In the one case 900 die out of 1,000 in five years; in the other only 15. The conditions which produce this state of things are well known. They are absent in many places. I will mention one in particular—Her Majesty's convict prisons. In those select and exclusive establishments the mortality is about 8 in the 1,000, but then they are selected lives; picked out of the most unhealthy and disreputable classes of society. If the same rules as to habits and manner of living could be observed by a similar number of persons taken from healthy stocks and from individuals who had not damaged their constitutions by crime and debauchery, this death rate would still be lower; 6·5 to 7 in the thousand is probably the normal mortality which would arise in such communities, and although we must not compare adults with children, yet a public health which should show such results would in the course of years add materially to the number of nonogenarians in the death list, and in course of time bring many up to the limit which has been placed by Providence to human life, viz.:—100 years. I believe every person is entitled to live to that age, and if he does not he is deprived of a portion of his birthright, either by his own act or by the acts of other persons. There is a time when a man must go down to the grave, but it ought not to be in consequence of disease, and it ought not to be before he has passed at least 90 years on earth. Death will come though disease need not, and death without disease would probably be no more pain to men than the fact of being born into this world is to the child. Uneasiness there may be, but not that acute suffering which arises in most instances from a disobedience to God's laws, either on the part of the individual himself or of the commonwealth to which he belongs, or to his predecessors, or forbears upon the earth. It is not my intention to dwell upon hereditary disease on this occasion. No doubt it exists to a very serious extent, and is becoming more and more manifest as people increase and multiply upon the face of the earth. The history of insanity, of hysteria, of cancer, of syphilis, and of gout is too clear on this point for any doubt to exist. I would merely remark, upon the subject of hereditary disease, that without a doubt there are powers inherent in the human frame to throw out disease even when it has hereditary tendencies, and to enable diseased fathers and mothers to be the parents of healthy children. But the subject is of too wide a nature to be dealt with on this occasion. It is, however, most probable that measures taken to raise the health of the units of a people will diminish the evil of hereditary tendencies and dwarf its consequences, so as in time to reduce it to a minimum of the smallest possible degree.

What is disease? It is a departure from the condition of the body called health. When does health cease and disease begin? I believe that there is a border line in which the conditions necessary for the establishment of disease must have time to produce their results before the disease actually arises. It is in this border line that the work of the sanitarian is most manifest, and is most beneficial to the community, by preventing functional disturbances and the consequences which naturally follow from the loss which sickness produces. I am sometimes asked if there is anybody living in perfect health at that particular moment. That is a question which is difficult to answer, if by health we are to understand that there is to be no disturbance of the equilibrium of function in the body. It is probable that on this basis there is no one living among civilised beings who is perfectly healthy. But I contend that there are great numbers in whom the border line of the disturbance of the equilibrium has not been passed, and in whom disease has not yet appeared. A knowledge of and obedience to the laws which regulate health and prevent disease is of the greatest importance to these persons, for unhealthy home influences will prevent them throwing off their burthen. They are not well, but they are not ill. Conflict is going on between two forces, and Sanitary or Insanitary conditions may decide the issue. Disease works its way in many directions, and by a thousand and one means. There are some classes of disease which arise from the effect of morbid poisons which can reproduce themselves in the human body, and in these cases each person suffering from that particular form of complaint becomes a manufactory of disease-producing particles. If these are brought into contact with other beings they spread that particular form comparatively in geometrical ratio. There are some people, however, who are able to resist the effect of this poison, either because they have already suffered from the disease in question, and are protected from its future consequences, or because some unknown condition is present which takes away their liability to suffer from it. This class of disease is called zymotic—

it includes small pox, fevers, cholera, diptheria, &c., "et id genus omne."

Some individuals and some families are much more susceptible and more easily influenced by this class of disease than others, and some die much more rapidly than others from their effects. The causes for these differences are not difficult to understand. The places in which such diseases will be most fatal when the particles capable of producing them are introduced there are pretty well known. The conditions producing fatality are of man's making, and can be removed by the action of man. What are those conditions? In a few words, they are due to those changes which flow from the natural result of the act of living; the natural products of secretion or of excreta which are either retained too long within the body itself, or being excreted are not passed on to the vegetable kingdom for utilization and re-application to man's wants. These excreta are the main springs of this class of disease. They are allowed to remain where they ought not to be. It would be as impossible for Zymotic diseases to exist among us as it is for fish to live long out of water, if all excreta were rapidly removed and immediately utilized. The presence of Zymotic disease in our midst is evidence that some kind of excreta is retained somewhere in too close proximity to particular individuals for it to be safe for those persons to continue in contact with it. We are accustomed to regard excreta as matters which everybody naturally passes away, or ought to pass away into our sewers. Some of these matters used to be stored in cesspools. That fatal error has been abandoned in most civilized places in Great Britain, but people now think that if excreta are sent into the sewers, all is done which is requisite for safety to health. Let the destructive effects of foul air upon the employés at the Government offices, and the death of Dean Stanley, answer this suggestion; let the *Times* newspaper be consulted any day in the week, and you will find in the obituary a record of someone who has been cut off by active disease, the consequence of impurity in the house, which impurity is at present scarcely suspected to have been the cause of that particular person's death. It is hidden in the neighbourhood of the house, and is possibly unknown. Erysipelas, or carbuncle, or so-called inflammation of some particular organ, has cut off the victim in the prime of life, and the death is at present seldom referred to its real cause, viz., foul air in the house, and which probably comes from the drain. Any sewer which smells offensively is wrongly constructed, and is antagonistic to public health. Sewers ought not to smell; fresh sewage does not smell, and a sewer should be as clean as a back kitchen sink. There is no difficulty about this cleanliness if sanitary engineers understood the first principles of sanitary work. The moment any kind of excreta has passed from the body, at that moment, or as soon as temperature is reduced, there is a cessation of those actions which give rise to offensiveness. The offensiveness produced within the body is not injurious to health under ordinary conditions, otherwise every person would rapidly poison himself. That offensiveness is gaseous, and is soon dissipated, but there is a border land of time for removal before any kind of dangerous offensiveness can arise. When it is produced it is proof that the excreta has been kept within range of human life too long. The offensiveness is caused by germs or molecules capable of reproduction in a different form from those which previously existed. They are caused by material particles, which have grown in the excreted matter outside the body. They are new cultivations, and are capable of doing serious mischief if introduced into the tissues of living persons. They may be comparatively harmless within the body until they undergo a kind of change of nature which enables them to do things which they could not have done without that change, and which would not have taken place if there had not been something at hand to enable it to begin. This change outside the body is promoted by rest in contact with nitrogenous matters, and is opposed by motion. There are some natural conditions which entirely prevent the change in the dangerous direction. These natural conditions are found in our mother earth, and in the growth of vegetable matter upon the earth. The changes are promoted by rest and the atmosphere which arises in the presence of organic matter in a state of rest, viz., an atmosphere containing excess of carbonic acid. This excess is sure to increase when organic matter is changing without an abundant and continually new supply of oxygen. The first principles, therefore, of sanitary work are embodied in the immediate and direct removal of all excreta from our midst, and its conveyance to, and utilization or destruction in those districts which Providence has designed for its reception. Six to twelve or twenty-four hours are required, according to temperature and seasons, before mischief can arise, but this margin of time is ample for its removal.

But some of my hearers may say, are not some diseases infectious and capable of being transmitted from one to another irrespective of outside sanitary work? I have to answer yes, to this question, unfortunately they are, but this infective character arises from the fact I have already mentioned, viz.:—there is defective sanitation at home. There is scarcely a house in the kingdom in which excreta are not to some extent retained. The most civilised and luxurious home is, in some cases, carefully prepared for the cultivation of factors of disease, if they come into our midst; carpets, curtains, and comforts of all kinds retain the debris from our skins and our pulmonary membranes, the excreta from our sweat glands are allowed to settle upon our uncleaned windows, on out of the way cornices, useless ledges, and so-called architectural or upholstering ornaments, and our smoking friends spit about in a fashion which allows of forcing beds for disease germs to exist everywhere, so that, but for enforced ventilation, even the smoking carriages on our railroads would be very pest-houses if disease germs find admission to their floors, while our sensitiveness to draughts, and the way in which we heat our dining-rooms and offices, our public places of resort, our churches and drawing-rooms, provides a forcing-house for the growth of disease which it seems almost impossible to disperse. I say almost impossible, for this is only as regards present time; with the growth of knowledge there will be a gradual removal of causes, and when the wholesale distribution of disease germs by water companies or by other impure sources of supply, by impure food, and by sewers, is absolutely stopped, the private multiplication and spread of factors will be capable of being stamped out in a far easier and more satisfactory way than is now the case. Pure air, pure water, pure food, and temperate habits will diminish the amount of pabulum in which disease factors can develope, and with those benefits we shall have a diminishing amount of impurity in the blood of individuals which will gradually be effected in consequence of a more perfect knowledge of public hygiene. This will render the blood and other tissues of most people so free from unnatural excreta, that in the words of the Psalmist "they need not be afraid of the pestilence which walketh in darkness, nor of the destruction which wasteth at noonday" (Psalm xci., v. 6). This was a condition of things which was well known to the great Jewish Lawgiver. Obedience to the sanitary laws which were laid down by Moses is a necessary condition to perfect health, and to a state which shall give us power to stamp out zymotic diseases. If those laws were observed by all classes, the zymotic death-rate would not be an appreciable quantity in our mortality tables. It is the duty of the state to prevent the wholesale or general distribution of zymotic disease, and if with great public spirit, acting in the right direction, we have private action in every case, in opposition to its distribution, there will be a great obstruction to the establishment of foci in our midst. That action must be directed by an intelligent knowledge of the fact that every person suffering from zymotic disease is a manufactory of particles of infective matter, which particles must be deprived of beds in which they can increase and multiply, and then zymotic diseases will altogether disappear as epidemics from among the people.

Let us keep this fact in mind, that it is in excreta in a state of rest, and which are not brought into contact with soils and growing vegetable life, that allows of the multiplication of disease particles able to infect humanity. But we may also remember that if that humanity is in a proper state of health the germs may find admission to the system, but will fail to find pabulum to set up disease there, or the pabulum may be so trivial in amount that the disease will be of the mildest and least dangerous character. The chemical constituents of the secretions and of the excretions are so varied and changing that it is easy to see that the pabulum may be very various in character, and as each kind of disease particle may require and may obtain a different kind of pabulum, it follows that in one case the disease may be severe and in another slight, or different in character altogether, for the effects of the disease will depend upon the quantity and quality of material upon which it grows; for I am of opinion that there is an analogy between the growth and development of the factors of disease both within and without the body. The causes can only increase and multiply at the expense of used up matter which has filled its mission in the human body, and which has not been removed in proper time from the tissues of the body or from the neighbourhood of its producers. That this used up matter would be harmless if kept within the body only so long as might be necessary for its proper discharge, and a disease germ then finding admission would fail to find food in sufficient quantity to live upon, and would abhort, become unfruitful, and be incapable of reproducing itself. It is the quantity of this pabulum which regulates the intensity of an attack of zymotic disease, assisted to some extent by the quantity or size of the dose of infective matter; a small dose takes considerable time to re-produce disease product in sufficient amount in the tissues of the body to seriously interfere with general health, unless the pabulum is very great, but when the dose is large there is a more rapid reproduction, the stage of incubation is more decided, and the new crop or new association of matter which the crop sets up is capable of arresting some of the various functions of the body, which functions are necessary for the continuance of life. They get into the way of the work of a gland or take material for their own nourishment which the body requires for healthy action, and so diseased organs arise which may or may not have a fatal effect according to the amount of interference which they produce. If, however, the products of the act of life are removed from the body as soon as formed, or as soon as nature requires them to be removed, the germs of disease may be admitted without material risk, but being admitted, the result of their action will be manifest according to the quantity of debris which is present for them to feed upon; they then grow, come to maturity, reproduce the minutest of the minute form of perverted protoplasm, and having fulfilled their mission, die a natural death; these debased protoplasmic particles have to be expelled from the body (in small-pox they form the pustules), the causes of the mischiefs break up into other organic forms, and become excreta from the body if health is restored. If, however, death takes place, after a short interval they continue to multiply in the tissue of the victim, until putrifaction has thoroughly broken up the animal matter into its simple elements.

This is very easy to understand when we remember that man produces in himself, by his own act of living, three or four of the most virulent poisons which can be manufactured. We are apt to think of the saliva of a mad dog, the secretion in the poison fang of a snake, or the cause which produces the plague, as terrible things to be kept at a distance, to be run away from at the shortest possible notice, and yet we manufacture in our own bodies every moment of our lives poisons which are as virulent as any I have mentioned, or which can be produced anywhere in nature. The carbonic acid which we expel at every aspiration we make, is instantly fatal when it is inhaled in its concentrated form. The cholesterine, or some product resulting from a change in the elements which form that material and which is produced by the act of thought, being manufactured out of nerve action in our own persons, has only to be kept within the body, in a way which does happen sometimes in some form of liver disease, to be fatal in a few hours. The same result follows in some kidney maladies in which that gland refuses any longer to perform its work; and if the skin is completely varnished over with some impermeable varnish, an end comes to life within a few hours from the retention of an excretion, the retention of which is the probable cause of fatal effects in some eruptive diseases. These poisonous excreta exist in some shape or other in the blood, and ought to be removed as rapidly as nature designs that they should be, and yet by our domestic habits, our taste for stimulants, by our absurd fashions, and by our so-called civilised life, we impede the actions of those organs which excrete those poisons, we keep the products of metamorphosis of tissues about our own persons, both within and outside, and then wonder that nature rebels at such treatment, and sets up actions of her own, antagonistic to the deadly effects which such treatment is certain to produce. It is in consequence of these antagonistic actions to the retention of these morbid poisons that pain arises, that sickness comes on, and that, as an ultimate result of that sickness, the mortality of our country as well as of all others in the world is so much higher than it ought to be. It is a curious and a wonderful fact that the usual effect of the self-manufactured poison is not painful. Deaths by carbonic acid, or urea, or acholia are comparatively painless. Pain is the outcry of those watchful sentinels which Providence has given us for our protection; they are danger signals to be carefully considered, and by means of which the approaching mischief may possibly be warded off. The tendency of treatment by the medical profession at the present day, is rather to ease pain than to prevent a recurrence of those evils which give rise to pain. I trust, however, that a more sensible era is approaching, and that human foresight will take the direction which I have indicated, viz.:—That of rather bearing with the pain, and taking measures to prevent a continuance of its cause, than simply flying for relief to those agents which make us still more blind to its consequences whilst we let the cause go on. I refer here more especially to the use of intoxicating liquors for assisting an imperfect digestion, for relieving neuralgic conditions, and for obtaining an artificial and delusive warmth. The relief is obtained at the expense of a paralysing action set up in the watchful sentinels of danger. The organic and sensitive nerves, which are the danger signals, are put out of gear, and the train goes on heedless of the mischief which is then hidden from feeling and personal observation. By these means organic diseases arise in the different organs of the body; brain, heart, lungs, liver and kidney, or spinal column ultimately break down, and life is shortened in a way, and by means which is little thought of by a majority of the victims, and the daily use of alcoholic drinks assist this more than any other known agent.

Time would fail me to deal with all the diseases which arise from a want of proper knowledge among the people of the first principles of domestic hygiene, and of the evils which follow from a non-removal of the products of excretion, and the retention within ourselves and our houses of those deadly poisons, which are manufactured by the human frame in the act of living. I must, however, remark that it is not likely that the best method of dealing with excreta will be generally used until public opinion has put a stop to that vicious principle which is adopted of paying our engineers and our architects for the work they perform according to its cost, viz.:—A commission upon the cost of the work done, rather than by a sum calculated upon the result obtained. The great object is to expend large sums in great works, whilst the minor details, which take up the most time, and cause the smallest expenditure of capital, are relegated to the care of those who have to inhabit the house after it has been built, or keep the sewers in order after the engineer has finished his work. If the anti-vaccinationists were as energetic in the promotion of sanitary work, which has for its objects the utilization of our excreta, as they are in antagonism to vaccination, they would be doing some good in the world, and assist to bring about a condition of things which would render vaccination altogether unnecessary.

As regards the individual, I am of opinion that sufficient as vaccination is at present in protecting the masses from the effects of small-pox, the right course to be followed in the prevention of the effects of infectious disease is not to be found in trying to bring into vogue new methods of vaccinating for the prevention of such diseases as cholera, diphtheria, and others of that class, but in removing from our own persons, and from our habitations, those debris which arise from the act of living, and which, being properly removed, would render us proof against the evils caused by contagion. However much, therefore, I may admire the efforts of Pasteur to prevent the spread of infectious disease at the present time among our domestic animals, I believe that that is not the direction for us to look to in the future with regard to ourselves. We may, however, draw the inference that as it is by cultivation that a germ becomes deadly so by a counter cultivation its deadly character may be done away with and the disease rendered harmless. I prefer to follow upon the lines connected with the latter, rather than the former contingent.

I propose now more especially to dwell upon the results which follow from a want of ventilation in our houses, and the retention in our midst of carbonic acid, and other excretions from our pulmonary membranes, which results from the act of breathing: for with that carbonic acid there are organic matters which are deadly in themselves, and which are the proper food for the growth and development of malarial influences and enthetic diseases. This action has a direction which differs from that of CO_2; the latter may be, and is always, everywhere present in small quantities, four parts in 10,000 being its natural part in the atmospheric air. In this proportion it assists humanity by providing the proper food for plant life, and it modifies the acute action of pure oxygen, but the organic matters which accompany its excretion have a different relation. There is a peculiarity about carbonic acid, which peculiarity, if it is present in the other excreta, is so in a very minor degree, viz., its diffusive power. Carbonic acid has a natural tendency to diffuse itself through mundane space in antagonism to the law of gravity. It is considerably heavier than atmospheric air, but it is not necessarily found in the largest quantities near the surface of the earth. Each particle or atom of the gas has a decided repugnance to be in contact with its neighbour, and it gets away from it as far as possible, and thus Nature herself puts a bar to the concentration of carbonic acid which is of the utmost importance to man. This diffusive power is comparatively slight in the ammoniacal matters which accompany the excretion of CO_2, it is absent in the epithelial and albuminoid matters which are always with it. These are the natural food of the disease germ rather than of common vegetable life, and where men most do congregate there the breath poisons are most concentrated. Let anyone enter any bedroom, at 5 a.m., which has been occupied during the night by several people; let us suppose it is the dormitory of a school, or the ward of a badly designed hospital, or a crowded bedroom of a common lodging house, and he will become aware of the noisome odour which attends upon an atmosphere that has been respired over and over again, but which has not been purified. Let him go into a crowded church at the close of the sermon, or into a theatre when the performance is nearly over, and he will become more perfectly aware of the stifling atmosphere which pervades these places. Perhaps in the aggregate the worse places, next to our city offices, are our sitting-rooms, and next to them our churches and our places of public assembly, especially on an evening when there is a cool air outside, the preacher popular, and the gas brilliant. The unprotected standards and wall lights take out all vivifying influence from the air. The windows are probably closed to keep out the draughts, which must arise in consequence of the heat within, whilst the closely packed multitude in the body of the building send out from their own persons a mass of deadly poison which only requires a few germs of morbid matter to cause mischief to everyone present in a greater or less degree, and perhaps to the minister most of all. Diseases may be set up by the action of morbid matter, which perhaps some fair girl, in the first stages of consumption, exhaled, and which morbid germs are transplanted to the mucus membrane of other persons, and then sets up actions which show themselves in addition to the simple drowsiness which is the consequence of the action of carbonic acid; that may counteract simple bronchial irritation, caused by other matters, or may produce a deeply-seated attack of disease. It has been established by undoubted experiments that the cultivation of morbid matter may turn a particle of comparatively simple and harmless pulmonary exudation into a virulent material, capable of setting up acute tubercular disease in those who are sensitive to its influence, and that strumous or consumptive conditions are capable of being spread from individual to individual. It is true that the conditions which have been recognised have been only so recognised by experiment carried on in the most exaggerated conditions, but the fact is there; and it probably has a much greater effect on human life, and the production of tubercular diseases than it has yet had the credit of doing. The mortality from these diseases is very excessive. Its most active and best recognised form is called consumption, or phthisis. But there are a vast number of other complaints which belong to this class, and are known to the medical world as scions of the tubercular family. They are diseases of a similar character set up in other parts, besides the lungs. Every region of the body is liable to tubercular deposit, and it is most certain that its greatest factor is the want of ventilation in our dwelling-houses, our work-rooms, and our places of public resort; and nowhere is it more deadly than in the counting-house of the city merchant, and the offices which are inhabited by those clerks who have made his fortune. Let me mention a few of the names by which this class of disease is known. Phthisis or consumption, various forms of lung disease connected with bronchitis, tubercular meningitis. hydrocephalus, or water on the brain, cephalitis and other diseases of the brain, convulsions, tabes mesenterica, or disease of mesenteric glands, which are situated in the bowels, marasmus, scrofula, debility, inanition, atrophy, and many others. These diseases are especially fatal to children who have not been supplied with pure air, and who have been produced by delicate or diseased parents. There is a constitutional tendency inherited from scrofulous parents, which is rapidly brought into fatal activity when children are deprived of that fresh air which nature intended them to have. The first proof of this is afforded by the fact that death rates increase in an alarming ratio among populations according to the density of the people upon the soil, and the number in individual houses. This increase of mortality among children under five is progressive so far that the number of persons living upon each acre of land being known, the number of children per thousand dying under five years of age will certainly mount up in a very rapid manner with each addition of persons per acre. There are various causes tending to render these deductions apparently somewhat fallacious.There are sources of error, but in a great number of instances ,the errors rectify one another, and the numerical result comes to the same point. Dr. Farr has proved that mortality is progressive according to the extent of overcrowding.

The influence of overcrowding is shown most fatally in its effects upon children under five, for whilst the death-rate at all ages in the most crowded populations is 38·6 per 1000, it is 139·5 for children under five years of age; compare this with Brighton mortality, and the advantages of situation and pure air are manifest, although it is probable that the mortality among children in the Brighton houses is very much higher than it ought to be. This increase in the death-rate is mainly caused by impure air, and it ought not to be. The consequences of overcrowding would not be so manifest except for impure air. Poverty assists it, but it is impure air which allows tubercular disease to be so prevalent. It is probable that nearly one quarter of all the deaths which do arise in our midst have this as the foundation upon which particluar forms of tubercular disease are able to develop themselves. This class would not be frequent, then, if pure air was always provided. We may take it that tubercular diseases are as certainly preventible as typhoid fever or cholera, and that a dense population may exist if our architects provided adequate ventilation so as not to be necessary for individuals to poison each other. I will not weary you with detailing the quantities or the qualities of the constituents of pure air, beyond mentioning the fact that the oxygen bears the relation of 20·96 to that of 79 nitrogen and the CO_2 is ·04 in one hundred parts; aqueous vapour is also there, but it adds very little to the bulk. The air has been carefully analysed by a considerable number of experts, and it is most wonderful how close the results of analysis are to those figures, even in the most fetid and used-up air. Out of doors the oxygen seldom falls to a lower figure than 20·6, and Dr. Angus Smith says, "very bad air" begins at 20·6 per 100 parts. I am afraid "bad air" is very common in our houses and in our places of public meeting. There is a corresponding rise in the proportion of CO_2. Nature never presents an air with an exchange of these elements of more than 3 or 4 parts in 10,000, so active and decided are the means by which the products of combustion are dissipated, and the changes produced by oxidation are compensated for out of doors. We may bear in mind that a diminution in the quantity of oxygen means a corresponding increase in the quantity of CO_2. It might seem that a difference of only 100 or 200 parts in a million, meaning one or two parts only in 10,000 of atmospheric air, could have no appreciable influence upon human life. Yet, the evidence which is forthcoming upon this point shows most conclusively that if people, especially children, are kept in an atmosphere air with such a loss of oxygen, there is a rapid deterioration in power, a diminution in the quantity of red blood in the viens, and a retention within the system of effete matter, which ought to be removed, and which cannot be kept in the system without danger. Some of our friends may say stuff and nonsense to this statement, and yet I make it upon evidence which cannot be controverted; whether it is the presence of CO_2 or the absence of O is immaterial, a difference in addition of CO_2 to the natural one of three or four parts in 10,000 is sufficient to alter the balance with regard to one of the actions which is always going on in the human body. The transference of CO_2 from within to without, and its exchange in the blood for oxygen, does not take place with that freedom and celerity which is the case when the quantities are natural. The results named correspond somewhat to those which obtain with regard to the temperature of water. You know that water expands by the agency of heat, and contracts when exposed to cold, but there is a limit to this. When it is cooled it continues to contract until 39·5 F. is reached; the contraction then ceases, and expansion begins, and this corresponds to the border line I have before spoken of. The cold water is lighter than that at a higher temperature. The result is that it fortunately remains at the top of the stream instead of sinking to the bottom, as it did before that temperature was reached. If it were not for this law, winter would be destructive to life in our country by the ice sinking to the bottom until the whole was frozen up. This measure of 39·5 is a wonderful point as regards temperature in connection with change of shape, so is the natural mixture of carbonic acid and oxygen in the air. Alter the proportion by a very small degree, and the exudation of carbonic acid from the lungs is interfered with. Oxygen is not absorbed in its usual rapid way, and as a consequence the *debris*, the results of the act of living, are no longer thoroughly oxidised. The *debris* is kept in some of the blood cells, or some parts of the tissues of the body, and they are not purified as they ought to be. The cells are unequal to the work which they have to perform, some used-up matter is kept back, and the foundations for tubercular and other disease is laid. These foundations may be infinitessimal in quantity, and be laid in a few cells only out of many millions, but they are foundations nevertheless—a kind of gunpowder, which forms a train for explosion whenever it happens that a capable match is applied, and the quantity of *debris* is sufficient for the purpose. If it were not for other circumstances connected with poverty, the poor would be rapidly swept from the face of the earth by tubercular disease, but it happens fortunately for them that their houses cannot be kept entirely draught proof; wind and storm find their way into their lodgings and diminish the evil by diluting it, and that which they consider a misfortune is a real blessing, for dilution of the poison is impediment to its effects. This good fortune does not apply, to the same extent, to the houses of the rich; they, as well as the poor, take care to exclude fresh air, and take the greatest possible trouble to keep oxygen outside and to retain carbonic acid and its concomitants in their living rooms. Every step which is taken to ensure comfort adds to the danger. The old-fashioned open fire place and imperfectly fitting windows kept the enemy at bay for a time, but the chimney corner is gone, window frames are made so tight that not a breath of fresh air can get in by their means, and carpets, curtains, and other so-called comforts remove from the air all its freshness; whilst the introduction of gas for illuminating purposes adds very much to the evil, each ordinary gas burner using up as much oxygen as three people, and now the custom is to render the walls perfectly impervious to the transmission of air, and still greater evil naturally follows. The result is that people, especially luxurious people, live in an atmosphere in which there is a diminution of the required oxygen, with excess of CO_2 and its concomitant excreta. These in themselves are still more injurious, as being food for debased protoplasm, and then they wonder why they are out of health; why they constantly take cold when exposed to draughts; why they lose their appetites; cannot sleep; and why they suffer from headaches and listlessness; why, in fact, they don't enjoy life and feel thankful to the God that made them for the blessings which might be theirs if they understood and obeyed the laws which belong to the act of living.

Suppose we look into the Church where we go to give God thanks for our many blessings. A thousand people are there, each occupying a square yard of floor space. It may be even less than this if it is a fashionable place of worship. The seats are cushioned, and the floor at the least matted. If it is cold weather, the great object of the verger is to keep it warm and comfortable. The temperature is carefully observed to be above temperate on the thermometer which hangs on the centre pillar. If the air in that Church was examined before the commencement of the service, it would be found to be already deficient in oxygen. Instead of 20·90 it is probably 20·70. A thousand people are assembled; each of these on the average produces six-tenths of a cubic feet of carbonic acid per hour, or a cubic foot during each ordinary service. A thousand cubit feet of a deadly poison is exhaled into the place, and if there were no ventilation at all, the whole of the congregation would be suffocated before the service was over, for 3 per cent. of carbonic acid would soon be fatal. Each person uses up 16·6 cubic feet of air per hour, and to keep down the level of carbonic acid to its natural standard, 100 times that quantity of fresh air is required to be admitted for each individual. Dr. Parkes calculated that 2,800 cubic feet per hour per individual of fresh air was necessary to effect this object, besides the quantity required for the supply of gaslights, which may be used, and which are used, in most places of public assembly in the way which is most likely to damage the health of those exposed to its influence, viz., by naked burners. The thousand people required 3,000,000 cubic feet of fresh air each hour to keep the poison within the natural limits, and at least half that quantity to keep it within the safe amount. Is there any architect in the kingdom who provides this, notwithstanding Mr Street's self-satisfaction as to the capacity of the profession to do wonderful things. Is there any architect in the kingdom who ever considers the subject from this extreme point of view? The result of this neglect is the establishment of draughts, which the shortsightedness of people generally will not permit. They prefer to be poisoned by an anæsthetic painless process, rather than submit to discomfort and possible pain, but also to a diminution of danger. There is another result which follows from close packing; each person is a furnace which tends to raise the temperature of the place in which the people are assembled to a point as near to 98·5 as the assembly will permit. This is a law established by Providence to prevent suffocation, for as soon as ever there is a rise in the temperature of the air within the room, there is an immediate effort made by the outer air to bring it to an equilibrium again. The higher the temperature the more rapid the movement of the outer air to get in, and the more decided the draught. There is at once a cry on the part of those exposed to the draught to close the aperture, and to check the benevolent designs of Providence, when the real indication which is afforded by the draught is that more openings are wanted. Selfishness, however, obtains the victory, and the offending opening is closed with the certainty of greater injury being inflicted upon all the occupants of the room than it was possible for the draught to effect. It ought to be an established rule for architects to provide entrance for fresh air as well as exits for foul air, which shall correspond with the number likely to be present in the building, and we ought to call upon all those who have the care of places of public resort for an intelligent supervision of these means; so that it shall not be left to an ignorant attendant to regulate the ventilation of a place on a cold night, and not alter it as temperature rises within or falls without. Each of these conditions ought to be watched, and provision made according to the requirements of each place; and until they are considered by architects on the basis I have mentioned, it will not be possible to prevent people assembling in numbers, to some extent, from poisoning each other; whilst as to our dwelling houses, when the public understand that pain is an evidence of some wrong conduct on our own part, induced it may be by regulations for the prevention of the ingress of fresh air into the house we live in, we may hope to get some alteration in present methods of ventilation. Architects will then see that provision is made for free ventilation which shall not be destroyed by imperfect design. They will then not obey the wrong instincts of our nature by trying to shut out that vivifying influence which air frequently renewed can alone afford.

Time will fail me on this occasion to say anything upon the important subject of educational training.

Quis custodiat custodes will especially apply to this part of our subject. Until we are able to remove some of the pernicious influences which re-acts upon our people from the leaders of fashion, and those who trade upon our foibles and our vices, the work will not be easy. There will be great difficulty in counteracting their effects.

It is to those who guide public opinion among the denizens of Society that we must look for reform. Whilst distorted waists and high-heeled boots are encouraged in the fashionable world, and winked at by the educated, Science will be comparatively helpless. Let those who have to form the minds of our aristocratic youth of both sexes keep the fact in view, that they may influence, for good or for evil, the future of our race by teaching the children of a noble family that health is a primary consideration which may belong to the rich as well as to the poor, if they will only obey its laws, and follow its directions; but that lungs impeded in their actions, or spinal columns bent out of shape, distorted feet, or appetites indulged, will prohibit its enjoyment for any length of time, whilst as regards mental training it must be borne in mind that there is something to be done besides cultivating brain energy, and a power to pass a given examination; that muscular is as necessary as theological Christianity, and that God will be best served by our obeying the laws which he has implanted in the substance of matter, as essences which belong to it, and that mind is only a moiety of the whole, which is capable of being influenced by mental and bodily culture in a wrong as well as a right direction.

Dr. TAAFFE said but few words would be required to secure Dr. Carpenter the very hearty congratulations of those present for his able address. It was said that no prophet had honour in his own country; but if they went to Croydon they would find that Dr. Carpenter's work is greatly appreciated there, and that he is a prophet who is honoured in his own country. The work of such men as Dr. Carpenter, Dr. Richardson, and Mr Chadwick is of the utmost value, and would fully compare with the achievements of Sir Garnet Wolseley at Coomassie, or of General Roberts at Cabul. (Hear, hear.) While, however, men in the Church, the State, and the Army obtained public honours and rewards for their services, the only reward such men as Dr. Carpenter obtained was the satisfaction they derived from their own approving consciences. He therefore called upon them to express their hearty approbation of the address of Dr. Carpenter.

Mr HENRIQUEZ, in seconding, referred to the great abilities of Dr. Carpenter, and said that at none of the meetings in connection with the Congress was it likely that they would hear another address of such brilliancy and so full of instruction, or one that would afford so much satisfaction.

Dr. RICHARDSON said he could not convey to them how grateful he was for the fact that Dr. Carpenter had backed up what he (the speaker) had said in his opening address on Tuesday night, namely, that the worst of all policies would be to endeavour to put out the old diseases of mankind by introducing new diseases, instead of going to the very bottom of the matter and beginning there. He was also struck with Dr. Carpenter's observations in regard to the houses of the poor,—that, in many cases, the imperfection of their houses, which were unable to keep out the passage of fresh air, was their great protection from disease. As illustrating the importance of fresh air in coping with disease, he mentioned that some years since Dr. Barker, brother of Dr. Barker, of Brighton, was called to attend some poor families living in a small village in Bedfordshire, who were suffering from typhus fever, and at once, on his own responsibility, had a hut or shanty erected in a field. The patients were transported from their home thither, where they were freely exposed to the fresh air, with the result that every person so treated made a good recovery. (Applause.) Those who were engaged in the field of sanitary work did not find that it led to decorations and honours, the only thanks they got being the thanks of the audiences who heard them. As an example, he might refer to that Nestor of Sanitary Science, Mr Edwin Chadwick, who was yet undecorated, though his whole life had been a life of devotion to the cause.

Dr. Carpenter, having acknowledged the vote of thanks which had been accorded him, said there was a paper down in the name of Sir Antonio Brady, on "The Prevention of Smoke." Sir Antonio, who had manifested great interest in the Congress, died somewhat suddenly on the previous Sunday. His life, too, had been devoted to the public service, and he died while he was thinking about the work he proposed to perform at the Congress, and within an hour from then the remains of Sir Antonio would be conveyed to their last resting place. They would not, however, through that sad event, lose his labours, as the paper had been forwarded for the Congress. He would ask General Alexander to read the paper which was all but finished when the hand of death took possession of its author.

[After the reading of the paper, the President of the Section read a letter from the late Sir Antonio's son, Mr Nicholas Brady, referring to the paper, and to the importance attached to it by the family of the deceased, as being almost the last sentences written by him before his death. Dr. Carpenter said that at the General Meeting of the Associates, a vote of condolence with the family would be proposed, and under the circumstances, it would be better not to take anv discussion on this paper.]

PREVENTION OF SMOKE IN FIRE-PLACES.

By Sir ANTONIO BRADY.

The subject of the Abatement of Smoke with the view of purifying the atmosphere of London, and lessening the deleterious effects and character of London Fogs, and indeed those of all towns, has been vigorously taken up with the happiest prospect of success.

A report on the existing state of the law in regard to Smoke, and on the machinery for bringing it into action, is published in the Preface to the Catalogue of the International Smoke Abatement Exhibition, which was opened at South Kensington on the 30th November by the Lord Mayor of London.

The Exhibition is held under the patronage of the Royal Family and many of the most distinguished Lords, Ladies, and Gentlemen in London celebrated for their patriotism and scientific knowledge. It owes its origin to a joint Committee of the National Health and Kyrle Societies.

The wish of the Committee being to carry out the desired objects with the least possible friction with any interest, and with the largest possible assistance and co-operation from the manufacturers, who were large consumers of coal, and, *at present*, large producers of smoke, the Committee proposed to undertake trials of various descriptions of Fuel and Apparatus for the purpose of lessening the generation of Smoke. At present there was a great loss of coal by the way in which it was consumed, or rather attempted to be consumed, by imperfect or ill-constructed furnaces.

At a Conference of the Fog and Smoke Committee of the National Health and Kyrle Societies with manufacturers and others, held November 25th, 1880, the Chairman (Mr Ernest Hart) said that Sir Francis Knollys' estimate was that, out of five million tons annually consumed in London, more than two millions were wasted. Captain Douglas Galton, C.B., expressed it as his opinion that in manufactories there was nothing like that proportion suggested by Sir Francis Knollys, but that in domestic consumption he believed the loss to be quite as great as that quoted, viz., from two to three-fifths.

He said the smoke question was a very large and difficult one, which could not be met by legislation, and required the co-operation of the whole community. Every new fire-place introduced into a house should be one which would assist in the economical consumption of fuel and the prevention of smoke, for then by degrees they would have a system which would relieve London of one of its greatest curses.

Mr Flannery, M.E., could not sufficiently emphasize what Capt. Galton had said—that the subject should be divided into two branches, (1) the consumption of coal for steam purposes under boilers, and (2), what was a much larger subject, the consumption of coal for housekeeping purposes under grates.

He would remind the meeting that Professor Rankin, than whom no higher authority on combustion existed, stated that in "every steam-engine the amount of heat contained in the coal was at least ten times greater than the work produced." The production of smoke was the consumption of fuel. The smoke if properly combined with air would ignite, but if not, wonld go up the chimney in waste and poison the atmosphere. It was possible to do away with the production of smoke. He had himself made alterations in boilers which effectually consumed the smoke.

Another meeting, called by the Committee, was held at the Mansion House on January 7th last, was a large and influential one, and the speeches were most interesting. I have only space to quote a most telling fact related by Mr Alexander Fraser, of the firm of Messrs Truman, Hanbury, and Co., brewers. The result of one such fact is of more worth than all the theories on that subject, and I quote his statement in extenso. An independent examination of the books by a member of the Smoke Committee thoroughly corroborated it. He referred to the experiments his firm had made with a view to the prevention of smoke prior to the 1853 Smoke Act. He said by care and by the use of furnaces which had been daily in operation for nearly thirty years at their works, he might fairly say their chimneys were smokeless—indeed, no smoke at all came from them, except a trifling quantity on first lighting the fires or in "banking" them down. They used ordinary bituminous coal, and while benefiting their neighbours, they had saved themselves some £80,000 by the more economical consumption of coal.

Similar evidence has been lately publicly stated in the *Times* and other leading journals, both in London and in the Provinces, notably from Yorkshire, by the Messrs Fielden, and from the Potteries by Messrs Minton. It is obvious, therefore, that it is to the interest of manufacturers to conform to the law, and it will be no longer possible for any Local Authorities to excuse themselves for not putting the law in force, on the false assumption that smoke from furnaces is a necessity which it is impossible to prevent.

The committee proceeded to make arrangements, by the permission of Her Majesty's Commissioners, for the Exhibition of 1851,—of the Lords of the Committee of Council on Education, and of the Council of the Royal Horticultural Society,—for the Exhibition of improved Fire-grates, Furnaces, Kitcheners, Cooking-stoves, Warming and other apparatus of all kinds devised to prevent smoke, or to consume smokeless fuel, to be held in the buildings erected for the International Exhibition of 1862.

To keep the subject fully before the public mind and to report progress, a meeting was held at Grosvenor House on the 26th July, at which there was a large and influential attendance. Amongst those present were H.R.H. Princess Louise, Marchioness of Lorne, thus showing the great interest taken by our Royal Family in the movement. The report of the joint Committee which was then presented stated that "the present endeavour to reduce the smoke nuisance is *not* directed, as all previous efforts have been, exclusively to suppress the smoke from factories, bakehouses, and other industrial works, but it aims at reducing the smoke from *all* sources, including dwelling-houses.

It has been conclusively shewn at the meetings and by lectures and papers that the *unburnt* particles, carbon and gases, given off by the million chimneys in the Metropolis are the chief noxious ingredients of the Fogs of London and of all large towns. Their prejudicial effect on plant and animal life is notorious; after only a few days of London fogs the death-rate is largely raised—in some East-end parishes more than *doubled*. All diseases of the respiratory organs are intensified, and not only is the death-rate increased, but there is an enormous increase of sickness and of physical suffering. A great part of this may be materially mitigated, if not wholly removed, by better enforcement of the law.

In such a health resort as Brighton, where there are no foul chimneys belching forth dense volumes of black smoke, such as there are unfortunately for the inhabitants of West Ham, Essex (where I live), and the Black Country, yet—through the increase of this beautiful town—complaints are beginning to be made of the increase of smoky fogs. It is to be hoped that, by the use of the means for lessening the smoke from Domestic fires, damage to our London-by-the-Sea as a health resort may be prevented.

A marvellous fine collection of furnaces and grates and appliances of all kinds has been got together at South Kensington; of which it was said in one of the leading London Journals of the 2nd December: — "It is the first great educational movement for enlightening the nation on the smoke abatement question, and it is to be hoped that the lesson will be taken to heart, and profited by."

It would ill become me to call attention to any particular exhibit before the committee of experts have reported and awarded the prizes; but this I will say, the exhibits are far in advance of any previously exhibited, especially the domestic kitchener stoves for economising fuel and preventing smoke.

I went with the energetic secretary to Paris to see what we could find there that would be interesting for our Exhibition, and we were enabled to induce our scientific neighbours to enter the lists, and to give us the benefit of their experience One exhibit we saw there is now in operation in our Eastern Arcade. I hope and believe this invention of Mr Dowson is calculated to lessen the use of coal for heating and driving machinery, through the decomposition of water as a means of generating gas. You all know that water is only two gases in combination,—oxygen and hydrogen,—but their affinity is so great that it has not hitherto been found practicable to separate them, except at such cost as has rendered it commercially impracticable. The inventor of the apparatus I allude to seems to have solved the difficulty. He is making Hydrogen gas from water at a cost of 3d per 1,000 feet. You need none of you to be told that pure Hydrogen gives intense heat,—but little light. It is, therefore, at once available for heating purposes and driving machinery, and I do not despair that our chemists will soon find a cheap mode of making it luminous.

Certainly one of the most distinguished physicists and inventors of our time, Dr. Siemens, looks forward hopefully to a not very distant day when raw coal shall no longer be burned in our factories or houses. In the South Kensington Exhibition his Gas Coke Stove is shown, which, even at the present price of gas and coke gives more economical results than any coal fire. Other forms of gas stoves are also exhibited. The fire-places at present in use need not be changed, but can, at a small cost, be altered to meet Dr. Siemens' system, which he strongly recommends for its efficiency. He is not pecuniarily interested in it. Gas firing has many advantages in its favour in point of convenience, and with the prospect of coal gas becoming cheaper, and the Dowson gas coming into larger supply, it is very desirable to pay close attention to this means of obtaining heat for our domestic purposes without smoke. The superior value of gaseous fuel was demonstrated in figures by Dr. Siemens in his lecture delivered in March, 1878, on the Utilisation of Heat and other natural forces.

I must now proceed with the second part of my address on Law in its relation to the smoke nuisance.

Notwithstanding the beneficent provision of the Public Health Act, the nuisance has grown up in our day to be the gigantic evil it has now become. The report, which is referred to at the commencement of this paper, shows that the Smoke Acts relate only to factory chimneys, and "that there is no law prohibiting the production of smoke for household purposes, except so far as a particular chimney or fire may, by reason of the smoke, become a nuisance to others. Such cases might arise and be dealt with under the ordinary law of nuisance, as in the case of the obstruction of lights, but there is no Act of Parliament dealing with domestic fire-places." The factories, doubtless, make the most dense smoke, and those who have the misfortune of living in West Ham, Sheffield, or the Black Country, know this to their sorrow. But there is, no doubt, that, in the aggregate, the million or more domestic fires in London do an immense amount of mischief. Therefore it is that the Smoke Abatement Committee are very proud of the splendid collection of improved grates and stoves for domestic use. It is an old saying that when things are at their worst they sometimes mend. Now that public attention has been aroused to the fact that smoke is not a necessity to a manufacturing community, and, thanks to a great International Exhibition, it has been fully demonstrated that there are many cheap and effective means of avoiding the evil, it will no longer be possible for Local Boards, however apathetic, to plead in excuse for not putting the law in force that it is impracticable and that smoky factory chimneys are a necessity. A desire, through ignorance, to prevent interference has fostered this opinion.

So far back as 1855, my old and esteemed friend, the veteran and honored Sanitary Reformer, Edwin Chadwick, C.B., did much to reduce the smoke and other nuisances in London. I received, a few days ago, a letter from him which I have his permission to quote, which is very interesting as showing the mode in which he then proceeded:—"East Sheen, Mortlake, Nov. 28th, 1881.—In 1855, I had to take steps for the execution of Lord Palmerston's Act, for the suppression of the smoke nuisance of the large manufacturers in the Metropolis. I sent a circular to all the manufacturers known of smoke-consuming furnaces, and asked them for lists of the manufacturers to whom those furnaces of theirs had been supplied. We then sent to the manufacturers who used them, to ask their experience and what of the promised economy of coal had been effected. We got lists of some 300 of the users of furnaces of that character. But, out of that number, I found that there were only 90 who had given attention to the results in the saving of coal; and the mean result of the experiences of the 90 was that the saving was 17 per cent. I do not remember the range of this mean. The variations of result from good or bad stoking were very great indeed.

"It was with the police to watch the working of the Act. The complaint of the policeman, that smoke was being emitted, was information to the manufacturer that his coal was being wasted by the stoker. The difference between careful and careless stoking was enormous. It was, and I believe now often is, as much as 50 per cent.

"What I would have done would have been to attach to the police a specialist, conversant with the subject and the best means of prevention, to go to offenders and give them instructions as to what they might do, and what they might save by obeying the law. I got this done with success with some other nuisances than smoke nuisances. Offenders were grateful for suggestive admonition."

We do not want more stringent laws, but a more easy and ready mode of enforcing them. Let us glance at the causes which have led to the failure of the permissive legislation in this matter. As a free-born Englishman, I prize as an inestimable blessing local self-government, but there are certain functions of it which are of imperative and Imperial importance, which can only be fitly controlled by the Government. Having settled in the Public Health Act, 1875, what are nuisances, I venture to hope in any future legislation, instead of the permissive word "may," the word "shall" may be used, not leaving it to the discretion of Local Boards, many members of which are the greatest offenders against the law. It is contrary to reason and common sense to expect them to enforce it.

In any new law, I trust that Officers of Health and Inspectors of Nuisances may be appointed and paid by the State, so as to be independent of local ratepayers. I have come to this conclusion through having suffered by living where the evils I have depicted have grown up around me, with no power to prevent the mischiefs I deplore. The classic ground known as "London over the Border," since I have lived in my present house, was a charming rural suburb, inhabited by some of our merchant princes and even nobility, the whole population being then under 10,000. It is now a flourishing town of more than 130,000 inhabitants, and the population has totally changed. It is for those who cannot help themselves, as well as for myself, that I plead for an alteration of the law.

First, we owe this enormous flood of people into this neighbourhood to the construction of the magnificent Docks and Warehouses on the River front of the parish; but mainly to the care of the Metropolitan Board, who, having regard to the Metropolis under their charge, drove the filthy factories of Bow Common over the Border (River Lea) into West Ham, which is in the adjoining county of Essex. Here they have been encouraged to crowd, by being allowed full swing in defiance of all law and propriety.

In the Metropolis, under the Smoke Acts, the police put the law in force. Here we are under the Consolidated Public Health Act of 1875, by the 93rd clause of which the police are authorised to do the same. Why they have not been permitted to protect our health and comfort, as well as our property, I have yet to learn. I have always been told the reason is, that we are not in the Metropolitan area. Yet the K division of Metropolitan police is in charge of this district.

We have seen what magnificent results Messrs Truman Hanbury and Co. achieved by adopting the best-known appliances! Why does not the law compel others to do so likewise?

Dr. Alfred Carpenter, speaking on the subject in December last, said "there are many difficulties, because the members elected to serve on Local Boards are themselves offenders against the Act, and the power to proceed against the manufacturing offender should be placed in the hands of a Public Prosecutor, and should not be left with the Local Authority, who, as at Bow and Stratford, allow the law to be a dead letter, because if enforced it would be upon the members of the Local Authority, or upon their friends, that it would have to be levied.

HINTS FOR HOME SANITATION.

By H. H. COLLINS, F.R.I.B.A.

A disciple of Gallen, in order to emphasise and prove his case against a defendant, served him with notice to produce the prescriptions which he had written for him during his illness. The defendant *not only* brought these into Court, but *likewise* the bottles and pill boxes which were their result. The jury returned a verdict for the defendant, adding that, in their opinion, the plaintiff might consider himself fortunate that the defendant had not taken the medicine prescribed, or they might, in addition, have had to find a verdict of manslaughter against him.

Some few years ago, a learned German doctor wrote in the pages of the *Times* that the secret of longevity was to be found in the partaking of lemons, beginning, say, with one per diem and ending with twenty. The *Times* devoted a leader to the question, and I recollect the pith of it was that there might be a great deal of truth in the theory, but if *life* could only be preserved through such a medium, query, was it worth having, subject to a perpetual stomach ache?

Now, these two anecdotes forcibly re-called themselves to my mind when I received, from our esteemed President a mandate, and a courteous request from Dr. Carpenter, to pen the jottings which I shall have the pleasure of addressing to you. The morals which I drew from them were these:—1st, that it was of no use to saturate a Congress of this kind with a display of too much learning, or to tender too much advice, which, instead of producing the desired effect, might have quite a reverse one; and, secondly, that if too large a number of remedies were suggested, you might consider that life, with such precautions, was scarcely worth living for; in fact, "That the remedies were worse than the diseases."

Under these circumstances I have simply jotted down such every day matters connected with home sanitation as may be easily recollected, and as easily applied. I have avoided all technical and long-sounding verbiage, and have acted on the judge's advice, to give the results of experience without stating the reasons for them. As I speak in the presence of many who can correct my assertions if they be wrong, I may, without egotism, ask you to take the hints which I propose for your acceptance as correct, if they be not contradicted.

AMENITIES OF RESIDENCE.

Although we cannot always select, yet we can all discriminate with regard to the amenities and surroundings of the locality of the house we intend occupying. Given a certain number of residences from which to determine, we may choose *that one* which, from various reasons, is the one most free from objections, and which possesses the fewest defects. For example, we may endeavour to avoid a too crowded locality, one surrounded by narrow and ill-ventilated streets, alleys, or lanes, the devitalized air of which would be sure to prejudice the one we are about taking. We may give the preference to a detached or semi-detached house, well bathed in air, to that of a terraced house, cribbed, cabined, and confined. We may choose between two sides of a street, so as to obtain the best aspect, say a south or south-westerly one in lieu of the other points of the compass. We may select a gravel, loamy, or well-drained sub-soil in lieu of a damp, ill-drained clay one; and we may carefully refrain from dwelling in a house the foundations of which rest on fœtid débris or former dust receptacles. We can easily ascertain if illness has been prevented in the locality. We can see if roads are made and with what materials, and we can easily ascertain if the same have been "taken to" by the parish, sewered, lighted, and supervised by competent responsible authority.

Before entering into the occupation of any house, we may protect ourselves against the incalculable evils arising from bad drainage or roofs not watertight by obtaining a verbal or written assurance that the same are perfect, and the house consequently fit for habitation. It would be advisable to secure such a guarantee in writing, or to have such assurance given in the presence of witnesses.

Quoting from the judgment of Mr Baron Pollock, it will be seen that if such assurance is given, ignorance or carelessness upon the part of the landlord will not excuse him:—"If persons take upon themselves to make assertions as to which they are ignorant, whether *true or untrue*, they must in a civil point of view be held as responsible as if they had asserted that which they knew to be untrue." Mr Justice Kay, in another judgment, said: "Now what is enough in law to make a man liable for an action for deceit? It is enough that either he knew the statement he made was not accurate, or he made it recklessly, without having knowledge about it one way or the other."

Lastly, with respect to exterior considerations, we should give the preference to that house which has the thickest walls, the greatest amount of light, and appears to be the most substantially constructed, carefully avoiding being led away by a showy exterior,—however picturesque or overlaid with (too often) meretricious ornament,—for most of these so-called advantages are the means of retaining dampness, garnering filth and dirt, and preventing the escape and evaporation of the natural humidity of our climate.

The *dust-bin* should not escape our notice. We should take care that it is so positioned as not to prove a nuisance, properly ventilated, and moved as much away as possible from any of the ingresses to the house. Nothing but dust and ashes should be allowed to be placed in it; vegetable and matter liable to decay should be burnt each day.

INTERNALLY.

The first consideration with regard to the interior of the house is its sanitary condition. Assuming that its external drainage is guaranteed and perfect, we must carefully see that there does not exist any connection with the main sewage and the house proper. This is not difficult,—see that the waste pipes from the sinks are open at their ends and pass outside; also that the overflow pipes from cisterns are similarly treated. A simple plan for keeping waste and overflow pipes clean is to obtain a cane and bind round its end a piece of rag or sponge, wet the same and pass it up the pipe once or twice. See that sinks are placed against external walls and under window openings. Ascertain the position of w.c.'s; if situated in the centre of the house, give the preference to that house where the conveniences are positioned against an external wall, and lighted and ventilated from the outside; recollect that w.c.'s off staircase landings are the best.

Take care that the w.c.'s are supplied from separate cisterns, so that no communication exists between the drinking water cistern and themselves. This can easily and economically be effected by interposing a small waste-preventing cistern if it be necessary.

See that the soil pipes are of lead, and carried up their full bore above the roof, away from all windows or other ingresses to the house. It is an ordinary practice to make common light cast iron rain water pipes serve both for soil and rain water. This should not be permitted, but if the landlord objects to substitute lead for iron, then take care that the joint of the iron pipe is carried up above the gutter as just mentioned, and a branch put in thus to receive the rain water.

In any such arrangement it is essential that the soil pipe be exterior to the house. If possible it is very desirable that an open trap, "Pott's Edinboro' or Buchan's," should be inserted at the feet of these soil pipes.

Pan closets should be avoided; simple earthenware Hopper closets are much preferable, and more economical in first cost. If safes or trays are placed under w.c.'s take care that the overflows therefrom pass direct into the open air.

Let me recommend you to always close down the flap of the w.c. every night, shut the door, and slightly open the window, and once or twice a week to have the basins washed out with dilute spirits of salt; there exists no reason why the basin of the w.c.'s should not be as clean and the water as pellucid as that of a drinking fountain.

Ascertain the position of the cisterns; these should be accessible so that they may be cleansed out frequently, for if placed in roofs, under stairs, or jammed into sculleries they soon become neglected and sources of disease; all cisterns should be covered. All drinking water should be boiled and filtered, and if charcoal be employed as the filtering medium the same should be renewed at frequent intervals.

If a bath forms, as it should do, a portion of the fixtures, take care that its overflow and waste pipe discharge into the open air, and I should advise that means be taken to carefully shut off draughts by placing indiarubber seatings between the wood and metal work. (The same observations apply to w.c.'s). Similar remarks apply to all fixed lavatories, slop sinks, &c., which should always be placed next external walls, and not in the centre of houses, where they are most productive of prejudicial effects.

GENERALLY.

Let your preference be for that house which has an amplitude of light, free from dark and unventilated passages; cupboards, closed drawers, nooks, and corners are not always the conveniences they appear to be; they form, as a rule, receptacles for all the neglected dirt of a house to congregate in, and are fruitful sources of danger. Every housewife will recognise, sooner or later, that by exposing to the full light of the day the pots, pans, and household requisites, she will be better able to preserve them clean, and what is equally necessary, *whole*, unbroken and fit for use.

Never use as a bedchamber an apartment without a fireplace, for here it is "that the death of each day's life" occurs, when vitality requires all the assistance which can be afforded to it.

Ventilation is of vital importance to the hygiene of house and occupant. Guard yourself against the inconvenience and annoyance of smoky chimneys by special agreement with your landlord; but a smoky chimney is better even than having none at all.

A simple and cheap means of obtaining ventilation without draughts is the insertion of a board about 3in wide between the bottom rail of the sash and the sill of the window, but if you can obtain from your landlord fireplaces having hollow chambers formed round the same, so that in winter air may be admitted in a warmed condition, and in summer in a cooled state, so much the better; many such are to be seen in your Exhibition.

I have hitherto spoken of the admission of pure air, but it is equally, if not more, necessary to extract, or, at least, to allow egress of, the foul air. This can be readily obtained by means of Sheringham's ventilators, Arnott's valves and contrivances of a like nature being inserted in the outer walls or in special flues in the chimney breasts, and at very little cost.

It is very desirable that all halls and staircases during winter should be warmed; a good gas stove will, if there be no other way, be a simple means of procuring this, but *never* adopt gas as a heating medium unless the stove or apparatus is furnished with a flue to permit of the escape of the impure air; nothing can be more dangerous to health than the neglect of *this hint*.

Attention should also be given to the state of the gas service; it should be examined and tested with a taper to see if there be any escape.

As regards the appropriation of rooms, of course this depends on the class of the house, but as a matter of common sense, and consequently of sanitation, there is no difficulty in any class of house to select proper aspects for each apartment, bearing in mind the purpose for which they are to be devoted, thus:—The dining room, as probably the least used room in the house, may have a northerly aspect; the sitting and drawing rooms, southerly and westerly; the kitchens, westerly; larders, &c., northerly; nurseries, the same as sitting rooms, and so forth, so that the largest amount of health and enjoyment may be extracted from even an ill-planned and ill-arranged dwelling.

One hint more with regard to the house and its belongings, worth all the rest; do not imagine that when structure, drainage, water supply, and the various appliances appertaining thereto, are left in perfect condition, that they will always remain so, and that, unlike every other production, they will last unimpaired for ever, or even *that* period of *for ever*—a few years. If you desire health you must work for and deserve it; constant supervision to ensure great and continual cleanliness is essential; you cannot "nag" your domestics too much on this score. Whether the house be large or small, whether it belongs to peer or peasant, you cannot be too watchful if you wish to preserve it as a pure wholesome dwelling in which to live, instead of to die in.

This is a duty you owe to society quite as much as to yourself bearing in mind that public sanitation is mainly, if not entirely, dependent upon private hygiene, and that the law declares in unfaltering accent, "Sic utere tuo ut alienum non lœdas." That people *must* make use of their own property in such a manner as not to injure that of others.

FOOD.

But there are other hints equally necessary to glance at, such, for example, as food. I am afraid, as a rule, it is exceptional for the lady of the household to pay that attention to the kitchen department which was the honored custom of the last century. In aristocratic families the duty devolves on the housekeeper, who relegates it to her assistant, who hands it on to some underling. In middle-class life the cook, whether she be skilled or unskilled, reigns supreme.

In the less elevated classes an utter ignorance seems to prevail of dietary necessities. Goldsmith tells us that "Heaven sends us good meat, but the devil sends cooks," and if this latter gentleman have an existence I am sure a large proportion of my audience will be of the same opinion.

How *can* "good digestion wait on appetite and health on both" when the elements of the chemistry of food and cooking are absolutely unknown to the housewife? The hint here is to practically make yourselves acquainted with "what to eat, drink, and avoid, how much thrift may be engendered, how much household saving effected, how much good humour secured, and how much health preserved, by a little knowledge and some care given to this subject!" First, as in all *chemical* operations, absolute cleanliness is required in pots, kettles, and utensils. Due weight—this will not suit the butcher! Purity of concomitants—a wail from the grocer! Economy in their use—*warning from the cook!* The meat weighed and washed, the vegetables cleansed, salted, and soaked; the fish carefully examined and well cleansed; the cloths free from impurities; the knives, spoons, &c., clean and fit for use. Lastly, the result, a delicious meal, effected at half cost, productive of comfort and replete with health-giving properties.

Sanitation is so wide a subject, and embraces so much that is essential for the welfare and comfort of mankind, that "hints" might be multiplied *ad infinitum*, but I cannot conclude without calling your attention to one other matter of every day life, of equal importance with the other subjects to which I have directed your attention, namely, clothing.

CLOTHING.

Dr Max Von Pettenkofer, Professor of Hygiene at the University of Munich, writes:—"One of man's principal defensive weapons in his struggle for existence is his *clothing;* the place it takes in the history of civilisation, and its connection with physiology, are not often thought of; it is spoken of from a moral and æsthetic point of view; its main purpose is a purely *hygienic one.*" He adds that:—"The forgetfulness of this is to be deemed a great misfortune, inasmuch as small and frivolous considerations have subjected mankind to many ills, and have often acquired an ascendency over better and fitter hygienic clothing." The seeds of grave disorders and chronic illness are frequently—very frequently—promulgated by the neglect of well-known principles with regard to clothing. This is a large subject, and I would refer you to Pettenkofer's work, wherein you will find much instructive and interesting matter, but I would mention that he calls attention to the fact that we generally consider clothing as an apparatus for keeping air from us, whilst in truth we could not bear any garments which did not allow of a continual ventilation of our surface.

It is therefore necessary that we should make ourselves acquainted with those textures which, being most permeable, afford us the warmest clothing. It is not the densest, thickest, or heaviest material which is best suited for our purpose. My *hint* on this head is that, as our health is so intimately associated with the economy of our dress, you should begin to think for yourselves with regard to it;

emancipate yourselves from the tyrannical dominion of fashion, and study to obtain a deeper insight into those laws of clothing which will inevitably tend to increase the longevity of the community, and to enhance its comfort and enjoyment.

There are, as I have said, a host of other subjects connected with Domestic Sanitation, such as those relating to furniture, &c. On this head I would hint at the desirability of taking care that it should be of such form and character as to prevent the lodgment of dirt and dust; all hollows should be filled in and all unnecessary ornamental projections dispensed with; under any and all circumstances a continual application of *elbow grease* is very advisable.

Too much caution cannot be exercised with regard to various matters external to the house, but often productive of serious consequences internally, such as the selection of the laundress, charwoman, seamstress, tailor, &c. It is a *hint* worth attention if the lady of the house would visit, or at least ascertain, the character and surroundings of the homes and workshops belonging to these tradespeople before availing herself of their services. *Good* in countless ways would result from such knowledge.

As my pen writes these concluding observations, I seem to hear a murmur that I have quite lost sight of the remark with which I commenced this paper, and the question inevitably arises "That, since life can little more supply, than just to look around us and to die," is it worth the trouble of practically adopting the many hints laid down for our guidance? *Cui bono?* Has *ever* a people so lived, and, if so, with what results? My answer is yes, and with the happiest and best of results; results which were intended for all, and which all may attain. Without entering into any polemical disquisition as to whether the laws to which I am about to refer were of Divine origin or not, or whether they have been acted upon by religious or superstitious motives, there can exist no doubt, that they were wise and beneficent, if we judge *only* by results.

The laws embraced every matter on which I have lightly dwelt, —household, dietary, personal, sumptuary, and every conceivable sanitary question affecting the happiness and life of mankind; explained and amplified by the savants of the Jewish race, they have acted as their guiding star for over 5,000 years, and have preserved them in health through unexampled difficulties up to the present day.

Dr. Richardson, our esteemed President, thus writes:—"Facts show that, from some cause or causes, this race presents an endurance against disease that does not belong to other portions of the civilised communities. The resistance to those influences which tend to shorten the natural cycle of life is singularly instructive." He gives statistics which show that amongst infant mortality 10 per cent. die amongst Jews, and, amongst other denominations, 14 per cent.; that the average duration of the life of the Jew is 48, of others only 36; that one-fourth of the Jews live beyond 71 years, of others 59 years and 10 months; that the extracts from the Civil State papers of Prussia show a mortality of the Jew 1·61 per cent., as against the mortality of the whole kingdom of 2·62; that the annual increase of the Jews is as 1·73 to 1·36 amongst other denominations. He adds, the Jews escape great epidemics more readily than other races. The mortality of cholera, for instance, was so slight that the fact of its existence was even disputed.

He attributes the main causes to what he calls "soberness of life," thus interpreted by him—sobriety, better food, carefulness in the rearing of children, thoughtfulness for their aged and infirm, general care of their poor, and also of themselves. Whilst in no way disputing the conclusion which Dr. Richardson has arrived at, I venture to assert that most of these beneficial effects have been the results of continuous and unremitting attention to the sanitary and hygienic laws laid down by Moses and amplified by his disciples,—laws which, for the first time in the history of the world, proclaimed that "Prevention was better than cure,"—that the real science of medicine laid in the direction of prophylactic rather than therapeutic measures; that, by the laws he laid down—not as a monopoly for Jews alone, but open to all who desired to live by them (admittedly onerous, but undeniably efficient)—he *not only* prevented disease, but if, unhappily, it arose, he took all those measures which modern science has revived for stamping it out.

HOUSE INSPECTION.

By Professor FLEEMING JENKIN.

(*Communication read by the Secretary.*)

The points I would urge as established by experience are the following:—

1. The inspection should be experimental.
2. The inspection should be periodic.
3. The inspection should be made by a professional engineer who should have no interest in any expenditure he may recommend.
4. An inspection of this character can be efficiently and cheaply carried out by making use of the principle of co-operation.

Let me explain what is meant by saying that the inspection should be experimental.

It is commonly supposed that, to investigate the sanitary fittings of a house thoroughly, it would be necessary to rip up floors, tear down panelling, break open plaster, and lift the pavement of the ground floor. Householders prefer to run some risk of typhoid fever. With a more rational system of arranging the plumber's work in a house, the pipes could be readily inspected without this demolition, and it is heartily to be desired that architects would give their minds to arranging every pipe so that every yard of it can be seen with little trouble, and repaired without inconvenience. The first principle an engineer is taught in the drawing office is this,—every part of a machine must be readily accessible for inspection and repair. The water and drain system of a house constitute a large and complex system, but architects and builders have sadly neglected this condition of accessibility.

The sanitary engineer must, however, deal with existing houses as he finds them, and contrive experimental tests by which the fittings can be proved without being actually seen from end to end. When an old house is inspected for the first time, some disturbance and expense is almost necessarily entailed.

No inspection deserves to be called inspection which does not make sure that the house drainage system really is connected with the town sewer. To make sure of this, the ground must be opened between the house and the sewer, the drain broken into, the flow of the sewage from the house inspected, and the condition and structure of the drain examined. But, when this has once been done, it is easy to insert an inspecting man-hole or simple eye, with a lid easily removable, by which, on all future occasions, the necessary examination can be made with no disturbance and at no expense. Even the first opening of the drain need not involve any inconvenience, for the work can usually be completed outside the house. The inspecting eye or man-hole can be made use of for other experimental tests.

Then the second point of cardinal importance in drainage is, that pipes conveying drainage through any part of a house should be *watertight.* I shall be told that no pipe ever should cross a basement, so be it; but in old houses built in streets, with a sewer in front and water-closets at the back, the drainage pipes *must* cross the basement. We cannot avoid this defect of design, and must render it as little noxious as possible. This we can do by ensuring, at least, that the pipes shall be watertight. This can be tested experimentally. The whole network of pipes, up to a certain level, can be filled with water while the outlet at the inspecting eye is stopped with a clay plug. If the water does not sink, then the system is watertight. This inspection ensures the excellence of the underground channels, without disturbing a single paving stone, or interrupting the servants in their work for a minute. Experience has shewn, however, that no drains laid in old houses will stand this test. Builders are positively aghast when drains are specified which are to be subject to this test. They have to be told that it is the commonest test in the world as applied to pipes laid by contractors for engineers, before they will consent to undertake such a responsibility as keeping water in a pipe under, say, six feet of head or pressure. The builder has thought, until now, that if he provided an open channel with a sufficient fall, and with smooth joints inside, he had executed first class work. The fact that the joints would let sewage ooze out and gradually saturate the basement was not taken into account. We can, by experimental inspection, guard against this danger.

The third point in inspection I take to be ensuring that the system of piping throughout the house shall be *gas-tight.* No doubt, by careful ventilation and thorough flushing, the inside of drainage pipes may be kept moderately clean, but it will always be our duty to stop all direct communication between the insides of the pipes and the rooms of our houses. The sewer gas inside the pipes may be present in very small quantities, or may be of a very mild type, nevertheless it should not be admitted to our houses.

We can experimentally test the staunchness of the pipe system, by introducing some strong smelling volatile substance, such as paraffin or oil of peppermint. If this be poured into the pipes by a man outside the house, and if an inspector with a good nose goes over the house carefully, room by room, he cannot fail to detect the existence of holes in the piping when these exist. This third experimental test detects faults of design, faults of execution, and faults arising from decay. Often we find that some unforseen and unguarded by-path exists by queer cross connexions leading sewer gas straight into bedrooms or bath rooms. Often we find in this way dry traps leaving an unguarded hole. Often we find badly executed joints, where the soldering is so imperfect that a finger could be introduced into the gap. Often we find that work originally good has in course of time decayed, so as to leave numerous vents from which sewer gas can issue. It will be seen that this experimental test is really more searching than the much dreaded tearing down of panels and breaking open of plaster, which only becomes necessary when the existence of a defect has been proved.

In what has been said, small allusion has been made to the original design and arrangement of the sanitary fittings. The public are too apt to assume that sanitary inspection means, calling in one sanitary engineer to condemn what another sanitary engineer has just recommended, but if every house were perfectly drained and fitted with the best sanitary appliances, even then the inspection described in this paper would be necessary. We should still require to test experimentally whether

1. The pipes were choked.
2. The drains were water-tight.
3. The pipes were gas-tight.

This leads me to the second head of my paper—the inspection should be *periodic*.

It is not enough to call in the engineer and have all put in the best order once in a way. This is indeed very necessary in most cases, how necessary few know; but when it has been done, the inspection must be maintained; the case is quite analogous to that of a steam boiler. We must in the first instance provide ourselves with a good outside, designed by competent engineers, and experimentally tested; but we must also pay competent men to come year after year and examine whether any deterioration has occurred. I am continually told, when I press friends to join an Inspection association, "Oh! our house does not require it, our drains were all put right five years ago by Mr So-and-So," naming an authority of undoubted weight. My answer is, "You, my friends, are the very people who should welcome the inspector. You will incur no expense beyond that of mere inspection. I could understand your objection if you were in a very bad state, because inspection might involve you in great expense, might turn you out of your house for weeks while alterations were being made and so forth." Sometimes my friends are persuaded, and sometimes I find their excellent drains choked, their excellent lead pipes burnt through by lime, or cracked by settlements, and it is well worth while to pay an inspector a guinea a year to ensure you against these accidents, which have cost more lives than all the boiler explosions that ever have or ever can happen. The number of accidental injuries to pipes is great beyond belief.

In London we find about six per cent. of the houses inspected have their drains choked, so that the whole of the sewage oozes out into the basement, and over 30 per cent. of the whole show considerable leakage of sewer gas through faulty pipes when tested by oil of peppermint, nor do these things occur only in houses where there is some reason to believe defects exist. It is a common fallacy to suppose the inspector should only be called in when some danger or nuisance is proved. This is like calling in the engineer only after the boiler has burst. If every house in London were tested at this moment it is my conviction, based on experience, that the above proportions would be maintained—one in every twenty houses would be found not to be drained at all—the air in rooms of one in three would be found in direct communication with the town sewers, and this has little or nothing to do with faulty design.

The next point for consideration is, who shall make this periodic experimental inspection? Some say the householder himself. They contend that these tests are very simple and such as a man of sense can himself carry out with the aid of shilling handbooks. This may be true, but the man of sense never will do it. He has so many other engagements, and sewage is such an unpleasant subject, that he will not rout out manholes in the area, put his arm into traps half full of dirt, climb up under the slates to inspect cisterns, get on to the roof to pour down oil of peppermint—he will pay some one to do it for him. Moreover, "a man who is his own doctor has a fool for his patient." The same thing is said of law, and perhaps the same thing may be said of engineering. The amateur engineer does not command my confidence, even when dealing with drains.

Others say the inspection should be carried out by the town officials. In this I heartily concur, but while the law and custom are what they are this cannot be done. We find that for thorough inspections such as I recommend one man can undertake 400 houses per annum. In Brighton there are perhaps 16,000 houses, and therefore the town authorities should have 40 inspecting engineers to do what has been here recommended once a year for each house. In course of time the Medical Officer of Health will have these 40 engineering assistants, and the sooner the better, but it will not be this year or the next. Let us agitate for improved official inspection, and strengthen our argument by showing what can be done by private organization.

Some say the plumber should make the inspection. Many plumbers are competent to do so, some are not. Few at present carry out these inspections, and in my opinion they are not the proper persons; they have an interest in recommending alterations and repairs; the adviser of the household should be quite disinterested, and should be capable of inspecting work executed by the plumber. The best of contractors' work is better under inspection, and this we find by experiment is also true of plumbers.

We come, lastly, to the professional engineer or architect, as the proper person to inspect in the way suggested. He can not only carry out the tests described, but he is competent to give an opinion on the merits of the general arrangement of pipes in a house, on the design of the sanitary fittings, on the condition of the cisterns, and on the supply of water. All points of great importance, though they have been subordinated in this paper to the one question of *inspection*. That a well-educated disinterested professional man is the proper person to advise and inspect seems so clear that the only remaining point is to consider how to find such a *rara avis*, and how to induce him to undertake the work at such moderate rates as the average householder can afford.

This brings me to my last point, namely, that the experimental periodic inspection by a skilled disinterested man can best be obtained by making use of the principle of co-operation. When three or four hundred persons club together, they can, by subscribing three or four hundred guineas, pay a salary which will secure the services of a well-educated young engineer or architect of good standing. Between the ages of 24 and 30 the salaries in these professions do not run much higher than from £150 to £300 per annum, and this single engineer can, as has been proved in Edinburgh and London, inspect the 400 houses. This the Section must take for granted. On the one hand they may be told that one inspector of nuisances can thoroughly inspect sixteen or twenty thousand houses per annum, and on the other that no inspection is worth anything which costs less than fifty or a hundred guineas. Both statements, though somewhat less crudely put, are made with unfailing regularity at every meeting where this subject is discussed. I appeal to experience. For four years the leading doctors, bank directors, hospital managers, and householders in Edinburgh have tested our system of inspection. Hundreds, I may now say thousands, of houses have been inspected under it, and not one person who has had the inspection made has ever complained that the inspection was not thorough, and letters are continually received expressing the greatest satisfaction with the care given. The system is spreading in London, Bradford, Wolverhampton, and elsewhere. Liverpool, Brighton, and Plymouth are discussing plans for its adoption. The idea is no longer a speculation, but has been put to the test of four years' experience among the shrewdest of the inhabitants of these islands.

Not only does co-operation enable you to pay a man of your own to conduct these inspections, but it places his appointment in the hands of a local committee, under whose eye he works. They should be men whose names are a guarantee to the citizens that the appointment of the engineer is honestly made, and that his work will be honestly watched. Co-operation will do still more; it will provide a retaining fee sufficient to pay a consulting engineer of standing who will exercise such a general supervision over the executive engineer as to ensure the adoption of sound principles and the avoidance of all quackery. These are the principles which led to the establishment of the Edinburgh Sanitary Protection Association, and which I trust may lead to the establishment of a similar association for Brighton.

The one difficulty in starting local associations has been that of finding at the start a sufficient roll of members to justify the appointment of a resident engineer. In these cases the proper course seems to me the following:—

Let the inhabitants of a town like Brighton join a central association, such as that over which Professor Huxley presides, at 7, John street, Adelphi, London. Let a local committee of supervision be appointed to watch how the London officers do their work, and to promote the interests of the local members.

Whenever the numbers in a given town justify the step, let the local committee constitute themselves a council for a local independent association, appointing officers of their own.

In this way no pecuniary risk would be run. The London association is not a money-making society, and would be heartily glad to be the means of establishing the nucleus in successive towns of successive associations. The breaking off of each descendent from the Parent Association would be a matter of still greater rejoicing than the starting of a new affiliated branch. It is much easier to begin any work of this kind by degrees in each town than to create an independent and completely organised society from the first.

Unfortunately the system of inspection proposed only meets the case of persons who can afford to pay at least a guinea per annum, but if we can show what inspection is possible, and how great the need of that inspection is, we shall have neared the point at which inspection will become compulsory. No argument for compulsory inspection that has ever been brought forward has a tithe of the force of that established by the London Sanitary Protection Association, namely, that even among the better houses one twentieth part are not drained at all.

DISCUSSION.

Mr HENRIQUEZ remarked that the last read paper dealt with a fragment of a very extensive subject indeed. The subject necessarily fell within a department of health, and he regretted that there was not a public Government Department in connection with such matters. There was no greater good than the public health, and in the endeavour as far as possible to secure it, he thought some interference with private rights should be allowed. Such interference would mainly consist in the periodic inspection of all houses. He held that every inhabitant of a town was interested in the proper sanitary condition of every house in that town as much as in his own, and for that reason public inspection ought to be conceded. He hardly considered such an operation an interference with private rights, or more than they ought to expect. The Town Surveyor should also have the power to compel house owners to carry out the works shown by such inspection to be necessary. In regard to such work, he also thought that when completed a certificate should be given. Such a certificate in a town like Brighton would be of great service, both to their owners and also to casual visitors to the town. With regard to co-operation for obtaining sanitary inspection, as they had not at present the help of a Government Health Department, they were thrown back on voluntary effort and combination. Professor Huxley was at the head of such an institution in London, and the work done by that institution was, he believed, most satisfactory, though the institution itself was not so widely known as it should be. He would like to see a similar institution started in Brighton.

Dr. Roth, referring to the paper of Mr Collins and the remarks therein about dress, pointed out the progress made in public opinion by the Ladies' Association, which some twenty years since was very much reproached. He also referred to the Health Museum which some years since was established at the Pavilion, but which was, for some reason, afterwards discontinued, and thought it desirable that such a museum should be re-organised.

Dr. Tindal Robertson pointed out a practical difficulty to the carrying out of compulsory house inspection. It would, no doubt, be of immense advantage in a town like Brighton, but he believed that many lodging-house keepers would be unable to bear the expense of repairs which might be judged by the inspector to be necessary to be carried out. There was, he thought, not much chance of any real good being secured in that matter unless it were made imperative on owners of property to carry out the sanitary alterations found necessary by the inspector.

The President thought the papers had been of an extremely instructive character, and were worthy of a careful consideration. The points submitted by Mr Collins were such as should certainly be studied by persons about either to purchase land, or to take a house; while the suggestions made in Professor Jenkin's paper, as to how best to keep a house in sanitary order, were also excellent. There was one thing which he would particularly ask persons to consider, namely, that however well a system of sanitation might be carried out it would, in course of time, get out of order, and such matters therefore required continual and persistent inspection. With regard to a good deal of the work which was required, he thought it should be done by the local authorities.

HINTS ON DOMESTIC SANITATION.

By HENRY J. STRONG, M.D.

One of the necessities of life in this world is to live; we are bound religiously and morally to do our utmost to maintain a healthy existence. Unfortunately there are various antagonistic influences at work, always contending with us for supremacy, and what is often spoken of as "the battle of life" is something more than an idea. It is a fact!

It is only within the latter part of the present century that public attention has been directed to questions of sanitation, till Sir Wm. Jenner, and, subsequently, the late Dr. Murchison, pointed out the difference between them both as to their origin and symptoms. Typhoid and typhus fevers were presumed to be one and the same disease, and it is but a few years ago that it was demonstrated by Drs. Buchanan, Simon, and others that the germs of typhoid were communicable through the agencies of milk and of impure water.

We are also largely indebted to the teachings of many gentlemen, whose names are, indeed, in the list of Vice-Presidents of this Congress, and notably to yourself, *(Dr. A. Carpenter)*, who, by persistently advocating the principles of sanitary truths before public bodies and urging their adoption in practice, have been the means not only of saving many valuable lives, but of preventing a large amount of suffering.

In no town has the influence of the adoption of proper sanitary measures been more prolific of good results than in my own town, Croydon; for, whereas before sewers were generally established and a good and constant supply of pure water distributed to every house, Croydon had an unenviable notoriety, and its death-rate was over 28 per 1,000; at the present time, it is only 16, thus outvieing the most healthy country villages in England.

I cannot, with the limited time at my command, to-day advocate any startling proposition, and my subject has been more ably dealt with than I can pretend to do. I hope that the few hints I shall have the honour of bringing before you to-day may prove as interesting as the same basket of flowers in different hands might, with a diversity of arrangement, convey pleasing impressions under a new form.

The leading points bearing *upon* and necessary *for* the preservation of Domestic Health may, I think, be classified under the following heads:—

1. Water.	4. Sleep.
2. Air and Ventilation.	5. Exercise.
3. Habitation.	6. Cleanliness.

The most important factors in the preservation of Domestic Health are, undoubtedly, fresh air and pure water. One is subservient to the other; if the air be charged with noxious gases, we are in danger of being asphyxiated; if the water be loaded with organic matter, or even have surplusage of mineral ingredients which exist in all good potable waters, disease in various forms might arise. All the water we drink being derived, in the first instance, from the heavens, whether in the form of rain, river, well water, melted ice, or snow, the only consideration for us at the present moment is which form of supply is the best and and purest for domestic purposes. That which is derived from springs or deep wells, either below the chalk or other deep lying strata as olite, greensand, is, undoubtedly, the purest or most wholesome, because less likely to be contaminated with organic substances. At the same time, it must be borne in mind that at Lock Katrine, which supplies Glasgow, the water is chiefly obtained from the drainage of neighbouring hills. It should be, as a rule, colorless (although water, perfectly pure in other respects, may have slight colour if percolating through a peaty soil or geological strata), transparent, bright, palatable, of a uniform temperature. A very cold water is generally impure from an excess of nitrate of potash from decomposition of organic remains. The impurities of water are either mineral or organic, the latter being the more important and derived from the animal or vegetable world; the animal organic matter being highly prejudicial to health, and existing as albuminoid ammonia with more or less of free ammonia, derived from the decomposition of urea.

The method of supply, whether intermittent or constant, is of undeniable importance, and must in the course of a few years attract the notice of our legislators, inasmuch as the question of storage of water is intimately connected with it. If the supply that is drawn direct from the mains is constant, cisterns for domestic uses would not be required. They are not so frequently cleansed as they should be, and I have seen them with overflow pipes indirectly connected with the sewer, so that foul air from the sewer might under pressure be forced up and contaminate the water; in other cases, the drinking water was supplied from the same cistern which served the W.C.

On the Continent the wells are mostly shallow, or surface wells with cesspools in dangerous proximity. The water, therefore, contains organic matter, and should never be drunk without previous boiling. As this is not always convenient, a useful companion for travellers is a pocket syphon filter, made of a hollow block of charcoal with a tube passing into the interior, from which the water filters through the charcoal. All filters require frequent cleansing, otherwise they become foul, and they should be periodically taken to pieces if possible; if that cannot conveniently be done, a solution of Condy's fluid, acidulated with a little sulphuric acid (or oil of vitriol), should first be allowed to pass through it, followed by two or three gallons of pure water, with a small quantity of hydrochloric acid, commonly known as spirits of salts. Water from surface wells, that is to say, wells less than 50 feet deep, should never be used for drinking purposes.

FRESH AIR AND VENTILATION.

How important a part these play in our every day life and general welfare, all, who have felt the oppressiveness of a close ill-ventilated room, can duly appreciate; and yet how little is the value of a pure health-giving atmosphere estimated at its proper worth, or the science of ventilation understood, even in its most elementary form.

You are all aware that atmospheric air contains about 79 parts of nitrogen, 21 of oxygen, with a trace of carbonic acid 0·04 (4th-100ths) in 100 parts, and a small quantity of mositure varying with the temperature. The oxygen is the vital constituent, without it nothing animal or vegetable can possibly live. It is also essential to the production of light and heat, increasing and favouring combustion, omitting the electric light from our category. Of the use of nitrogen, but little is known unless, as one writer (Dr. de Chaumont) happily puts it, it is to dilute the oxygen, which, like wine or spirits, would be too strong to drink undiluted. Carbonic acid is more useful to plants than to man, as, whilst the latter exhales it, it is absorbed by the former. In these æsthetic days when sunflowers are rather sought after, it has been suggested that they should be freely planted in swampy places, from the power they have of absorbing

Carbonic Acid and malarious gases in a similar manner to the gum tree, the Eucalyptus. An adult human being at each inspiration and expiration exchanges 30 to 40 inches of fresh air on the average with each act of respiration, or 397 cubic feet per hour. In the sick room this quantity would be insufficient for self-evident reasons, the emanations, the breath, and other secretions from an invalid all render the air more impure, whilst the patient requires even a purer atmosperhe and more oxygen than in health, to counteract the debilitating effects of disease and the larger amount of Carbonic Acid which is given from the lungs. It is chiefly for this reason that the cubic space of a sick room should be increased by making it as bare of furniture as possible, all unnecessary hangings removed, and the floor dry rubbed or wiped over every morning with a cloth, as little wet as possible, to remove flue, fibres of different kinds, hairs, epitheleum from the skin, particles of soot, &c., which are always floating in the air, unseen unless made visible by a bright ray of sunshine penetrating into a darkened room.

More air from without should be admitted into bedrooms at night under ordinary circumstances than is usually the case ; it may be obtained by a window opened only the width of the sash bar at the top, or two Sheringham's ventilators placed if possible at opposite sides of the room, but communicating with the external air. The object of having two is that one can be closed if the wind is blowing strongly from that direction. In fact, any method by which a current of fresh air is admitted to the apartment is not only efficient, but very conducive to longevity. The occupant of the room rises in the morning feeling mentally and bodily better from the sleep having been more refreshing, with infinitely less liability to coughs and colds than if the bedroom had been less perfectly ventilated. The register of the stove should never be shut nor the fireplace closed by a fire-board, and let me here point out that it has been repeatedly proved by the highest authorities that impure air, more especially if coupled with bad or insufficient food and want of exercise, is one of the most fruitful sources of phthisis or consumption.

An adult man gives off from 12 to 24 cubic feet of Carbonic Acid in the 24 hours, whilst the skin and lungs eliminate 25 to 40 ounces of water in the same time. 211 cubic feet of air are required to maintain this moisture in the form of vapour.

De Chaumont points out that in an assemblage of 2,000 persons 17½ gallons of water would be given off from their lungs and skin in two hours, and nearly as much carbon as would be extracted from a hundredweight of coal. It cannot then be a matter of surprise to you that in a badly-ventilated and crowded church or concert room, the walls, more especially when covered by a non-absorbing surface, should run down with water.

Remember, too, that when the air of an occupied room contains more Carbonic Acid than six parts per 10,000 of air it is beginning to get impure and unfit for respiration, and that 3,000 feet of air per person are necessary every hour to maintain it (the air) at this standard of purity. It is also imperative in calculating the supply of fresh air required in an apartment to maintain it fresh and healthy to estimate the amount consumed by the artificial light. Two candles or one gas jet burning three cubic feet of gas per hour demand as many cubic feet of air as an individual.

THE HABITATION.

The choice of a house to live in depends so much upon a variety of circumstances that no rule can be laid down as to size, style, or how situated, but I would advise you to reject one with rooms in the basement; I will give you the reason bye-and-bye.

Cellars are to be preferred under a house, because they cause a current of air underneath the living-rooms; but see there is no grating connected with any drain in them, as, however perfectly it may be trapped, it is liable to get dry, and then sewer gas would escape freely into the house. The lower flooring boards should be not less than 3 to 5 feet above the earth, and the water line at least another 5 feet below that.

My objection to so-called breakfast parlours, which are built in the basement, is this: The ventilation is generally imperfect, the ceiling lower than that of any other room in the house, whilst the top of the window in the majority of cases is either below or very little above the level of the soil.

All malaria are most intense near the surface of the ground; bricks are porous, and permit either moisture or noxious gases to permeate through them, which cause a damp unwholesome smell when the room is shut up; if it be occupied after dark and the gas lighted, the room becomes hot and the heat draws into it any poisonous gas or miasmatic exhalation.

Drawing and dining rooms, if illuminated by gas, should have provision made for the exit of any products of combustion. Bedrooms should be thoroughly cleansed every week, and nothing placed in them which can be conveniently put elsewhere. They are very often made store cupboards for provisions of all kinds. The floor should be so carpeted that the carpet can be removed and shaken every few days, and, as before stated, there should be some means of keeping up a constant supply of fresh air in the sleeping room. When an invalid is in occupation, remove all superfluous drinking cups and glasses, &c., as soon as used, and import no more nourishment into the room than is required for immediate consumption. Gas should not be burnt in bedrooms; a common practice and a very bad one is to use gas as a means of warming the room before going to bed. All gas contains a large amount of sulphur; this absorbs the oxygen from the atmosphere, forming sulphurous acid gas, a very irritant and unhealthy vapour to breathe.

On leaving the bedroom in the morning, the bed should be opened and the bed clothes well exposed to the air, and the windows opened top and bottom. It is even most important that the top sash should be let down, otherwise there is a stratum of air between the head of the door and ceiling which is practically undisturbed, unless there is a current of air to force it.

Again, every bedroom should have a fire in it occasionally,—it removes damp, destroys mildew and fungoid spores, and, by creating an increased current of air towards the chimney, improves ventilation and consumes various organisms which are floating in the air.

Last, but by no means least in importance to health, is the position of the water closets—the better the dwelling the more numerous are they. They should never be built in the house, but always in the form of an annexe, the door from the closet leading into an anti-chamber or lavatory, with windows on both sides to allow of free cross ventilation. In a recent epidemic of typhoid fever, it was found that the cottagers of the district did not take the disease to the same extent as their richer neighbours, from the circumstance that the closets were disconnected from the house.

SLEEP.

Sleep has been the subject of considerable discussion and much original research, the theory being that during repose oxygen is stored up which is again consumed when awake, till mental and bodily exhaustion supervene and sleep is the result. Again, less blood is said to be in the interior but more on the exterior surface of the brain, so that it is essentially in a bloodless condition, and this seems to be the view taken by recent observers. To be refreshing and salutary, it should be profound and free from dreams, though these are often determined by some accidental circumstance to which our attention has been directed during the day. The amount required varies with the temperament of the individual who can by force of circumstances greatly regulate the time necessary. Old persons and young children require more rest than the middle-aged, and sleep taken before midnight is much more beneficial and refreshing than the same amount would be after, and the length is not of so much importance as intensity and calmness.

CLEANLINESS.

There is neither time, nor would it be desirable, to enter into the question of the physiological action of the skin. It will be sufficient for us to know that it is an important excretory and absorbing organ, that by it a large amount of aqueous fluid containing certain elements in solution are eliminated from the body by the sudoriforous or sweat glands, the average number of pores in each square inch throughout the body being about 2,800, and it materially assists the kidneys and lungs by the excretion of urea in the one case and carbonic acid gas in the other. In addition to its power of increasing the deterialization of the blood, it will thus easily be understood that there is a vital necessity for keeping the surface of the skin clean by the daily use of a sponge bath or frequent ablutions, especially with soap, to get rid of the fatty constituents of the perspiration.

EXERCISE.

In the most limited acceptation of the word implies muscular activity, but a much wider interpretation is admissible, for by it carbon is eliminated from the lungs, the functions of the skin are increased, animal heat is maintained, a large amount of oxygen is stored up, the muscles themselves are increased in size and tonicity. No form of exercise is more convenient to every person and none perhaps more conducive to health than moderate walking in the open air daily repeated. Men and boys have their outdoor amusements in cricket, rowing, and athletic games, but till the introduction of lawn tennis girls were sadly in want of some games requiring muscular energy. The arm of the housemaid is frequently of a better shape and form than that of her young mistress. One has her daily duties which induce action of the muscles, whilst the other employs a large part of her time in occupation of a sedentary character.

CONCLUSION.

In concluding this paper, I cannot do better than quote the words of Mr Simon, late Medical Officer to the Privy Council :—" It is to cleanliness, ventilation, and drainage, and the use of perfectly pure drinking water, that the population ought mainly to look for safety against nuisance and infection ;" and, in the words of another writer, " No better Christian work can be done than the propagation of such knowledge as will carry a firm conviction to the minds of the people at large, and give them such warnings and instructions as may secure the mitigation, if not the extinction, of infectious disease."

DOMESTIC FILTRATION.

By EARDLEY F. BAILEY-DENTON, C.E., B.A., Oxon.

It would appear at first sight inapposite at Brighton, where there is a constant supply of pure water at high pressure, to address a Congress brought together to promote public health on the subject of Domestic Filtration; inasmuch as, under the favourable conditions here prevailing, no such filtration is required, unless it be in those cases where accident, or other unlooked-for causes, have temporarily interfered with the efficacy of general service.

I would, however, premise that the deterioration which a constant supply of water, pure at its source, may undergo in delivery from such accidental causes, may be readily rectified by the same description of domestic filtration as is positively necessary to counteract the evils attending an "intermittent supply;" and, therefore, that the observations I am about to make may have reference, in some small degree, to a town so much favoured—as regards water supply—as Brighton.

It is becoming a generally received axiom that water—a primary essential of life—is subject to more doubt and suspicion than any other substance upon which human life depends, and that even uncontaminated waters, when obtained from springs, deep wells, or uncultivated surfaces,—the only waters that are declared to be positively wholesome,—undergo greater or less deterioration whenever stored and detained for use; the actual amount of depreciation in purity necessarily depending upon the character, size, and situation of the receptacle in which the detention takes place.

It is needless to observe that the best approved supplies to all large communities are, in a certain measure, stored in lakes and reservoirs, and that the supply obtained therefrom in many instances undergoes some filtration before delivery. It is not to instances of the magnitude here referred to, of which the stored supply is constantly being refreshed, and which is not unfrequently associated with constant service that my observations will apply, but to small communities and single dwellings for which the water is stored in underground tanks and house cisterns, where it stagnates for a time, and the supply from which has been frequently found to be detrimental to health.

In our country houses, for instance, where natural circumstances would, it is generally supposed, favour purity of water, the usual condition as regards water supply is even more objectionable than in town dwellings. The main cistern or tank containing the water for domestic use is not unfrequently placed upon the roof, in order that it may be high enough to serve as a provision against fire as well as to supply the requirements of every floor. In this position it receives not only the falling soot from the chimneys and the dust from the atmosphere, but it forms a receptacle for the leaves of trees and insects, and the excreta of birds; or, if placed immediately under the roof in close proximity to the uppermost sleeping apartments, it receives, not only the rising dust and insects penned in by the roof, but the water it holds absorbs the vapours and exuviæ from below, rendered worse in proportion as the number of occupants increase. These receptacles in country houses are, therefore, from their inaccessible positions, almost invariably left to take care of themselves, and are not even examined for years together. In fact, it may be stated without hesitation that, as a rule, they are only visited when, owing to some mechanical derangement, the supply of water is interrupted. All the foreign matters, whatever they be, which fall into them settle at the bottom or cling to the sides; and, as in consideration of this fact, the outlet pipes from the receptacles are generally so fixed that it shall not be possible to completely empty them, a miscellaneous accumulation of putrescent organic matter is soon formed to corrupt the water with increasing effect the longer it is left to accumulate. This would appear so obvious, and is so generally admitted, that it seems an act of supererogation to refer to it at all, but the truth is one which not one householder in a thousand, though recognising the fact, will acknowledge his obligation to rectify. If an inspection were made in order to gain practical conviction, it would be found that after drawing off the water down to the level of the service outlets, the bottom of all such tanks or cisterns are most frequently covered with a layer of filthy ooze, sometimes five or six inches in depth, and that clinging to the sides is matter equally offensive in character, though of less thickness. This ooze, when examined under a microscope, has been found to consist largely of vegetable growth and living organisms, which after exposure to the air for 24 hours will become most offensive to the sense of smell. I use these terms because, not being a chemist myself, they express the results of my own observations. I believe, however, that if this matter, which I have termed "ooze," were closely analysed, it would be found that not only Bacteria with ova and small worms and leeches were present, but, by the aid of chemical tests, that much organic impurity existed also.

House cisterns or tanks in London and large towns are subject to the same drawbacks as those of country houses, with this difference, that being smaller they possess the advantage of the more frequent change of water incidental to a public or general service. In towns intermittently supplied, the position of the main house cistern is almost invariably in the roof or uppermost storey of houses, in order to furnish water closets and baths on different floors, supplemented in many instances by additional cisterns in the basement or floors below. In the majority of town houses, however, the same cisterns serve all purposes, drinking, cooking, and washing, as well as for water closets. If accurate statistics were obtainable, it would be discovered that these various cisterns (although plumbers may be close at hand) are not emptied and cleansed during whole periods of tenancies, during which the pernicious filth accumulates at compound ratio as years go by.

In the suburbs of towns, the supply cisterns, if not placed under the roof in close association with the sleeping apartments and the objections to which they are subject, or in the basement in close proximity to the kitchen, scullery, and other domestic offices, from which effluvium is constantly rising, are fixed outside the house, possibly on the roofs of privies or other inferior offices, exposed to the heat of the sun and other atmospheric influences which encourage animal and vegetable life. Any one travelling on a railway can see that this state of things is the prevailing condition.

In a word, taking a general view of the means adopted for storing water in dwellings and of the receptacles in which it is stored, it will be conceded that nothing could be more inviting to defilement than the existing state of things; and that the prevailing neglect in the cleansing of tanks and cisterns is due, not to ignorance of their condition, but to the inexplicable fact that, instead of being placed in an accessible position with the readiest means of cleansing, they are placed where they cannot be reached without extra labour and an expenditure of money, which the majority of persons are not disposed to incur.

There is no remedy for the evils of storage, when unattended by frequent cleansing, but systematic domestic filtration. It has been made clear, however, that such filtration, to deserve the name, must not be practised in the partial and careless manner in which it is now usually performed, but that it must be made to conform to the stern lessons gained by daily experiences which have shown that it must be applied to the whole house, and not to a part only, and that water must pass through the filter *automatically*, and not be subject to the neglect of servants.

The common idea of the action of a filter is that the water to be purified has merely to run through it, to leave behind it all the suspended foreign matters and such organic impurities as it contains, and that this action will go on, *ad infinitum*, without keeping the filtering medium itself perfectly clean. The result of this prevailing misconception is, either that after successful operation for a short time the water is found to gradually deteriorate in quality, and in the course of time to become worse than it was before filtration, the consequence being that before long the filter is put on one side as valueless—or it is continued in use and the water drunk with its increasing defilement until sickness strikes down the consumers and discloses the cause of the evil.

To meet the evil consequent on storage and the defilement of water which was pure when first delivered to the dwelling, sundry forms of filters have been adopted, some of which have gone beyond the mere restoration of purity, and have aimed at rendering water radically impure perfectly potable, although, I believe, it has been admitted by the highest authorities that no species of filtration can accomplish this object. I believe it also to be the fact that the filters which have obtained a reputation for chemical effect owe their reputation more to æration than to any special chemical properties of their own, although I am aware that one or two have been well received, from the filtering material of which the air has been designedly excluded.

The different modes of filtration now in vogue may, for the present purpose, be divided into two classes (1), those in which the filtering material is wholly under water when in action, and which is therefore not ærated, and (2) those in which the water passes through the material intermittently and must consequently be ærated. For obvious reasons, I do not propose now to criticise particular inventions, but to show that the most clever conceptions and best arranged designs may be rendered worse than useless if the impurities derived from house cisterns are allowed to accumulate in the filtering material and disseminate defilement, instead of ensuring immunity from it.

If we closely examine the most common form of table or sideboard filters, where sponge is used to arrest the coarser suspended substances, supplemented by animal or vegetable charcoal in a compact and loose condition, or by porous sandstone or artificial conglomerate, through which the water percolates, we shall find that the more minute floating particles which have passed through the coarser pores of the sponge have been arrested in the pores of the material below. Or, if we take those filters in which blocks of silicated or compressed carbon are used as the filtering medium, it will be found that when they are in use the coarser suspended substances which have been carried forward from the house cistern will be collected on the outside of the block; while much of the more minute matter finds its way with the water into the block and is retained in it.

If the mode of supplying these filters is such that the material is constantly under water, it will not be long before such dissolved organic matter as the water contained when it left the supply cistern will pass through the filtering medium, augmented rather than decreased in quantity; whereas, if the mode of supplying them is intentionally or unintentionally as is mostly the case, intermittent, so that air may take possession of the material alternately, with the water to be purified, a considerable proportion of the organic matter becomes oxydised, through the agency of Nature, who herself performs the part of the chemist in reducing the amount of defilement.

Passing from these table or sideboard filters to those of a larger description, serving for a supply of a whole dwelling, and which may therefore be called "House Filters," it will be seen that, although there are exceptions, the majority of them aim at filtration constantly under water, the filtering material being silicated or compressed carbon (vegetable or animal) in some form or other. It is indisputable that the water drawn from these filters is clarified, and it may be assumed that the clarification becomes more perfect as the passage of the water, mechanically, through the blocks becomes slower in consequence of the pores and interstices being partially occupied by the more minute suspended matters; but it is equally manifest that as these pores become filled, the amount of pernicious matter communicated to the water passing through them must become greater.

The deductions to be drawn from these truths are (first) that the filtering medium should be, if possible, *always* kept clean, and (second) that æration is a *sine quâ non*, not simply because the oxygen of the air renders organic matter imputrescible, but that, inasmuch as it is not practicable to keep the filtering material constantly free of impurities, the help of æration is all important so as to render the necessity of cleansing or changing the material as seldom as possible.

The importance of æration when performing the functions I have, on the highest authority, attributed to it, will be better appreciated if I quote certain passages from the report of the Rivers Pollution Commissioners, 1874. Speaking of ordinary filtration, they say:—"A small volume of the filtering material is crammed into the smallest possible space, and then for months, or, even years, water, more or less polluted, is passed through it until the pores become so clogged with filth as to refuse the transmission of more liquid. Long before this takes place, however, the accumulation of putrescent organic matters upon and within the filtering material furnishes a favourable nest for the development of minute worms and other disgusting organisms which not unfrequently pervade the filtered water. The proportion of organic matter in the filtered water is often considerably greater than that present before filtration. It cannot be too widely known that, as a rule, domestic filters constructed with sand, or sand and charcoal, are nearly useless after the lapse of four months, and positively deleterious after the lapse of a year."

The filtering medium in those house filters,—where the material is constantly immersed in the water it is intended to purify, —frequently consists solely of mineral substances, such as sand or sandstone, gravel or potsherds, mixed together or placed in layers, though occasionally these mineral substances are associated with animal or vegetable charcoal, in which case the accepted rule is that the closer and more compact the loose or granular ingredients can be compressed the more perfect the effect produced.

The superior powers of charcoal (animal or vegetable) for purifying water are more due, I am led to believe, to its minute pores or interstices (which, when air is admitted into them, exercises, as already stated, an immense oxydising influence), than to any superior chemical action belonging to the material itself. Charcoal, therefore, if kept clean, forms a valuable mixture with mineral substances, into the interior of which air cannot penetrate.

Mineral substances, if they could be obtained as minutely porous as animal and vegetable charcoal, would possess superior filtering capabilities, inasmuch as they would be free from the disposition of animal and vegetable materials to foster the growth of living organisms.

As charcoal, whether animal or vegetable, preserves its filtering value only when its pores are kept open and free, and as this can only be secured by the reburning of the material or by the frequent substitution of fresh for used material, the drawbacks to the use of charcoal, in any shape, are considerable.

It follows from these remarks, if they are sound and practical, that filtration should not be partial but complete, and should not be limited to drinking water only but to that which is used for cooking and personal washings;—in fact, that it should extend to the supply of the whole house and not be limited to the demands of particular persons or apartments. Further, they show that every possible facility for cleansing the material and freeing it of any foreign substances that would rest in it should be secured, and that the filtering medium itself should be ærated, *i.e.*, alternately filled with water and air, so that by this action the evils of storage may be removed.

It was with a view of meeting these desiderata that the "Self-supplying Oxydising Filter," which is manufactured and sold by Messrs Doulton, was designed. It may be seen in action in the Exhibition, and it is only for the purpose of illustrating the statements I have made and of challenging discussion upon them, that I call attention to this particular filter, which I hope will be the forerunner of others of the same description, as it not only allows every facility for the cleansing, washing, or removal of the filtering material, but by automatic action ensures that every drop of water used in the house shall be filtered.

WOMEN'S DRESS IN RELATION TO HEALTH.

By Mrs. E. M. King.

HON. SEC. RATIONAL DRESS SOCIETY.

In these days, the question of the equality of men and women is often discussed, being warmly claimed on one side, and as warmly denied on the other.

Equality is a word of very wide and indefinite meaning, and perhaps those who use it are not always quite clear as to what they mean.

Whether as a fact women are equal to men; or whether, some day, they may and will become equal; or whether or not they have a right to be treated as if on an equality; are three very different questions. Yet all these three, without distinction, are discussed under the one indefinite term—Equality.

To me there is no greater proof of the inferiority of women to men than the way in which women clothe themselves. We take it as a truism that dress is an indication of the mind and character of the wearer, and it is as true of a class as of an individual.

It is now generally admitted that the first idea of clothing did not spring from love of comfort but from love of adornment. That it was adopted originally not for protection but for ornament. Tattooing, feathers, and beads are the savage's first idea of personal adornment and covering, from which the civilized man has worked his way upwards, from less and less of personal ornament, to more and more of personal comfort, health, convenience, and decency.

For a long time, however, this upward progress with women has ceased. They remain in a semi-barbarous condition, the principal aim in their clothing being still personal adornment; and this aim ignorantly followed even at the expense of self-mutilation, self-torture, and the most reckless sacrifice of health, comfort, and convenience. Such a state of things betrays in the sex, as in the individual, a low condition of mind, character, and civilization.

Not only is this barbarous mode of dress a sign of inferiority, but it is also a cause of it. An article appeared in the *Times* not very long ago on the equality of the sexes. It tended to show how in every case where men and women had been placed together in any work of life women had shown their inferiority by their weakness both of body and mind. As, for instance, when there was any pressure of work in the Post or Telegraph Offices, women broke down, not being able to stand the extra work. Also where delicacy and finish were required, when women might be expected to manifest superiority, they had disappointed expectation, so that even in needlework men were found to be the best workers.

Without guaging the perfect accuracy of these statements, we may ask, how is it possible for it to be otherwise, when almost from youth upwards the muscular and organic development of women has been checked, their health undermined, and their nerve power wasted by the clothes they wear?

Just to take one instance of this. The amount of air which any one can take into the body at one inspiration is called *lung capacity* or *vital capacity*. The latter term is very significant, implying as it does, that the working of the whole machinery of life depends upon the air which can be drawn into the lungs. The larger the volume of air, the better the health, and the greater the strength and activity both of mind and body; while the smaller the volume, the less the strength, the poorer the health, the lower the vitality, and the less altogether of bodily power and brain power.

Now I venture to say that not one woman in a thousand has ever attained to, or at present possesses, her full amount of lung or vital capacity.

While men from youth upwards have encouraged the developement of lung capacity, by vigorous exercise, and by wearing garments which compress no vital organ, and which offer the least possible impediment to the free exercise of the limbs. Women, on the contrary, have taken little or no vigorous exercise, and worn garments compressing all the vital organs, while offering at the same time the greatest hindrance and impediment to the free exercise of the limbs. How then, with this abnormally small lung capacity, which in the majority of women is just about half what it ought to be, can they hope to stand on an equality with man? Or, while they persist in the wicked folly of defrauding themselves of half their life power, can they expect to be treated as equals?

But this compression of the lungs is but one form of mutilation which women inflict upon themselves by their style of dress. Many a warning voice has been raised, and many a warning example given, but the barbarous self-mutilation still goes on, and the votaries of fashion still continue to worship their ugly and grotesque fetish!

There is a French motto which may be said to comprehend the creed of this fetish worship, *Il faut souffrir pour être belle.* Why so? Let us ask. Why should our clothing be made to cause us suffering? And how can suffering make us beautiful? It can do so only in the eyes of those who have still lingering in them the feelings of the savage. Those who tattoo their bodies because they think it beautiful have to suffer. Those who bore holes in their flesh to stick therein an ornament, because they think it beautiful, have to suffer. Those who cramp their feet like the Chinese, or who wear high-heeled French boots, because they think them beautiful, have to suffer. Those who wear crinolines and crenolettes, because they think them beautiful, have to suffer—very acutely sometimes. And, lastly, those who screw in their waists, or carry heavily weighted petticoats, pressing down over the region of the hips, because they think these things make them beautiful, have to suffer, and that in a much more deadly manner than in any of the other modes of self-mutilation. But people of cultivated minds and taste know that none of these self-inflicted tortures add to beauty; but that true beauty and grace are the results of perfect health, perfect development, and perfect ease.

Let us, therefore, discard this wretched French motto, and the false standard of taste which fashion has set up, and try to find one for ourselves compatible with true ideas of grace and beauty. This, however, is no easy matter, for the taste of both men and women has been so long vitiated by the contemplation of bad models, that nearly all sense of what constitutes female beauty has been lost sight of. There appears to be a fixed idea that the perfect female form, such as the sculptor and artist love to portray, and the woman's body which has to be clothed to-day in modern garments, have no reference to one another at all. So the portraiture of the beautiful form, undraped, remains to be hung up on walls, or elevated on pedestals, a mark for the vulgar gaze of the many and the pure admiration of the few, but the form to be clothed is the thing we see in the shop windows, in shape like an hour glass, with a bell on to the end of it instead of legs, or like a wine bottle with a swelling at the top.

This is the model we have to form our dress upon, and this is the thing—the "beautiful" thing—which, we are told, in order to become like, it behoves us "to suffer!" But that a woman's body should be clothed in conformity with her natural shape seems a dreadful and unheard of proposition.

Preaching the necessity of a dress reform for women is no new thing. Medical men have for years declaimed against its unhealthiness. Dr Richardson, in his article on "Dress in relation to Health," in the *Gentleman's Magazine* for April, 1880, says "It is astonishing how resolutely the advanced professors of medicine, in all times in which they have written, have denounced the practice of compressing the body in the stages of its growth for the purpose of moulding it into some unnatural form, incident to fashion. It is equally astonishing how resolutely the votaries of fashion have resisted the teaching of the learned, who may be said never to have made a single point in advance towards a practical victory. Now and then fashion has given way for a short time, but it seems always to have fallen back again and resumed its place."

These words of Dr Richardson's are as undeniably true now as they were a year and a half ago, when he wrote them. There are always a few women intellectually in advance of their sex who lament the waste of time and destruction of health to which our method of dress leads, and who have, both by precept and example, endeavoured to promote some measure of reform, but their efforts, like the "teaching of the learned," have failed to make any appreciable effect, to gain a "single point in advance towards a practical victory;" for a time there may have been a slight improvement, but in the end we have "fallen back again and fashion has resumed its place."

Now the reason of this failure appears to me to be, that these reformers have never made their reform thorough enough, and they have considered too exclusively the needs and feelings of sensible middle-aged women—of those with whom love of comfort has superseded love of admiration. But until we can win the young, we *shall* gain no practical victory, because fashion is led by the young. Neither shall we effect any practical good unless we win the young, because it is during youth that unhealthy dress causes the most mischief.

What may be called the present sensible woman style of dress can never be made attractive. It is generally of no particular cut, and no particular colour. It neither follows Nature, nor the art, such as it is, of the dressmaker. The shapeless boddice and short plain skirt of some dingy-looking material appear yet more unattractive from being brought into contrast with the closely fitting boddice and gorgeously trimmed skirt of the fashionable beauty. But a dress modelled on a totally different plan would not suffer by being thus contrasted. Moreover, a costume presenting the charm of novelty would have much more chance of acceptance with the young than one which appeared to them only as a bad copy of an old fashion.

The boddice which looks well and fits like a glove over a pair of tightly fitting French corsets cannot be made to look well in their eyes when made loosely and setting all in a crease over no stays at all.

A short skirt with the smallest amount of fulness, and with little or no trimming, cannot be made to look well in their eyes beside the long flowing, wonderfully puffed, gathered, or flounced fashionable skirt.

Unfortunately, these sensible women whom we ought to be able to count upon as helpers, for the most part appear satisfied with things as they are. They say our short skirt is not at all in our way; it is not heavy, nor does it get in the mud; and, as to the body, I don't wear stays and my dress is perfectly loose. Then they wriggle up and down in their dress to show how loose they are. I am rude enough to say to myself, "Yes, and a nice dowdy straight up and down object you look!" But what is the use of the sensible elderly female clothing herself in a healthy dowdy manner, except in so far as her own comfort is concerned, if no young people can be induced to do likewise? Nearly all the mischief of unhealthy clothing is done by the time a woman has reached maturity. The ribs are forced together or made to overlap. The muscles of the back and shoulders have not been properly developed, the internal organs have either become diseased or displaced. The figure has become set and fixed, development arrested, health injured, and mischief done which can never be undone The young girl, however, knows little of all this, and she naturally prefers the beauty which is patent to her observation to her health, which she and most other people are so careless about until they lose it, and, as to her comfort and convenience, it is an article of faith with women that they must give up everything and suffer everything in order to appear beautiful and attractive.

Young girls have not only not followed the sensible dress reform, but the evils of tight lacing have lately very much increased. In my young days it was thought sufficient if we screwed in of an evening, and displayed then the covetted slender waist. We could at least take a walk in a dress in which we could breathe freely, covered with a loose and modest cloak or mantle. Now a woman must display the upper part of her figure as conspicuously in the street as she does in the house. She must have the tight jacket buttoned over the tight body, which is again buttoned or laced over the tight stays. Even the waterproof, which began as a sensible loose garment, is now converted into an instrument of waist-torture, and so the pinching and screwing, at all times and seasons, and in every sort of dress, goes on worse than ever.

And so things will remain as long as there is no truer standard of taste in dress than that recognised by fashion; and as long as fashion rules, young girls having any regard for their appearance will dress according to the fashion, whatever it is; and men will encourage them in it, for unfortunately the taste of the majority of men is as much vitiated in the matter as that of women.

If we would have a reform that will be lasting there must be a break with the traditional conception of women's dress, and until this is done no reform, however wisely begun, will be lasting, but will inevitably be drawn back again to the old original false standard.

It is the same with regard to every system, institution, or belief; when it begins to work in a wrong direction, causing only mischief, false opinions, or unhealthy conditions of mind or body, they must be put aside entirely, broken with completely, or no progress or reform is possible.

This is not the first time that the radical change now advocated has been attempted.

The first organised effort with which I am acquainted, to break with the traditional idea of women's dress, and to carry out "the teaching of the learned," was made by some American ladies about seven or eight years ago. They inaugurated a series of five lectures, which were delivered in different parts of the United States, and all these, with but one exception, were written by medical women. These lectures were published in Boston together with an introduction and appendix by the Editor, Mrs Abba Goold Woolson. The work of these ladies was put together and published in England by Ward, Lock, and Co., under the title of "Dress, Health, and Beauty." But although with some passages left out the book is copied word for word from the lectures of these ladies, the compiler did not think it necessary to say from whence he had derived his materials. Lately, another book on the same subject has been published in America, entitled "Dress and Health,"* compiled very much from the same source, with extracts added from English and American writers.

This book has become a text book, and an invaluable guide to all those who have felt the necessity of a dress reform for women; more especially has it been received as an infallible authority by the Ladies' Sanitary Association,—an Association which has done so much towards imparting general useful information on this and other hygienic subjects.

The Rational Dress Society is building on the foundation laid by these American women, and is mainly employed in carrying on their work, but this can be clearly seen only by referring to passages which both the English and American compilers have thought fit to leave out. These women saw as clearly as we do that a radical change in the style of women's dress was necessary, and that a dress adapted to the form of the body, and covering it naturally and evenly, could be the only satisfactory one. But they hesitated to make a too sudden innovation in the traditional petticoat, which seemed to many to be the divinely appointed garment for women to wear.

The necessity for a cautious approach towards the accomplishment of this radical change was brought the more forcibly home to them by the lamentable fiasco which Mrs. Bloomer had made some time previously, when she rashly made her appearance in some ugly black cloth habiliments, which immediately brought down upon her devoted head the dreadful accusation of "trying to imitate men!" The originators of Bloomerism are spoken of as "themselves intelligent and brave." They assumed "that great numbers of women were not only dissatisfied with the old attire, and longing for a better, but that they would adopt a better as soon as it appeared, however odd it might look." The result, however, proved their mistake. "Some desperately seized the remedy offered, and defied consequences; a greater number, while coveting the ease and freedom it promised, lacked courage, and waited till it should find general favour. Many thoughtless women treated it with indifference and ridicule. To them nothing was right that was not fashionable, and nothing could

* Sold at the Ladies' Sanitary Association, 22, Berners Street.

be fashionable which did not come from Paris." "Men sneered at the costume without mercy. They had never experienced the misery of the old attire, so they could never appreciate the comfort of the new." Poor Mrs. Bloomer; she, like many another reformer, overrated the courage of her followers, and underrated the strength of her opponents. She led the forlorn hope in the battle, and, I fear, socially speaking, persisted in the attempt. I hope, however, by and bye, she may receive some meed of praise for her brave but ill-directed effort!

It is not to be wondered at, therefore, that, with this failure before their eyes, these thoughtful medical women approached the subject of dress reform with double caution.

This is the account the Editor gives of their method of proceeding:—

"With no preconceived theories to establish, these ladies set to work in good faith to ascertain precisely what was wrong, how to cure it, and how to render these cures acceptable and widely known. They consulted the experienced fair-minded women about them, corresponded with many in other cities, and made a patient study of the hygienic and æsthetic principles to which proper dress must conform. The result of these enquiries was to convince them that the whole structure and the essential features of our present apparel are undoubtedly opposed to the plainest requirements of health, beauty, and convenience, and that any remedies to be thorough, must concern themselves, not merely with the external costume, but with every garment worn beneath it. It seemed vital to the physical well-being of the whole nation that such remedies when devised should be generally and permanently adopted. And yet it was also evident that any reform, which should produce a marked and sudden alteration in her appearance, would find favour but with few, and that these few, however heroic, must ultimately yield to the prejudices of the many." It was accordingly deemed best to render the improvements that should be recommended, however thorough they might be, as unnoticeable to ordinary observers as it was possible to make them, without too great a sacrifice of health, comfort, and beauty, to the fashions of the time. It was thought that "a complete revolution in the structure and the adjustment of the ordinary under-dress was by far the most important thing to be gained. If that could be effected, the outer covering," it was supposed, "would in time take care of itself." "But," continues the Editor, "this view did not imply that a radical change in the entire dress was not in itself desirable, but that, whether or no, it could not be imposed at the present time."

This beginning was no doubt a very wise one, but from the passages I have here quoted it cannot fail to be seen that these lecturers had the same ultimate end in view as that which we now advocate, but they wished the change made to be hidden from view, the outer garment remaining untouched.

The proof of the work of these ladies having been a good work, and their foundation a wise and right one, will be, whether from it we are enabled now to take another step in advance. Their plan of reform has gone on as far as it will go; it must now proceed further, or all they have done stands a chance of being obliterated. A seed or kernel may grow and expand within its husk or shell up to a certain point, but beyond that point it must break through its external covering or come to nought.

When these American ladies supposed that if the under dress of women was made right or hygienically, the upper would, as they expressed it, take care of itself, that is become hygienic also, without any further trouble, they were a little mistaken. The fact that to-day waist pinching is as bad or worse than ever, and that it is even more widely extended over every class of society, proves that they were mistaken. It was also a mistake to suppose that while the upper garment was allowed to remain of an unhealthy shape, the under ones *could* be made healthy.

Our principle is the reverse of theirs. We say, if the outer dress be made upon a hygienic plan, the under dress will take care of itself. This, I think, is the more logical position of the two.

But it may be asked,—Why attack the petticoat? That has nothing to do with pinching and screwing! Indirectly, I believe it has a great deal to do with it. Besides being unsanitary in many other ways, the wear and tear of nerve which the constant friction of petticoats causes is very great, and the weight they force the wearer to carry, not being close to the figure and evenly distributed over the limbs as in the trouser, but swaying about and all depending from the waist, is very exhausting. And if they are made to hang from the shoulders, so throwing all the weight upon the slender column of the back bone, it is a question whether as much or even more injury is not likely to be the result. I know from personal experience, and from the correspondence I have lately had in connection with my work in this Dress Reform Association, that many women feel this mode of carrying the weight of petticoats most oppressive. But, which ever way they are supported, petticoats are a constant tax upon the strength at the best of times; but when they have so encountered the wind, the rain. and the mud, the trial to strength, nerve, and temper is doubly exhausting. Neither are petticoats a sufficient protection against cold or against exposure. While they bring too much heat round the middle region of the body, they leave the lower part and legs exposed to every cutting draught or gust of wind; so that if a woman ventures on any exercise faster than a walk on level ground on a perfectly calm day and on dry roads, she is liable to exposure, which appears at once indecent and ridiculous. In fact, there is no position, except sitting or lying down, in which the petticoat is not an unmitigated nuisance.

But, whatever may be the relative amount of injury caused by the tight boddice, or the cumbersome petticoat, I believe the two to be inseparable. As long as the one lasts, so will the other. And, when the cumbersome petticoat is got rid of, the tight boddice will vanish also. That women seem to compensate themselves for the undue hiding of one part of their bodies by the undue exposure of another, has been often said by men, and the idea is a perfectly true one. The lower part of the body being entirely hidden by the skirts leads to an undue amount of self-consciousness being directed to the upper part. A double amount of self-conciousness and personal vanity, so strong in young people, being concentrated on one half of the body only, leads it to become morbid and unhealthy. But if the garments naturally and evenly covered the body, one part not more hidden than the other, nor another part more exposed than the other, self-consciousness and personal vanity, both proper and serviceable instincts in their place, would resume their healthy normal action, and there would be no pinching of one part and inflation of another.

As a proof of the truth of this theory, it may be remarked that when men took to wearing a long petticoaty style of coat, they took also, I am told, some of them, to wearing stays. Also the Highlander, who wears a short petticoat called the kilt, shows a bare leg by way of compensation. It may also be remembered that when tied-back skirts were worn, which suffered the graceful form of the limbs to be visible, waist pinching very much decreased, and low-necked dresses went very much out of fashion. But now that the tied-back skirt has gone out of fashion, and the puffed, trimmed, bustled-out skirt has superseded it, more waist torture has come in too, and neck exposure is again indulged in.

Besides this, the mode of dress affects the spirits and temperament, and re-acts upon the physical constitution.

The little girl in short skirts runs about merrily enough. But as she grows up and her skirts grow longer less and less exercise is taken. The petticoats clinging round the legs check the desire for movement, and with less exercise, less air is drawn into the lungs, and less air being required, the compression of the corset is less felt. Then with the tightened corset and less air drawn into the lungs, the desire for exercise still further decreases, and the woman becomes more and more inactive both in body and mind. But set up the reaction the other way. With less impeding clothing for the limbs the desire for exercise is not checked, the natural active impulse of youth is followed, the lungs being thus expanded and the vital capacity increased, the pain of waist pinching is at once felt, and the pressure made less possible to endure. With freely expanded lungs and uncompressed waist, more active habits are followed, a healthy appetite is gained in place of an unhealthy morbid one. A cheerful and contented temper succeeds the querulous, peevish, or irritable one. In short, the healthy mind follows from the healthy body, instead of the hysterical temperament and low vitality of the woman of unhealthy mind following from her unhealthy body.

The fragile women with sylph-like forms and taper waists, with delicate appetites and timid nervous disposition, may be very sweet and poetical objects of contemplation. But as daily companions, as wives or mothers, and still more as women who have to stand alone to fight the battle of life by themselves, they soon become poor faded worn-out creatures, a trial to themselves, and a heavy drag on all connected with them.

Before concluding, there is one other aspect of the question which, as yet, has been only incidentally touched upon. There has been little or no objection to the change we propose on the score of propriety, but women seem to be dreadfully afraid that it will not be pretty. A divided skirt, I am told, can never be made to look graceful. Here crops up again the remains of the old barbarous instinct, displaying the backward state of civilization of the ordinary female mind. It cannot for one moment put aside the one dominant idea that the chief end of clothing is personal adornment.

We would not lose one ray of beauty, only we say it should not be sought at the expense of either health, comfort, or convenience. But it must not be grasped at before, and above, and in spite of, these higher aims, or it will never be attained. Our standard of taste in the matter is entirely false, and we must be content to wait to let a true sense of beauty arise and grow out of the perfect fitness, ease, and adaptation of our clothing to our bodies. We must look for beauty not to folds and pleatings, and gauging and puffings of so much material, nor to the hanging of so many yards of curtain from our waists down to the floor, but to the beauty of form, which the clothing should cover but not conceal; to the beauty of perfect development and perfect health, and to the graceful action of this healthy and well developed body, moving with perfect freedom, beneath its easy, unconfining, uncumbersome clothing. We are a long way off from this happy condition of things. Like those who first trod the path of dress reform before us, we can only advance one step at a time, and so our present style of dress can only be a compromise between one adapted to health and comfort on the one side, and the dictates of custom and fashion on the other. But, as we gradually work towards the one, and away from the other, the new and truer beauty will reveal itself, and the ordinary female mind may gain a somewhat higher tone, while endeavouring to put aside for the time what has hitherto been her one end and aim and object in dress. She will then have reformed, not her dress only, but her whole mind and character.

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W. H. Hallett

MAYOR OF BRIGHTON, 1866–7; 1867–8; 1881–2.

DOMESTIC SOFTENING OF WATER FROM THE CHALK.

By W. H. HALLETT, F.L.S. (Mayor).

The benefit to arise from softening Chalk-water for drinking purposes is often discussed, but unless a Water Company undertakes the task, consumers continue to drink the hard water as though no remedy is within their power. My object is to state a means by which softened water can be obtained with little trouble and at small expense.

It is more than a quarter of a century ago that Dr. Clark, of Aberdeen, made known his valuable invention; and, as the patent has expired, the application of the system is open to all who are disposed to make use of it. His description of the process, presented to the Society of Arts, was substantially the following:—"The invention is a chemical one for Expelling Chalk by Chalk. Chalk consists for every pound (of 16 ounces): of Lime, 9 ounces; Carbonic Acid, 7 ounces. Nine ounces of Lime, which can be obtained by burning Chalk in a kiln, requires at least 40 gallons of water to dissolve it. That is called Lime-water.

"Chalk is very sparingly soluble in water, so that 1lb. would require 5,000 gallons to dissolve it; but if there is combined with it an additional 7 ounces of Carbonic Acid,—that is to say, as much more as the Chalk itself contains,—the Chalk becomes readily soluble in water, and when so dissolved is called Bi-carbonate of Lime. If the quantity of water containing the 1lb. of Chalk, with 7 ounces additional of Carbonic Acid, were 400 gallons, the solution would be a water of the same hardness as Well-water from the Chalk strata, and not sensibly different in other respects.

"Thus it appears that 1lb. of Chalk, scarcely soluble at all in water, may be rendered soluble in it by either of two distinct chemical changes; soluble by being deprived entirely of its Carbonic Acid, when it was capable of changing water into Lime-water; and soluble by combining with a second dose of Carbonic Acid, making up Bi-carbonate of Lime.

"Now if a solution of the 9 ounces of Burnt Lime, forming Lime-water, and another solution of the 1lb. Chalk, and 7 ounces of Carbonic Acid, forming Bi-carbonate of Lime, be mixed together, they will so act upon each other as to restore the 2 pounds of Chalk, which will after the mixture subside, leaving a bright water above. This water will be free from Bi-carbonate of Lime, free from Burnt Lime, and free from Chalk, except a very little. A small residuum of Chalk remains not separated by the process. Of 17½ grains in a gallon of water only 16 grains would be deposited and 1½ grains would remain."

To apply this to the softening of water on a small scale it is necessary to provide, in the case of Brighton water, Lime-water about one-tenth of the quantity of the water to be treated. I have used during the last twelve months two two-gallon stone ware casks with stone ware taps. The casks are placed near a constant service tap. One and a half pint of Lime-water being first put in, the cask should be filled up to two gallons. After standing twenty-four hours the supernatant water will be as clear as at first, and at the bottom of the vessel will be found a precipitate of Chalk. The shape of the vessel would be better if cylindrical, with the tap-hole a short distance up the side. This form of vessel would allow the process to be completed within twelve hours. The second cask (or vessel) is provided to ensure a reserve of softened water, while the other is being treated. No weighing of the Lime is required. The Lime-water is obtained by putting into a stoppered bottle fresh caustic lime, and water is to be poured on it to fill the vessel. In a few hours the upper part of the fluid is quite bright, and is saturated with Lime. The charge of caustic lime need not be renewed oftener than every two or three months.

If it is objected that the quantity is small, more vessels can be used, or larger ones, so as to meet the requirements. I have found these sufficient; and there is an advantage in having the water only stored a day or two during hot weather, when it soon ceases to have a brisk taste. The entire apparatus need not exceed 10s in cost.

I know of several cases of persons, who were liable to irritation of the mucous membrane, who have derived benefit through the continued use of this softened water for drinking purposes.

The softening process might easily be adopted by laundresses, by using large casks; the saving in soap would well repay them for a little trouble. Three years ago, when the Warren Farm Well was under discussion, it was said that the soft water obtained from the Sand was a saving of many pounds per annum, compared with what would be the cost of using the Town water. The Town water is now used in its stead, and the time seems to be come for the GUARDIANS to consider the use of a softening apparatus fitted for extensive use, such as Porter-Clark's or the Atkins' process. The sixth report (1874) of the Rivers' Pollution Commission puts the saving in soap by the use of Lime as follows:—

1 cwt. of Lime will do the work of
20¼ cwts. of Soap.
Cost of 1 cwt. Quick Lime, 8d.
Cost of 20¼ cwts. Soap, £47 1s. 8d.

There is, therefore, very little question that the adoption of some such mechanical means of mixing, combined with a rapid filtering of the separated Chalk, would soon be paid for through the large saving in soap.

Mr B. ELLICE-CLARK: Do you intend to take discussion on the Mayor's paper?

The PRESIDENT: It will depend upon time. I will now ask Mr Stevens to read his paper.

THE ASPECT OF PUBLIC ELEMENTARY EDUCATION IN RELATION TO PUBLIC HEALTH.

By HENRY C. STEPHENS, F.C.S.

When in the matter of Education a Sanitarian surveys the position he occupies, and considers how unthoughtfully professional educationists deny to health-knowledge its proper position in school training, he may naturally feel inclined to remonstrate with them, as, in Æsop's fable, the stomach reasoned with the other members of the body—

> "True is it, my incorporate friends," quoth he,
> "That I receive the general food at first,
> Which you do live upon ; and fit it is :
> Because I am the storehouse and the shop
> Of the whole body. But if you do remember
> I send it through the rivers of your blood,
> Even to the court—the heart—to the seat o' the brain ;
> And through the cranks and offices of man,
> The strongest nerves, and small inferior veins,
> From me receive that natural competency,
> Whereby they live."

The governmental system of compulsory elementary education is now rapidly becoming universal in its practical organization throughout the country, and educationists, wishing for solid and large advance, must recognise the self-evident truth that improvement in the moral capacity, as well as in the intellectual faculties of man, is dependent upon the soundness of his physical organism, and upon the measure of his understanding how to nourish, to guide, and protect it.

True health in a man is his state of highest efficiency, as it has been said :—"To be a good animal is of first necessity for success in life, to be a nation of good animals is the first condition of national prosperity." Therefore, we can imagine the health reformer saying to his brother reformers in theology, morals, philosophy, sociology, and politics—you must one and all allow me precedence, because it lies with me, as the promoter of vigorous physical health, to provide that surplusage of energy which is indispensable to every one of you for sympathy with, and for action upon, all your schemes of change.

Though every reflecting mind can be convinced that the promoters of health should march first among those engaged in endeavours to raise humanity to a higher level of power and sweetness, still the administration of public elementary education in this country does not exhibit that conviction. The Government and the popular mind show an encouraging inclination in favour of the further introduction of physical life-knowledge into the school curriculum; but that part of the educational machinery which emulates the academical feeling, or which is leavened with the academical *esprit de corps*, does not appreciate health-knowledge sufficiently, and by its inertia and lack of sympathy checks the development of school training in that direction.

When we consider that voluntary schools are largely under the control of Her Majesty's Inspectors, who, though men of an honourable University position, have acquired that position mainly through the old channels of distinction, it cannot be matter for surprise that the teaching of elementary science does not usually receive the degree of encouragement its importance deserves. There are not wanting inspectors frank enough to declare their inability to examine children in elementary science, or, at any rate, to do anything beyond putting automatically the exercise questions at the end of the chapters in the school text books. Of all subjects in the school curriculum, science must suffer most by this treatment, and the influence upon the school teachers of such an example by their superior officers must also injure the prospects of science-teaching in public elementary schools. I am aware it will be said that an inspector can soon provide himself with science-knowledge sufficient for an elementary science examination in our public elementary schools; but, all the circumstances considered, I think this assumption unsound. Certainly, those anxious to see elementary science largely introduced in our public elementary schools, should deem it important to ascertain whether the effects of association, and the influences of school and university training prevailing among our school inspectors, are likely to assist the cause of science-teaching.

The reports of Her Majesty's Inspectors differ greatly in opinion upon the value of the class subjects, and upon the subjects comprised in Schedule IV. Some inspectors favour poetry and literature, others grammar, or history, or geography; but though differing with regard to the relative importance of these subjects, their reports are almost uniformly unfavourable to the teaching of elementary science, and with reference to it, contain scarcely a trace of the constructive criticism bestowed upon the teaching of the traditional subjects of school work; indeed, here and there Mr Huxley's observation, "That the worth of the pursuit of science as an intellectual discipline is almost lost to those who seek it in books," seems to receive illustration. Occasionally the experience of the inspectors, as recorded in their reports, supports the contention that an extension of knowledge of the laws of life would be an advantage, as in the following extract from Mr Watts's report, made upon a visit without notice:—"If I ever endeavour to speak persuasively it is when I am aroused by the polluted atmosphere of a school where the children are evidently drugged to sleep, and where every avenue by which impurities could escape are as carefully closed as if ventilation were altogether a mistake. The sickly pallor of many of our teachers testify too truly that the accumulated influence of this neglect is telling a sad tale upon their constitution, while unfortunately the facility with which their lungs accommodate themselves to the gradual deterioration of the atmosphere renders them totally unconscious of the evil which is thus undermining their health. And if such is the effect in the case of adults, whose constitution is comparatively hardened against attacks of disorders arising from a low degree of sanitary civilization, no wonder that such large portions of our infant population are swept away under such unfavourable conditions. Great, indeed, and incalculable, would be the benefit conferred on his kind by the man who invents a self-acting and a self-adjusting means of ventilation such as would defy the carelessness of teachers, without exciting the anxiety of mothers, which is generally charged with the main cause of the mischief."

That the Education Department itself appears to be tinged with a want of sound appreciation for science-teaching can perhaps be discerned in connection with animal physiology from the code regulation: "That the instruction in this subject must be illustrated by models or diagrams only." Some teachers feel strongly the hindrance presented by this regulation, and it may not be generally known that the natural strain felt from teaching this subject by diagrammatic illustration only has not infrequently induced a breach of the regulation. Why the mechanism of the heart, of the lungs, of the eye, cannot be illustrated, as suggested by Huxley, by the corresponding parts of a sheep, it is difficult to understand. Possibly an idea that the children may contract an inclination for vivisection may account for it.

As our land system is based upon feudal tenure, in like manner our education system still has its roots fixed in the views which regulated it before the advent of science. All education is regarded and shaped as part of an ascending scale to the existing systems of our older Universities, but for application to the particular purposes of public elementary education, there has been much cobbling and patching, and, as a result, we have an unreasoned compromise between advancing perceptions of the true needs of education and the old pedagogic spirit. I contend that this system, or rather absence of system, is wholly mischievous. What is wanted is some completeness of equipment in public elementary education for the needs normal to the class to be trained under it; *not a few of the first steps* in a curriculum framed for quite other aims, and adapted for the requirements of a different social position. If we were under the *regime* of the old voluntary school system, this want of power of adaptation and certain instincts of conscious and unconscious opposition, as well as some elements of weakness inherent in the voluntary school system itself, might for long retard the growth of science-teaching in our elementary schools.

As workers for the promotion of a higher standard of national health, we shall find it fortunate that the management of schools has been so largely transferred to the people. Amongst them there will not be found much of the conservative torpor (always present in departmental agency and educational corporations) which opposes itself to much change of educational plan. Where are we likely to find sounder guidance, and of the sort we need most, than from the very class who have practical knowledge of the perils, deficiencies, and weaknesses, which have strained and still strain them most? We want an unflinching answer of the most searching description to the question,—"*What knowledge will be of the most value to the majority of the children of our public elementary schools?*"—that is to say, to children whose social condition requires that their own labour shall, quickly after leaving school, be sufficing for or largely contributory to their subsistence, bearing in mind the condition that the school attendance of such children would begin at five years of age, and must cease by fourteen.

In the consideration of materials likely to furnish knowledge of most worth, I have employed two test questions only:—First, Will such knowledge safeguard the children during their after life? And secondly, as alternative, Will such knowledge help the children to earn their living? Surely it will be very cheering if a scheme, constructed solely upon such an unattractive basis, should, nevertheless, appear likely to procure a noble development of the moral natures, and of the imaginations of children!

Time will not do more than allow me to bring forward the mere heads of my scheme.

I should begin first to educate the sense faculties by requiring easy exertions of observation, and of the analysis of impressions, also by training the muscular capacities in connection with mental effort, as in the Kindergarten system, and by tracing from copies placed under glass, and by singing. The long process of instruction in reading, writing, and arithmetic, would afterwards be commenced, and gradually carried to the point of sound proficiency. During the same period I should proceed with instruction upon the nature of matter in its physical states of solid, liquid and gas; and by experimental demonstrations in great variety, bring the children to a knowledge of the qualities of matter—hardness, brittleness, malleability, elasticity, compressibility, expansibility, and the like. The physical effects of heat would follow as an introduction to the study of the nature of force,—its non-destructibility, and showing by illustration the mutual convertibility of its various forms. Alongside with such elemental physics, instruction by experimental demonstration should be given in the chemical properties of matter, —having regard chiefly to chemical knowledge required for a comprehension of the chemical work of animal and plant life,—enough to teach the children what is required for the changes in matter by which they live, and enough to teach them what is required for the changes in matter by which plants live. By natural gradation the children would rise to the study of animal and plant physiology of the elementary sort, and for such teaching not only should diagrams and models be used, but after the first stages that impressive actuality which demonstrations from the organs of animals and of plants can alone provide should be secured. Such a preparation would procure much comprehension of the vital work of Nature, and what could better prepare for the study of physical geography, and of the primary facts in geology, than such practical instruction in elementary physics and chemistry?

Instead of history as it is usually taught, I would teach the normal development of civilization, of the arts of life and of pleasure, the growth of Society and of Government; also the facts of ethnological interest bearing upon their own country, the Roman, Saxon, and Norman invasions, with a short account of the progress of the history of England from the Norman invasion to the present time. The elder children before leaving school should be instructed upon the essential features of the present condition of the existing political constitution of England.

Apart from, and not touching the field of, religious instruction the curriculum I have just sketched comprises:—

1. Cultivation by means of the sense faculties.
2. Reading, writing, and arithmetic.
3. Elementary physics.
4. Elementary chemistry.
5. Animal and vegetable physiology.
6. Physical geography.
7. The normal course of the political and social development of nations, with the leading features of our history, and of our existing political constitution.

That this list might be improved by being enlarged—that is, by giving longer time to school life, is without doubt; but the few subjects I have given, and in the order I have given them, constitute my reply to the question:—"*What knowledge is of most worth to the children attending public elementary schools?*"

In such a scheme of instruction in *life-knowledge*, no room can be afforded for Latin, French, German, or for what is described by a great authority as "that intensely stupid custom, the teaching of grammar to children." A necessary sequence requires that the teaching of grammar should follow such attainment of the language, as it is written and spoken, as is possible for children. It is certainly a very suggestive experience to find that children at examinations at public elementery schools will exhibit a surprising acquaintance with the rules of grammar; yet, during the conduct of such examination, the children and the teacher both commit grammatical errors, and faults of construction, which strikingly declare their want of power to apply the information they have spent so much time in acquiring.

What, then, are the results we may presume we shall secure for children, educated according to the curriculum I have placed before you?

First. By their knowledge in reading, writing, and arithmetic, they have the tools for further self-education in any direction their inclination or the needs of their lives may require.

Secondly. By the science-knowledge imparted to children, many advantages will be secured to them, to which I will, as shortly as possible, call your attention.

When the children leave school, they will have learned what conditions are requisite to keep the bodily functions and faculties at their best, in vigour and soundness, and how to shield them from influences which would impair or destroy them. The value of this knowledge is not limited to the advantages they will themselves secure from it, but it is of the utmost importance for the safe and wise nurture of the young lives which will hereafter come under their charge. Society and the State suffer severely from want of knowledge of this kind among the working classes, and in a less degree among all classes.

They will be enabled to comprehend the character, and measure the extent, of the risks to health and life incidental to employment in some of the industrial occupations, and they will understand the necessity for cleanly care and the nature of the specific precautions requisite against inhalation of dust, or of poisonous gases and fumes.

Their industrial efficiency will be greatly improved in quality; as every industry demands in some shape a knowledge of physics and of chemistry, or of both; their science-knowledge will in many situations prove to them of direct industrial value.

They will understand the nutritive value of foods, and can compare it with their cost and other characters.

Their science-knowledge would throw open to them the nature of the specific risks, as well as the debasement of the conditions of living, which must ever result from overcrowding, unless efforts be made of an energy adapted to the hygienic strain created by the aggregation of large numbers of human beings in small spaces. They would understand that the inflow current of air and pure water must be accelerated in speed and increased in quantity, and that the outflow of the products of waste must be correspondingly accelerated, and must be effectual.

They would understand (the by no means insignificant matter) the *management* of drains from dwellings, and they would understand the sanitary requirements for the construction of drains of all kinds in their adaptation to the interior of dwellings, and to the sewers, carrying filth to where it may accomplish its reconversion into forms of beauty and vehicles of power. And their knowledge, producing co-operation and sympathy, in place of opposition, would thereby help towards the solution of the great problem which troubles all sanitarians and the nation so much—how, without waste, without danger to health, and without loss from the cost of the process, to effect the conversion of sewage matters by bringing them again within the circle current of organic life.

They would comprehend the commanding sanitary influences which water, by its quality, and by conditions of its supply, and by the fact that it may be the most insidious vehicle of deadly disease, exerts in every populous community. They would resolutely demand that the arrangements of monopoly of water supply injurious to public health or convenience, which contriving attorneys and capitalists have extracted from a careless Parliament, should be equitably set aside. I live near to a district in which there exists an abundant and cheap supply of quite pure water made soft by an artificial process, Dr. Clark's process; yet a body of nearly 20,000 people are not allowed, through the operation of a monopoly secured by an Act of Parliament, to supply themselves from this source. Every year this large population suffers great loss from the blockage of their hot water pipes, and in many other ways, because they are compelled to use hard water, owing to the fact that when the district was in a rural condition a "Hardwater Supply Company" cleverly obtained Parliamentary possession of the district for purposes of water supply.

Appreciating the vital work for which fresh air is wanted, they would understand what really constitutes ventilation, and how to attain it in summer and in winter, and they would, perhaps, be able to do that which so few of us are quite able to do—to defy the ventilation mongers and to rate at their true worth all the appliances of commercial quackery connected with fresh air supply. They will become disciplined sanitarians, quick to perceive for themselves the true requirements for health and for protection from dangers to health; they would be their own inspector of nuisances, and could protect the public health in matters connected with their own homes far more effectually than sanitary officers can possibly do—regarded as they are with apprehension, and too often compelled to put up with defective information. They would be aware for themselves and their families how to avoid the preventible diseases; or, if suffering from them, how to prevent their spreading to other homes. Life-knowledge would stimulate their sense of social responsibility, and thus—by the easiest and most dignified means—weaken the argument for much of the well-meaning interference often proposed—on hygienic and sanitary grounds—with personal liberty and the cherished independence and privacy of family life.

Their science-knowledge—or, rather, the general science-knowledge to which we are looking forward—would, more than anything else can do, raise the character of our local sanitary organizations. Men would not be elected as members of sanitary authorities if unfitted by want of sanitary knowledge, and surveyors and inspectors of nuisances without qualification would not be tolerated.

A comprehension of their operations and sympathy with their objects would impel them to watch over and further the efficient working of sanitary regulations. They would become supporters of precautionary measures of State sanitation, and intelligent critics of sanitary schemes, instead of obstructionists, yielding only when struck helpless by panic fears.

By their science-knowledge they will secure a better grasp of the truths and requirements of social and political prudence, and will be better enabled to understand the conditions of production, and to take part in the new modes of alliance between labour and capital which may be impending. The habit of *thinking through* questions, which is engendered by science-teaching, must contribute to give a practical character to politics and sober the judgment, as regards the means and the objects of political endeavour. Nothing illustrates the biologic blindness of men conventionally termed "educated" than their want of solicitude to distinguish between the protective features of Government and its aggressive ones; unthoughtful of the truth so apparent to every student of Nature, that adaptation by development and development by exercise is the law of life, they are usually eager in welcoming governmental interference of "the bib and pap-spoon" order; that sort of interference which deprives men of the effectual in[illegible] use of power and faculty it is the province of the natural action and reaction of penalties to provide. Training in science will, at least, do more than any other kind of training can do to awaken the mind to the shallowness in quality of the information upon which much governmental interference and regulation is based, and will bring into clear relief the retardation of progress brought about by restricting the operation of individual judgment in favour of the dead-level, and of what *must necessarily be the low level of State perception and of State conscience.*

Of even greater importance than the considerations I have put before you, is the truth that science-knowledge will impress him more than any form of mere exhortation could do, with the cost and character of sensual riot and excess ;—how such excess entails the decay and perversion of healthy sense-guidance ; how it clogs the animal machine ; how it induces mental lethargy ; how it lowers the capacity for happiness, the power of moral initiative ; and of self-restraint ; and thus brings near all the hideous evils of crime and pauperism.

Lastly, let no one venture to stigmatise this science-knowledge curriculum for public elementary education as too materialistic, as not affording an appeal to the emotions or a discipline to the moral faculties, without pausing to consider the prodigious stimulus to the imagination it provides. A habit of reasoning and interrogation, a real appreciation and understanding of truth, is engendered by hearing, seeing, and feeling in all things, the voicefulness of nature. Is not the poetry of our day rendered intellectually noble, and of more penetrating quality, by the revealment of a growing adequacy of cosmological conception, even though in tune it may not be so simple, or so sweet, as poetry unconscious of aught but human strifes and loves?

It may be that a greater expenditure would be required for the scheme of public elementary education I have placed before you, than for that at present carried on ; but the advocate of science education has a right to expect that the objection to a slightly higher level of School Board rates would be overruled by the consideration that the teaching given is all of a nature in which the community at large has promise of an indirect return fully justifying the outlay. *The soundest political aspect which public elementary education can present, is that of a prudential provision by the State for the safe-guarding and furtherance of the national welfare.*

The many injuries, and very heavy burdens, inflicted on a civilized community, through the absence of a self-sufficing physical, mental, and moral faculty on the part of some of its members, should certainly be accepted by political economists and philosophers as justification for the School Board rate. Keeping only in view its economical bearing, it may be expected that the local and imperial taxation for educational purposes must in time come to be regarded as a premium of assurance, it is profitable to pay by way of protection against the far heavier charges for prisons, pauper houses, and madhouses. But upon no principle of public right or of public economy can we put forth Latin, French, German, grammar, or English literature or others among the subjects covered by Schedule IV. of the code, as subjects proper to be taught at the public expense; and the weakness of any plea for the inclusion of such subjects in a public elementary school curriculum is rendered more glaring by the want of the needed scheme and arrangement and of all adequate provision for that education in life-knowledge which the State itself is most directly and heavily interested in providing.

If carefully analysed, the antagonism between the views with which the tax-payer and the educationist are usually supposed to regard State-aided education is shown to have no real foundation. To the question by the tax-payer, "What kind of knowledge, for the purposes of public elementary school training, will best assure me against the prospect of future charge, or loss, by, or in respect of, children attending public elementary schools?" and to the question by the educationist, "What kind of knowledge, for the purposes of elementary school training, will best provide a child with means for his personal development and ability to discharge his family, social, and political responsibilities, as they shall successfully be borne by him?" the answers to be made will present no difference of moment in political or educational principle, because reflection will show that the provision needed to satisfy requisitions from such very different standpoints are, nevertheless, one and the same, for the education required *for the promotion of the personal, social, and political interests of the individual, is in all respects identical with that which it is* (in the absence of other provisions) *wise and profitable for the State to provide at the general expense.*

I believe, that it will not be long before this important and consoling truth is grasped in its entirety by the people of of this country, and that it will be seen that the charges we bear in order to hide away the sloughings from wounds which ignorance creates—which the ignorance of sanitary knowledge creates in a degree far beyond all other forms of ignorance—are enormously heavier than would be the cost of health and true mental light.

The PRESIDENT then asked the Associates to allow him to exercise his authority as Chairman and pass over those subjects they had proposed to discuss and proceed with other business, he asked Mr Cassall to allow his paper to be taken as read, and also Mr Scott Moncrieff to allow them the same privilege. It was a great comfort to him to think that it was the intention of the Mayor and the body acting with him to publish the transactions of the Congress, and that the public at large would have the opportunity of reading for themselves the very important lessons which the Associates had heard that afternoon.

ON HEALTH-LESSONS IN SCHOOLS.

By CHARLES E. CASSAL, F.C.S.

Demonstrator of Hygienic Chemistry at University College, London.

THE necessity of making a knowledge of the laws of health an essential, and, indeed, a compulsory part of education, is by most people hardly appreciated, or even recognized. Throughout the reports of Educational Congresses and the pages of educational journals, one may search in vain for a word in favour of such an innovation, and I believe it is not an exaggeration to say, that the great majority of educationists look upon it either with indifference or disapproval.

One cannot help being forcibly struck by the extraordinary apathy and negligence existing in regard to this matter, by the fact that most men are content to remain—and to allow their children to remain—in the most thorough ignorance of the structure and functions of the human body, and of the means by which it may be maintained in health. This, indeed, is the greatest difficulty with which reformers can have to deal,—this indifference and inertia, the outcome of that which has well been termed compound ignorance,—the ignorance of those who do not know that they are ignorant.

The learned author of "Education as a Science" (Professor Bain) tells us that "the art of the educator assumes a certain average physical health, and does not enquire into the means of keeping up or increasing that average;" that, "although the fact of bodily health and vigour is a leading postulate in bodily and mental training, the trainer is not to take upon himself to lay down the rules of hygiene." On the other hand, I may quote Canon Kingsley, who enthusiastically supported the extension of hygienic teaching. In his "Essay on the Science of Health" he points out that, "in some more civilized age and country," the teaching of physiology and sanitation "will be held a necessary element in the school-course of every child,—just as necessary as reading, writing, and arithmetic;" and that "the practical value of pure air, pure water, unadulterated food, and dry dwellings," should be demonstrated to—and known by—every member of the community. So far as I am aware, but little has been done as yet, in this direction, in schools. The hygiene of schools, their construction according to sanitary principles, the providing of healthy furniture, and of proper appliances for lighting, warming, and ventilation, has been receiving more and more attention of late years. The advisability of making all teachers acquainted with hygienic laws has recently been insisted upon by the United States Education Commissioner in an article published in "The Education Review," an American paper; but hardly anything is said or done in order to teach the pupils themselves, something of the means by which they may protect themselves. It is not enough that teachers should have some knowledge of hygienic laws, if that knowledge is not to be imparted. It is not enough that measures should be taken to provide healthy surroundings and healthy recreation: the intelligent co-operation of the person to be kept in health is clearly an absolute necessity, though one which—as it seems to me—has been, and *is*, very much overlooked. No one can doubt that, if the community is to be made more healthy, if real and thorough progress is to be made, some knowledge of sanitation must be widely spread and popularized. If the pressure of public opinion is to be brought to bear, public opinion must be educated. This end can only be attained by health-teaching in every school throughout the country. How should this be done? Whilst wishing to advocate as strenuously as possible the teaching of elementary physics, chemistry, anatomy, and physiology, to both boys and girls, I believe that this teaching should have a direct hygienic bearing; that, in connection with and side by side with the teaching of physics and chemistry, for instance, there should be demonstrated and explained—as far as circumstances will allow—the principles of sanitary construction, the specific characters of good and bad air, water, and food; and that, furthermore, the current fallacies concerning such matters—and their name is legion—should be exposed and corrected.

The teaching of elementary anatomy and physiology should be carried out invariably with the aid of good diagrams and specimens, and should not resolve itself, as I have reason to believe that it too often does in Board Schools and in the very few other places where an attempt is made to teach these subjects, into the mere cramming of a number of technical terms, and so forth, for examination purposes. In connection with this teaching, surely the necessity, and extent, and nature of proper physical exercise might be explained,—

the fallacies about clothing might be pointed out and condemned, and the road to reform in this matter indicated. Something about the causes of disease should, of course, also be taught.

Above all, the teaching should be thoroughly practical, the lessons should be illustrated by experiment as far as they possibly can be, and the teacher should deal with facts, and leave theories alone. The composition and impurities of water and air, the composition and adulterations of the different foods, and the dangerous nature of certain quack preparations are subjects which admit, to some extent, of easy practical demonstration. Every lesson should, of course, be carefully prepared, and the success of the experiments insured.

Although the course just indicated is rather designed for the elder pupils in a school, I can see no reason why preliminary instruction of this sort should not be given in lower classes. The so-called "Object Lesson," that much-discussed, ill-understood, and worse-practised method of teaching, might be turned to good account in this direction. I may mention that I have attempted to carry some of these notions into effect at various times, and under various circumstances, and I hope with some measure of success; at any rate, I have experienced no difficulty in getting these things understood, and I have always found that they excited the keenest interest.

There is another matter which, were it not for its seriousness and importance, I should *not* have thought of bringing forward. The Rev. J. M. Wilson, President of the Education Society, and Head Master of Clifton College, has, in a most able and powerful address, lately called attention to the state of morality in our public schools. Mr Wilson does not advocate the teaching of physiology and hygiene as a remedy for this terrible evil. I would venture to express my firm and deliberate conviction that it is only in this way that the difficulty can be met. It is only by freely and openly teaching physiology and the laws of health—that is, by destroying the mystery and glamour that are foolishly allowed to surround certain things—that the death-blow can be given to immorality in schools or elsewhere.

In this same address of Mr Wilson's, I find quoted the words of Von Humboldt, "Whatever we wish to see introduced into the life of a nation, must be first introduced into its schools." In our thousands of schools, *even* if but one hour in the week were devoted to the teaching of hygiene, the results would, I believe, justify almost any trouble or expense. When sanitary science occupies its proper place in education, it will be understood and respected by all.

THE PROVINCE OF THE PHYSICIAN AND THE ENGINEER IN THE WORK OF SANITATION.

By W. D. SCOTT-MONCRIEFF, C.E.

There is, perhaps, no greater inter-dependence of professional work between two distinct departments than that which ought to exist between the work of the Physician and the Sanitary Engineer; and it is because the importance of this mutual helpfulness is frequently overlooked that the subject becomes of especial interest in a Congress that has made sanitary progress the object of its labours. As our knowledge of the origin of infectious and contagious disease increases, the work that opens before the scientific explorer becomes daily more and more beyond his capacity to deal with exhaustively; new discoveries result in new departures, and lead to developments that become more clearly defined as they are better known, and in their turn form the subject of further divisions. It is not necessary, nor would it be profitable, to occupy the time of a meeting which has so many practical matters to deal with by discussing the niceties of these sub-divisions of scientific labour; but the distinction between the work of the Engineer and the Physician, and the dependence of each upon the other, ought to be well understood, not only in the light of professional propriety, but in the interest of individuals and of the community at large. There has never been a period more apt than the present for calling attention to this particular subject. Preventive medicine has recently secured for itself certain stepping stones that must become more and more the common property of every sanitary reformer, and these have already, as it were, formed a passage for innumerable workers in fields of labour and inquiry that were but vaguely dreamt of within the last decade. I refer more especially to the labours of M. Pasteur and those associated with him in the discovery of the germ origin of various forms of disease, and it will be the object of the writer to point out as shortly as possible where the province of the Chemist and the Pathologist naturally ends, and the work of the Engineer begins, in this special field of germ-bred diseases.

It is almost unnecessary — but it will be convenient — to recapitulate in a few words the story of the discovery of what proved a crucial test of the falseness of the theory of so called spontaneous generation; and to point out how the skill of a mechanical engineer was necessary to the attainment of certainty in the new theory that organic germs form the *primum mobile* of the process generally known as fermentation. In the first place it should be remembered that the experiments were made by one of the most eminent physicists of modern times, and it must ever be an open question as to how long our ignorance of the true causes of fermentation would have remained unenlightened if the subject had been retained in the hands of chemists who appeared to be its only legitimate exponents at the time.* In 1843, Professor Helmholtz devised a method of filtering a fermenting liquid in such a manner as to allow it to pass into a fermentable liquid, leaving all germs behind it. As this process deprived both fluids of any fermenting capacity, the natural conclusion was that the organic germs were the real causes of the change which must certainly have occurred if they had been allowed to pass. This experiment may be said to have laid the foundation of the theory and practice of preventive medicine in the most modern and the most rational sense of the term. In order to show how physics as opposed to chemistry,—and, in fact, all the branches of knowledge usually associated with the study of medicine,—are still essential to the practical operations required for the filtration of organic germs from fermentable liquids, I cannot do better than relate a recent experience of my own.

A short time ago I was consulted by a gentleman who has become distinguished for the successful introduction of new processes into the art of brewing. The question before us was how best to remove the organic germs and other extraneous matters from beer before sending it out for consumption by the public, and the point at issue was, in fact, how to apply the original discovery of Helmholtz upon an extensive scale. The importance of doing so successfully has already impressed itself upon the brewers of Germany, and it may be looked at from different standpoints. There would be not only

* This doctrine of organic germs, though not universally accepted, had to fight its way for some time against the whole force of chemical authority.—Dr. W. B. Carpenter in the "Nineteenth Century."

a great saving in the materials at present used for clarifying the beer if mechanical filtration could be substituted, but the chances of fermentation setting up after the beer had gone to the consumer would be greatly reduced. Now, the conditions that are necessary to success are as mechanical in their character as any that go towards the working of a piece of machinery, in which wheels and levers are the means to an end. In the first place, the filtering medium required to be of such a nature that the germs were unable to pass through it, and experiments had proved that no sort of woven material that is even likely to be devised would be sufficient for this purpose. Thin layers of dried fibrous pulp, or, in plainer words, paper of a particular kind, had been found to be efficient; and the next question came to be how to apply it. We had a model of a German machine or press before us, and the objections to it were not so much based upon its inefficiency as upon its costliness and the expense of working it. In considering how it might be modified or improved, every point that showed itself in practice to be of vital importance was of a nature that may be described as purely mechanical. How to prevent the paper from splitting along the lines of support; how to regulate the pressure of the fluid in such a manner as to prevent a gelatinous deposit on the surface of the paper, which rapidly becomes impervious to the passage of the liquid after a certain pressure had been reached; how to retain the carbonic acid gas by mechanically restoring it; how best to deal with the waste products; and how to construct the machine in the most economical and effective manner —one and all of these questions occurred, and every one of them were mechanical in their character. And now, in case it should be asked: What bearing all this has upon the heading of the paper,—the Province of the Physician and the Engineer in the work of Sanitation,—it may be well at once to point out how apt the case really is, to prove how dependent the two professions are in the experience of every day life. Supposing the effect of allowing the unfiltered beer to go out to customers, with the elements of a second fermentation remaining in it, were to lead to a gastric disturbance among the members of a household; and supposing a physician were called in to prescribe for the patients. It is not unlikely that the immediate cause of illness could be traced to the beer barrel, and that the brewer might be written to, complaining of the harm that had been the result of his neglect. And here it is that we come to the division of labour between the two professions. It was certainly the duty of the physician, not only to prescribe for his patients, but to discover, if he possibly could, the origin and proximate cause of their illness. But even those who are most inclined to expect everything from a family physician, even after he has displayed the skill of a Pathologist and Toxicologist, could hardly go so far as to expect him to be an authority on the construction of a filtering piece of machinery, the absence or failure of which accounted for the existence of the germs which were the cause of the illness which he was called upon to prescribe for. Many specially trained and skilful mechanicians have been long at work upon the solution of the problem of how to filter beer from fermenting germs, and their labours can hardly yet be said to have been crowned with complete success. It is, therefore, unreasonable to expect that a physician, even if he had the genius, could afford the time to deal with the subject effectively.

But the illustration I have chosen is practically identical with many other experiences in the every day practice of medicine, with this important distinction—that, while the organic germs that are likely to find their way into the beer barrel and affect the health of the consumer are comparatively harmless, there are other classes of organisms infinitely more dangerous to the health of the community, which are more insidious in their attacks and more obscure in what may be spoken of as their habits. What was done by Professor Helmholtz in 1843, when he proved the true cause of fermentation to be the existence of organic germs, has within a very recent period been extended by M. Pasteur and others, who have traced a large number of zymotic and preventible diseases to a similar origin. And here, too, only in a more marked and decided manner than in the case of beer filtration, do we find the province of the physician and the engineer distinctly defined in the work of preventive medicine. If great mechanical ingenuity is required in the construction of a filtering medium and the arrangement of mechanism for preventing the passage of the germs of the yeast plant in a brewery, how much more special skill is necessary to preserve whole communities from the attacks of germ disease so obscure that they are known to us only in the character which they assume when they are polluting the currents and exhausting the fountains of life among organisations of an indefinitely higher order than their own. So far as human knowledge goes, the methods of prevention which are applicable to the filtration of the germs of the yeast plant in a brewery are equally binding in the case of the more subtle organisms which are the cause of zymotic diseases, and as the one process has been shown to be in the department of the engineer, so certainly are the appliances necessary to prevent the attacks of disease in the other. The proper treatment of sewage, both in its carriage and ultimate disposal, is not a matter with which the physician is called upon to deal, but when the noxious gases and the germ life arising from the exposure of human beings to the influence of sewage have produced disease, it is in his province, not only to provide a scientific treatment of the patient, but to trace, if possible, the causes of the outbreak. When the cause has been brought under his notice it is in the province of the engineer to provide a remedy against its recurrence. It is hardly necessary to add that a knowledge of the scientific principles upon which prevention of zymotic diseases depends is hardly within the range of an ordinary builder, and that the physician who advises his patients to have recourse to such an authority incurs a grave responsibility by doing so. The two professions of medicine and engineering, especially in the light of recent discoveries in the field of preventive appliances, are dependent upon each other, and I shall be glad if these remarks have contributed, even in a small degree, towards impressing this truth upon the minds of such an influential audience as that to which they are addressed.

ON SANITATION IN DECORATION.

ABSTRACT OF PAPER READ BY

ROBERT W. EDIS, F.S.A., F.R.I.B.A.

IN THE present striving after the proper application of sanitary science to the improvement of our buildings, public and private, and in the adoption of the best known appliances for the prevention of impure smells and other evils, with which, either from ignorance or carelessness, we have been content to put up for long years, there is clearly shown a desire on the part of the public generally to set their houses more in order, and not to leave to chance or to the speculative builder all those questions of the healthy treatment of the homes we live in, which are especially requisite for their proper sanitary state, and which may fairly be supposed to enter largely into the proper healthy condition of our minds and bodies.

In all matters of the mere decorative treatment of our room there has been evinced an almost equal amount of carelessness as of ignorance, and until quite recently we have been content to paper, paint, and whitewash our buildings without any regard to their healthy and proper decorative treatment. The first elements of truth and simplicity of treatment, of harmony of colouring, and suitability and common sense in the covering of our floors and the furnishing of our rooms, would seem to have been utterly neglected, so that it would, a few years back, have been deemed absurd to discuss any question of wall painting or papering, or any arrangement of floor covering or general treatment of the furniture and fittings of the house, from any mere sanitary point of view. Until quite recently it has not been thought necessary to avoid, as far as practicable, all useless floor coverings and window hangings, and the lumbering old-fashioned furniture which formed dirt and dust-traps in every house; all these floor coverings and pieces of furniture were more or less fixtures, and thus practically prevented the proper and healthy cleaning of the rooms.

In matters of taste there has been, and will always be, great differences of opinion, but as the sense of sight may be said to become interested and affected from our earliest childhood, long before our other senses become fully or practically developed, it is but fair to assume that the harmonious treatment of colours, and the arrangement of artistic forms with beauty and grace, will naturally exercise an equal amount of healthy influence on the sense of sight, as the proper sanitary arrangement of our homes, and the cleanliness and purity of our surroundings, do upon the especial senses with which they are connected—taste, touch, and smell.

Beyond the mere material improvement in the design of all things especially pertaining to what are called the domestic arts, we must remember that there is a right and wrong way of the treatment of our rooms from the aspect of bodily health, and that assuredly our minds are as much influenced for good or evil by the way in which we decorate our walls, as our bodily health is influenced by the more cleanly treatment of the floor surfaces and the general constructive furniture in our rooms.

It must be evident to all common-sense people that all furniture which collects and holds dust and dirt which cannot be easily detected and cleaned, that all window valances and heavy stuff curtains with heavy fringes which cannot be constantly shaken, and that all floor-coverings which are fastened down so that it is impossible to clear away the dust that gradually but surely finds its way under them, and prevents the coverings themselves from being constantly shaken, are objectionable and unhealthy.

The wretched class of building which pertains in so much of what is called the "speculative" class of houses of the middle and lower classes seriously interferes with any real improvement in general decoration and furniture. In the homes of the poorer classes the character of the work and workmanship is often of the most inferior kind: cheap, nasty, and absolutely unhealthy. All this wretched system of building, for which we architects are in no way responsible, exercises an important influence for evil on those who are condemned to live in such houses, and, to my mind, fosters a carelessness and untidiness which affect materially the mental if not the bodily health of the occupiers. How is it possible to be cleanly or tidy in a house in which the walls are breaking out into patches of damp, the woodwork of the floors or doors opening out into yawning cracks, resting-places for dirt and dust, which no amount of cleaning can get rid of? how can floors be kept clean wherein the joints and crevices are filled with decomposing filth? or how can walls be cleansed or dusted which are covered in places with mould, or blisters, from faulty and bad materials? The most tidy housewife might well soon tire of attempting to put her house in order, when all these evils of bad workmanship and bad materials are meeting her at every turn, and thus she is often disheartened, and the moral tone of healthiness engendered by the desire to set things right in her house, and to make all things about her clean and tidy, is lost, by the feeling that no amount of care on her part can make clean or tidy the miserable materials on which she has to work ; and the spirit of tidiness in the house, once done away with, leads to untidiness in other things, makes a house dreary, wretched, and unclean, no longer the pleasant, cheerful home, but a miserable and dirty abode in which the want of cleanliness leads, in a short space of time, to want of health. I have written thus strongly upon the moral effect of bad building in the homes of the poorer classes of the community, because I feel that it is absurd and inconsistent to urge any better system of design and decoration which shall not be useful to them as well as to ourselves, and that it is hopeless to suppose that we can surround ourselves with beautiful art work, if we leave the workers out in the cold, and think not as much for the improvement of their dwellings as our own. If everything about our cottage dwellings is miserable and squalid, hideous and unartistic, how can we expect that those who must find the hearts and the hands to carry on our own work well and properly, can be attuned to truth and beauty in form or decoration when their own surroundings are hideous and unartistic ? If we are to expect any real art knowledge in our workmen, we must surround them with things of beauty; all the teaching in the world in schools of art will not produce a race of art workmen if the lessons are not exemplified, in however humble a degree, in their own home life, and if the work and design which they have about them are tasteless and ugly.

It is perhaps unfortunate that the fashion of the day induces most people to cover their walls with eccentric and curious designs of birds, fruits, and flowers, conventionally or naturally arranged in crowded and oft times spotty patterns, so that the eye is wearied by the constant repetition, and although many of these papers are, in themselves, graceful in design, and fairly good in colour and treatment, there is an absence of repose about them, which, if not actually offensive, is monotonous and disagreeable. To my mind, nothing can be more objectionable and false in art than the overlaying of good coloured plain surfaces with flowers fossilized, so to speak, into unnatural forms, so as to present long-ways and cross-ways, and in any way in which you look at them, clearly marked lines or patterns, or continued spots on the general surface, which fatigue the eye, and perceptibly set up mental irritation even in those who are in good health, and tends to the infinite discomfort and mental annoyance of those who are suffering from sickness or brain weariness. No matter how well drawn or how artistic in general treatment, birds seemingly in flight or cherubs holding swags frozen into rest, seem to me utterly unsuitable for ordinary wall decoration, by the absence in them of all quiet and repose. The pattern and colouring of a paper should be so treated that there should be no spotty effects, and no vividly marked lines to break up the general surface into set forms.

I may here mention that a good deal of illness often arises from the bad nature of the size and paste with which the ordinary wall-papers are hung, and great care should be taken that no such inferior and practically stinking materials should be allowed.

M. Vallin, in the *Revue d'Hygiene*, reports an instance of the danger of this use of putrid size and paste. "A lady," to quote the *Sanitary Record*, "who from time to time came to supervise the decoration of her houses, was three times successively seized with violent sickness and headache, after sleeping in a newly-papered room. M. Vallin was struck with the putrefactive odour which pervaded the atmosphere, and after examining into the matter, came to the conclusion that it proceeded from the wall. It was found that a horrible putrefactive odour proceeded from the size pot, with which the paper-hanger, in the next room, was continuing to hang the wall papers, and that his size was in a state of putrefactive change. On making further inquiries, various other cases have come under his notice in which illness has palpably been produced by the use, by paper-hangers, of size and paste undergoing or speedily entering on septic change; and it is extremely desirable that this should be borne in mind, and if necessary, a little oil of cloves, salicylic acid or some other anti-septic agent should be added to the material which they use for this purpose, or, at any rate, care should be taken to avoid those disagreeable consequences of carelessness, which are only too common."

Various papers are specially susceptible of damp, and should be avoided as much as possible. Amongst these are what are called satin papers, or those which have a glazed or polished surface, like the French imitation satin or moirée silk papers. These are to my mind

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not only undesirable for this cause, but also on the ground of good taste and good art; equally with those papers which are made in imitation of willow-pattern plates, tiles, or marble; for when really good decoration or plain pattern papers, suited to every taste, can be obtained at moderate cost, there is surely no reason for encouraging shams of any kind either in wall decoration or painting.

I cannot advocate too strongly the greater use of distemper colouring for the walls of nurseries and bed-rooms, where for health's sake the wall covering should be changed as frequently as possible, for with the greatest amount of care and cleanliness it must be evident that the absorbent nature of paper must necessarily cause it to retain a certain proportion of the deleterious atmosphere which cannot well be avoided in ordinary rooms where no special provision is made for the ingress of fresh and the egress of foul air.

Bed-rooms especially become tainted after a time by the impure air which is engendered during the long hours of night, when the rooms are closely shut up, and in times of illness; and there is no really effective way of getting rid of this tainted and unwholesome smell except by changing the wall-covering as frequently as possible, certainly at least once in every two years; distemper, therefore, for all such rooms becomes invaluable, for it can be washed off and redone in a few hours at a comparatively small expense, and the colouring may be as bright and cheerful as desired. The walls thus treated are not only much more healthy, but, to my mind, infinitely better than when painted or papered, as, being free from any specific pattern and spottiness, which have anything but a soothing tendency on those who may be suffering from illness, or over-fatigue and taxation of the brain; and although the pigments used in the various colours are practically the same as those used for paints, the colouring matter is much less, and common whiting is used as a basis instead of white lead or zinc white.

Many of the flock papers now made are especially beautiful in design, but they are, to my mind, quite unfitted for the wall-surfaces of a room. The patterns stand out in relief, and offer innumerable spaces for dust and dirt, while the general fluffy nature of the material,—practically powdered wool,—renders it more absorbent and therefore more unhealthy, and the surface holds dust and dirt to a much larger degree than the ordinary printed papers, thus tending to a stuffy and unwholesome feeling, which is essentially at variance with all laws of health and comfort. Stamped papers, in which the pattern is raised in relief, offer the same objections in a minor degree, as the surface is smooth and can be readily cleansed; and in the case of the imitation leather papers, the surface is varnished, and can be readily gone over with a damp cloth without injury.

In bath-rooms and w.c.'s it is most desirable that the wall-surface shall be as non-absorbent as possible, and paper, unless varnished over, should generally be avoided, and when used should be of some plain, simple pattern, and not a bad imitation of tiles or marble.

All internal wood-work should be treated in flat tones of colour and varnished; the surface thus treated is easily cleaned and wears much better than when left, as is usually the case, unvarnished. It is essential for health's sake to carefully consider all these points; a little extra expense in varnishing the painted surfaces of doors, shutters, and the general joiner's work in a room will make the house much more healthy, and, by the protective quality of the varnish, save, in the long run, much labour and expense in re-painting.

For many years we have been content to cover the whole surface of our floors, whether in the sitting or bedrooms of our houses, with carpets fitted carefully to every angle and recess, and nailed tightly down to the woodwork; the ordinary cleaning has been done by sweeping over the surface, by which a certain amount of dust and fluff has been removed; but by far the greater portion, after helping to make the room foul for a while with clouds of filthy particles of accumulated dirt held in suspense in the air, settles again, in part, on its original resting-place, and in part on every piece of furniture and every ornament and projection in the room, necessitating constant labour in cleaning. For months this dust and dirt has been left to accumulate in and under the carpets, the floors never being washed, and the carpets never properly beaten and cleaned, until the usual time of spring or autumn "cleaning" took place, and thus infinite labour has been required to keep the rooms fairly dusted and pure.

In no room or passage should the floor-covering extend over the whole surface; and in no case should either carpet or rug be laid under any piece of furniture which is not easily removable, so as to admit of its being readily taken up for frequent brushing or cleansing outside the rooms.

In most cases the wooden floors of our houses, even where laid in the most careful manner, are liable to shrink, so as to leave spaces between the boards through which dirt falls and remains boxed up for ever in the spaces between them and the ceilings under, or until the spaces themselves get filled up with soap and dirt after many years, so that practically we must not wonder that there is generally a close and unwholesome smell clinging to the rooms, no matter how well they are ventilated, owing to the accumulation of decomposing and decomposed filth in the interstices of the boarding, which every cleaning only increases ; while in the older houses the floor-boards—which are always wider than those in modern buildings—have either shrunk or got worn in the centre so as to leave uneven surfaces, which all tend to unhealthiness by the spaces thus formed for accumulation of dirt and dust.

A remedy may be found for all this by carefully cleaning out all the dust-spaces I have referred to, and by stopping them in with good oil putty, and then painting in four or five coats of paint, or staining, and wax-polishing the whole surface of the floors. By these means they will be made much less pervious to dust, and there will be no spaces left for its gradual accumulation ; the dirt and dust will be much more readily seen on its surface, whether painted or polished, and the floors generally will be much more readily cleaned.

On these painted or polished surfaces, square carpets, rugs, or matting can be laid, the borders being left clear so as to form a pleasant contrast. The saving of cost would be considerable in all this kind of treatment of floor surfaces, and the result infinitely more artistic and healthy.

Everything about the house should be made useful ; all ledges and unnecessary dust spaces should be carefully avoided, and everything so arranged that it may be easily cleaned with as little labour or trouble as possible. All furniture which has superfluous carving or moulding should be avoided, and simplicity, utility, and common sense should take the place of the excessive ornamentation, with which much of the modern type of furniture is overladen, to the detriment of health and the loss of money. There is no reason why we should "convert our homes into pest-houses by a style of furnishing which renders accumulations of filth not only likely but positively inevitable."

If health and comfort are to be considered in furnishing, it must be self-evident that none of the bulkier pieces of furniture should be so made that they cannot be readily removed, to permit of the floor space under being cleaned and washed ; or, failing this, there should be sufficient space left open under them that all dirt and dust may be easily seen and removed. If a heavy piece of furniture is made to fix close down to the floor, or open only a few inches under, it must follow that the space below cannot be got at, and that it must necessarily form a resting-place for dirt which cannot be got rid of, and must remain until, at great cost and labour, the furniture is removed for the annual spring or autumn cleaning.

If there be any truth in the assertions that are made that nausea and general lassitude, not to speak of any severer forms of illness, are engendered by want of attention to the proper healthy arrangement of our homes, and that dirt and dust are to a certain extent equally conducive to the unhealthiness and unwholesomeness of our houses as defective drainage and bad ventilation, it must be admitted that we have yet much to learn for the more practical and better fitting up of the rooms we live in, and that too much care cannot be exercised in providing that, so far as practicable, all extraneous and useless ornaments and unhealthy fittings shall be avoided. Many people litter their rooms with all kinds of lumber, until there is hardly a corner free from it. They cover their floors and tables with fluffy mats of various kinds, which hold all kinds of dust and dirt, and which, like pitch, you cannot touch without "being defiled." With the best of servants and the best of supervision, it is impossible to keep such rooms pure and wholesome. Things stowed away in all sorts of odd corners, wherein they are left undisturbed for months, must breed dirt and disease; and while it is, of course, necessary that in every household there should be storing-places for all sorts of things only required for a season, and then to be stowed away, such kind of storing-places should be made suitable and convenient, so that they can easily be got at and easily cleaned.

The bed-rooms of a house should be kept as free as possible from all useless hangings which impede air circulation; the furniture simple and useful, well made and dust-tight; the floor-surface left free all round the walls and under the bed and wall furniture, and carpeted only so far as is necessary for comfort; all ledges and resting-places for dirt should be carefully avoided, such as Venetian blinds, valances to beds and windows, and inaccessible shelves; the fire-places left open, not closed up as is often done in the summer-time with curtains and useless hangings; the woodwork polished or varnished, so as to be easily cleaned; and the walls covered with simple pattern papers or distemper, so as to present no spotty surfaces for the eye to rest upon.

With all the vast improvements that have been made in design and construction in the various trades especially applying to the decoration and furniture of houses, there can be no difficulty in making our rooms healthy, comfortable, and artistic. With the same common sense and common care that pertain in other matters of life, our homes may be made pleasant and beautiful instead of inartistic and unhealthy; and by a careful regard for use and suitability, and an avoidance of all that is false and meretricious, we may obtain a more healthy, simple, and really artistic style in the decoration and furniture of our houses, by which the homes we live in will not only be comfortable and healthy, but artistic and beautiful.

The PRESIDENT, Dr. Carpenter, said they had only a short time at their disposal, and therefore he would at once propose a vote of thanks to the readers of the papers whom they had heard that afternoon, and also to those gentlemen who had not addressed them, because they had taken a great deal of time, trouble, and care in preparing the papers which, owing to the want of time, they had been unable to hear read, and he was sorry they had not had the pleasure of hearing them. The work done there reminded him very much of those toys which were cut out in several pieces and little children had to fit them together. The whole of the papers they had listened to fitted together as a kind of addition to the splendid address they heard at the opening of their meetings. The papers seemed to bear upon the whole of the subjects introduced into it. He touched briefly upon the subjects treated upon during the day, and specially referring to Mrs King's paper said it ought to be distributed throughout the length and breadth of the land. He must mention the presence of one gentleman. He referred to the Rev. Dr. de Collville, whom he would have liked to hear in connection with the subject of Vegetarianism. He proposed the vote of thanks. (Applause.)

Mr J. R. HOLLOND, M.P., observed that he need hardly say it gave him great pleasure to second the vote of thanks. He was sure the papers which had been read during the three days of the Congress would bear comparison with similar papers read at Congresses held elsewhere. The subjects, of course, had been very varied. A great many aspects of different subjects had been brought before them, and his regret had been that the time allowed for discussions had scarcely been sufficient, when they considered the importance of the subjects. But that, after all, was a fault on the right side.

The PRESIDENT put the resolution to the meeting, and it was carried unanimously.

The proceedings of the Section then closed.

GENERAL MEETING OF ASSOCIATES,

Friday, December 16th, 5 p.m.

Immediately on the conclusion of the business of Section "C," the President of the Congress (Dr. Richardson) took the chair.

The President: I am sorry to say, ladies and gentlemen, on resuming the chair for the transaction of the general business of the Congress, the first resolution to be put before you will be a very painful one indeed, and yet I know it will meet with your entire sympathy and approval.

Dr. Carpenter then rose and said: The resolution which it is my privilege and my duty to move, is one of condolence with the family of my old friend, Sir Antonio Brady, in the misfortune that has fallen upon them. Those who have had the privilege of a personal acquaintance with that fine old English gentleman, will feel the great loss that his removal from our midst has entailed upon us. He was one who corresponded in appearance to our Nestor upon my right, Mr Chadwick. He had been one of the foremost promoters of sanitary work in this country. He largely assisted in meeting some of the troubles that fell upon us during the Crimean war, and obtained by his labours the dignity of knighthood. His last work on this earth was the preparation of his paper for this Congress. Almost the last words he spoke had reference to that paper, and the last letter he wrote was written to myself upon the subject. The work is, therefore, left to us as a legacy, and, given to the world, in the way in which it is to be done, it will bear its fruits. The work of Sir Antonio Brady will exist after he has been forgotten in other ways, and it was most remarkable that, at the very time the family were burying him, we were hearing his paper read. I move "That this meeting has heard with the deepest regret of the death of their much esteemed and distinguished colleague, Sir Antonio Brady, and herewith request the President of the Congress to convey to Lady Brady and her family sincerest condolence and sympathy for an event which to them, and to the public also, is so great a bereavement."

The MAYOR OF BRIGHTON said: I am grieved to have occasion to second this resolution of a vote of condolence with Lady Brady and her family. In the course of the correspondence which I had to carry on, Dr. Richardson being at a distance from the seat of the intended Congress, I had a letter from Sir Antonio, in which he expressed deep sympathy and earnest feeling in the work of the Congress, and stated that, although his health was then rather feeble, he had great hope of being here at the beginning, and of being at the whole of its work. Such interest did he take in this meeting that I feel, as one representing those in Brighton connected with the Congress, we are doing a proper and kindly thing in joining in this vote of condolence. (Hear, hear.)

The PRESIDENT: You have heard the vote of condolence. I need do no more than put it to you. I am sure it will be carried unanimously.

The resolution was agreed to unanimously in solemn silence.

Mr CHADWICK, C.B., said he remembered some old verse as to the qualifications of a Mayor, with the burden that "dulness marked him for a Mayor." (Laughter.) Now he thought the present Mayor of Brighton was one who was the reverse of that which provoked the old appreciation of Mayors. (Hear, hear.) He was a Mayor that would facilitate every method of doing things for the benefit of the town which he represented. (Hear, hear.) They would be sorry to pay a visit to Brighton without manifesting or promoting some advance upon the conditions of things as they were. He believed Brighton was a town of very great capabilities indeed, and he hoped to see it one of the first advanced, and, in fact, the most improved health resort near London, or in the kingdom. He believed it was capable of being the chief one, but they must achieve this end by a good deal of sacrifice and exertion. Matters that might at first appear insurmountable could, and he still hoped would, be achieved. He considered that the present death rate of 19·0 per 1000 might, by the prosecution in matters of Sanitation, be reduced one third. He believed this Congress would contribute to the advance of which he had spoken in various ways, and on the whole he congratulated Brighton upon having such a man as Mayor—such an initiator of Sanitary improvement as this Congress had proved to be. (Applause.) He thought Brighton and other places would derive benefit from the example which the Congress had set. (Hear, hear.) He therefore proposed "That the best thanks of the Congress are due to His Worship the Mayor of Brighton for his untiring efforts and skilful energy in carrying out the work of a first Health Congress, locally originated, which has ensured over a thousand associates, and from beginning to end has been so complete a success."

Mr J. R. HOLLOND, M.P., said he rose to second the motion, and to add very willingly his word of tribute to the energy and zeal of their Mayor. (Hear, hear.) The duties of Mayor of Brighton, even under ordinary circumstances, were not such as to make the office a sinecure, and when they remembered that in addition to those ordinary duties the Mayor had had the whole responsibility of initiating such a Health Congress as they closed that evening, they must feel that, unless he was a man of vigorous energy, it would have been impossible that all those duties could be properly performed. (Applause.) He was sure that those who had been present during the three days' sittings of the Congress must know that in Mr Alderman Hallett they had a man who was equal to any amount of energy, and that his zeal and pleasure in doing the work must have been a grateful matter to all who had worked with him. (Applause.)

The resolution was carried unanimously.

The MAYOR OF BRIGHTON, in response, said he was sorry to confess there must be an end to all things—even to these delightful meetings. It had been a pleasure to him to superintend the arrangements for the Congress, especially as he had the knowledge that it had not been held at the bidding of any Society, however great, but that it had originated in Brighton. In proof of the success of the Congress, exclusive of the day ticket holders, 1,151 associates' tickets had been disposed of. (Applause.)

Major EDIS proposed the next resolution with the greatest possible pleasure, because that was not the first occasion on which he had been the recipient of the hospitality of the Corporation of Brighton. He acknowledged the great courtesy and assistance he had received, as a Commanding Officer, at the hands of the Corporation on the occasion of the Easter Volunteer Reviews. He, therefore, had the heartiest pleasure in proposing "That the best thanks of this Congress are due to the Corporation of Brighton for the use of the rooms, and the many facilities afforded them for the work of the Congress; and to the other public and private bodies for their generosity in throwing open so many places of interest for the instruction and pleasure of the Associates." When they found private people and public companies opening to them everything that was at other times private, it behoved them to give a vote of thanks to those persons who had provided so many places of interest for them to visit. (Applause.)

Mr H. H. Collins seconded the resolution.

The Mayor acknowledged the vote of thanks on behalf of the Ex-Mayor (Mr Alderman D. Smith, J.P., D.L.), who was absent owing to indisposition, but who had for a short time attended the Congress, notwithstanding his doctor's orders, — which, by the bye, was scarcely the proper thing for a member of a Health Congress to do. (Laughter).

Mr Brudenell Carter moved "That the best thanks of this Congress are due to the gentlemen composing the Executive Committee for the successful energy they have displayed in carrying out the onerous details connected with the work of the Congress, and to the Congress Secretary, Mr Benjamin Lomax." He praised the services of the Executive Committee, and particularly those of Mr Lomax.

Mr Henriquez, in seconding the resolution, said from the magnificent address of the President, which gave the keynote to the whole of the Congress, throughout the subsequent proceedings, they had literally no point to which they could take exception. All this was greatly due to the Executive Committee, and on the principle of giving honour to whom honour was due, he was sure they would agree that the Committee were justly entitled to their grateful thanks, and that Mr Lomax was entitled to a little extra thanks. (Applause.)

The resolution was carried.

Mr Lomax, in responding, referred to the readiness with which the Executive Committee had gladly laboured to promote the success of the Congress, and the support that had as readily been accorded them on all hands.

Dr. Tindal Robertson said he felt it a distinguished privilege, as an old friend of the profession, to ask them to give a vote of thanks to the President. As a medical man he paid a tribute to the intelligence displayed in the papers read, and added that the speeches of Dr. Richardson and Dr. Carpenter would bear comparison with any which had been made on the subject of Sanitary Science. Therefore the people of Brighton had reason to be proud of what they had done in this matter. He incidentally adverted to the poetic beauty and the wisdom of physiological thought contained in Dr. Richardson's address, but said it was not for these qualities alone that he asked them to vote for the resolution. Dr. Richardson had claims upon them for all the labours he had unhesitatingly given on behalf of Sanitary Science. His name would be handed down to posterity, and it would be remembered with gratitude when the whole benefit of his labours were recognised in years to come. (Applause.) He moved "That the cordial and grateful thanks of this Congress be accorded to Dr. B. W. Richardson for the distinguished services rendered to it as its President, and for the originality, brilliancy, and practical thought displayed in his inaugural address."

Mr G. J. Holyoake said he owed the honour of seconding the vote of thanks to Dr. Richardson to the fact that he (Mr Holyoake could be depended upon to speak briefly, to say exactly what he meant, and to mean exactly what he said. Dr. Robertson had discerningly remarked that there was poetic feeling in Dr. Richardson's great address. It had wise, practical thought also; but its brightness of statement was a great merit. There were those who killed important truth by prosaicness, from which not even by machinery could an interest be extracted; while it might be said of Dr. Richardson, in the words of a great speaker, that "the forehead of his sentences was lit by the rising sun." Physicians told us of fatty degeneracy of the heart. We had heard from Mr Courtney that a fatty degeneracy of the conscience was more to be feared, but there was a worse disease among philosophers, namely, a fatty degeneracy of the intellect, which rendered many supine in diffusing among the people the truths their own minds knew. Dr. Richardson, on the other hand, imperilled or neglected the emoluments of his splendid profession and well earned repute to render generous service to the people. He had the ardour of science; science whose instinct was truth; whose passion was discovery; whose rapacity was for facts; and whose policy was intrepidity of statement. Because Dr. Richardson had these great qualities he seconded Dr. Robertson's motion.

The motion was agreed to.

The President thanked them from his heart for this vote of thanks. "Poor as he was he was beggar even in thanks." He did assure them that to him it had been the greatest possible pleasure to accept the office. Even if he had not been thanked it would have been a pleasure, and their thanks more than repaid him for anything he had done. (Applause.) He concluded by referring to the great power of the Press, and proposed "That the best thanks of this Congress are sincerely tendered to the gentlemen representing the Press, who have so ably reported the proceedings, and to the Press generally for its most valuable assistance in making the proceedings of the Congress so widely known."

The Rev. Dr. DE COLVILLE, in seconding the motion, gracefully acknowledged the services of the Press in relation to the proceedings of the Congress.

The resolution having been put and carried, the meeting concluded.

EVENING ADDRESS,

Thursday, 15th December, 1881.

ON THE PROPAGATION OF DISEASE THROUGH FOOD AND DRINK,

BY

R. P. B. TAAFFE, M.D., Lond.,

M.S. Lond., F.R.C.S. Eng., Exam., C.S.S. Lond. and Camb., Medical Officer of Health for Brighton.

The man or woman who never leaves his or her own home nevertheless lives in at least two houses; the one built, say, of bricks and mortar, the other of materials which are converted by physiological and chemical processes into the mortal body in which we have our being or life. Sanitary science requires that the first shall be built of good and proper materials, that there shall be no admixture of sea sand in the mortar used, that the lime and sand shall be in proper proportion, and that all wood used in the building shall be sound and well seasoned, that its sanitation shall be rigorously attended to as regards ventilation, warming, cubic space, dryness, gas and water supply, that provision shall be made for the supply of fresh and pure air, and every means taken to prevent the entrance of sewer gas and the speedy removal or destruction of all matters likely to cause a nuisance or be injurious to health; so also sanitary science or preventive medicine, called by Corvisart conservative or preservative medicine, requires that every precaution shall be taken that the materials out of which our other or bodily dwelling is constructed shall also be of the best and purest kind. The materials out of which this bodily dwelling is built are food and drink, and it is exactly as this food and drink are sound, pure, and wholesome, that the bodily dwelling is properly constructed and fitted to discharge, through its various organs, healthy functions which are necessary to the prolongation of life and freedom from disease. "Who can doubt," says Condorcet, "that healthy aliment and lodging, a *regimen* which will develope energy by exercise without wasting it by excesses, the removal of the most potent causes of degradation, abject poverty, and superfluous wealth, will prolong the lifetime of men, insure more constant health and more robust constitutions." Here we find that healthy aliment and lodging are the two principal conditions to which all others are subsidiary though necessary adjuncts. The diseases which may be propagated through the media of food and drink are parasitic, tubercular, and infectious diseases. 1st. The parasitic:—Animals, notably the pig, sheep, oxen, cows, calves, deer, hares, rabbits, and probably others, are liable to become infested with the early stage of tape-worm in the following manner: they take in with their food the ova or eggs of tape-worm, these eggs become hatched in the intestinal canal of the pig, sheep, &c., and the young brood of worms pierce the mucous membrane and walls of the intestine and pass into the tissue between the fibres of the muscles of the body where they become surrounded by a small bladder formation; when the flesh of the animal so infested is eaten by man, the bladder formations or cysticerci become developed in his alimentary canal into tape-worm—that is, the tape-worm has its development matured in two animal bodies, the one wherein it lies in the form of cysticerci or bladder-worm being called the host. I have described how man can be infested by an animal, but the process can be reversed, and animals infested from swallowing the ova of the tape-worm of man. Cats are subject to a peculiar form of tape-worm, which they acquire by eating mice infested with the cysticercus, which forms the first stage of the worm. There is a very fatal disease called hydatids, generally found attacking the liver or lungs of the human subject, which is acquired by swallowing the ova or eggs of tape-worm called *tænia echinococcus*. Man may become infested by these parasites, either by taking them with food containing the cysticerci, or through drinking water which holds the ova of the worm, or through milk which has been adulterated with impure water which has the ova. This disease is spread very largely by dogs, and it is on this ground that dogs should never be allowed to be anywhere where animals intended for food are slaughtered; by being there they eat the offal and so become the subjects of tape-worm, and roaming about gardens and other places, distribute the ova of tape-worms over vegetables, lettuce, water-cress, and also distribute them in water. A cycle of infection is said to exist between dogs and sheep—one of the evils attending that useful animal, the sheep dog. The cat also is a medium by which the tape-worm is propagated to man. I do not think that ladies' pet dogs run so much risk of becoming infested as do dogs which roam at large and eat any offal which they can get at; dogs should not be fed on offal, more particularly the offal of rabbits and hares. There is not much chance of ladies' pet dogs eating animal offal, for these lucky creatures are generally fed on the daintiest fare, the choicest morsels from the joint, the wing of a chicken, or a prime mutton chop; thus these pets escape Scylla, but they frequently fall upon Charybdis, and become troubled with an unweildly amount of fat, with probably fatty heart and liver. The cysticerci, or bladder-worms, constitutes the disease called measles in the pig, and are from one-eight to half an inch in diameter. In the old bladder is a slit, and by making pressure with a camel's hair brush the head and some joints of the worm may be made to protrude. Measles, or cysticerci, may be recognised in the pig by being felt on the inner side of the eyelid, or by being felt or seen on and extracted from the lower side of the tongue. There is also generally inflammation of the mucous membrane of the eye, commonly called a cold in the eye. Measles are not often found in English pigs, but are very prevalent in Irish. In the latter country the animal is more privileged, and constitutes very often a member of the common household, and probably roams at will. That sagacious animal, which thinks he is going to Kinsale when his owner is all the time taking him to be sold in the market at Cork, has neither knowledge nor instinct enough to avoid eating garbage which contains the ova of tape-worm. Pigs in large breeding establishments are generally free from infection, doubtless owing to the greater amount of care and inspection to which they are subjected. It appears that when pork can be cured and converted into bacon, that the cysticerci die, and become harmless. Salting and smoking kills them, and they are also destroyed by perfect cooking. Dr. Thudichum examined many thousand sections of beef, and never found a cysticercus. It appears that the calf only can be infected, and that the cysticerci do not long survive the adult stage of the host in which they live, therefore all veal should be well and thoroughly cooked. Jews are subject to tape-worm; they do not use swine's flesh for food. The flesh of the bullock (not cows) is used, and carefully inspected, and the subsequent mode of cooking would kill the germs, therefore it is supposed that the infection is through the medium of watered milk; the longevity of these people is doubtless owing, in a great measure, to the care used in the *inspection*, *selection*, and *preparation* of their food. Not only the tape-worm, but other forms of entozoa or worms are propagated through the media of food and drink, but in the latter case it is due to the direct introduction of their ova or eggs into the human alimentary canal; it can happen from swallowing the ova with vegetables, or in water, or in milk adulterated with water. The *trichina spiralis* is another parasite or small worm to which man is subject—so-called by Professor Owen, from its likeness to a hair twisted or coiled into a spiral form; trichinæ are found developed and encapsuled in mice, rats, moles, hedgehogs, guinea pigs, and badgers; pigs are supposed to get their trichinæ from rats as carriers. In the horse and calf young trichinæ are born but are incapable of piercing the mucous membrane of the intestine. When the flesh of an animal which contains trichinæ is eaten, the young brood of trichinæ which are born pierce the mucous membrane of the alimentary canal and are conveyed by means of the blood vessels, and lymphatics, and distributed to all parts of the body; a pork chop will show them, whereas measles are principally found about the neck. It takes a space of four days for the brood to become distributed, during which time, if the infection is discovered, they can be dislodged, the remedy considered best being large doses of calomel. A portion of a muscle, taken after death from a child 4½ years old, was examined, and in one grain of the muscle 100 trichinæ were found. The muscles of an adult weigh 40lbs., and if infected in the same proportion as were that of the child, would contain 28,000,000 of trichinæ, quite a population to carry about; taking each trichinæ to measure from five to six millimetres in length, the 28,000,000 in a line would give 140,000,000 millimetres, or 90 English miles. One pig has been known to infect 158 persons, of whom 28 died. The only method of ascertaining the existence of this disease is by looking (as in the case of measles) at the mucous membrane covering the muscles at the root of the tongue, or by means of an instrument like a harpoon taking a piece out of the muscle. One person who was harpooned or vivisected in this way declined a second operation, but I should imagine the administration of chloroform might have got over that difficulty. The first cases of trichinatous disease were discovered in England, the subjects being an Italian and an Irishwoman. According to our present knowledge, it is not possible to state with certainty how many people are the subject of trichiniasis; of late years it has become the custom, when a doctor is unable to say what disease his patient is suffering from, that in all probability the affection is suppressed gout; perhaps we may now prognosticate it to be either suppressed gout or trichiniasis. There is no remedy that will absolutely prevent trichiniasis. Fielder shewed that alcohol, pyroligneous acid and acetic acid killed trichinæ, he also believed that the degree of heat which coagulated albumen (145° to 165° F.) killed trichinæ; cooking if properly performed affords perfect security against the whole of the entozoa. There should be no such thing as red gravy in cooked meat, more particularly pork, veal, rabbits, and hares; the lower classes of society should be taught cookery; underdone meat is supposed to be more nourishing as it is more juicy and more tender, and raw meat is now frequently prescribed for children. By not over cooking, joints appear more bulky and heavier than well or thoroughly cooked. The absolute rule should be that all cooked food should be served piping or boiling hot, the centre of the joint should have a temperature of 85° Centigrade (or 185° F.), and slow boiling is the best to enable this temperature to be obtained. It has been laid down that a ham of 11lbs should be boiled for three hours, a piece of salted meat under 12lbs four hours, and above that weight, one hour for every 2lbs is indispensable. Trichinæ have been found in eels and pike, and parasites have been discovered in other kinds of fish. The same rule as to thorough cooking applies to fish. In Germany several of the Town Councils ordered a microscopic examination of all pork immediately after slaughtering, a magnifying power of only 100 diameters being deemed sufficient for the examination. It is a question for consideration how far it may be desirable to employ skilled inspection of all meat exposed for sale, or immediately after the animal has been killed. This, of course, can only be done where there are public abattoirs, and it is one of the many strong arguments in favour of these being established, for it would be impossible to institute such an inspection so as to be perfectly satisfactory with our present resources. 2nd—tuberculous disease. The subject of the transmission of tubercular disease, of which consumption is the most familiar form to the general or non-medical public, through the media of meat and milk, is one teeming with interest. In 1880, Professor Creighton, of Cambridge University, on comparing the *post mortem* appearances of twelve persons who died of tubercular disease came to the conclusion that those appearances resembled or were identical with those observed in cases of bovine tuberculosis or tuberculosis of the cow or ox, that is, the *post mortem* appearances were the same. Dr. Creighton says, "my contention is that these cases of tuberculosis are all of them cases of bovine tuberculosis, and that they shew the distinctive and specific characters of that disease in their pathological anatomy and are related to it in their etiology, and that they have precisely that relation to bovine tuberculosis which glanders in the human subject has to glanders in the horse. Bovine tuberculosis is a disease by itself as much as glanders is ; Schuppel concludes that bovine tuberculosis is identical with the ordinary indigenous tuberculosis of man." Professor Creighton is of opinion that the twelve cases which he had examined after death were cases of bovine tubcrculosis communicated to man. Bovine tuberculosis has been called "duckweed" by the older veterinary surgeons, from the resemblance the out growths of the mucous membranes have to the dense masses of small oval or round leaves that float on the surface of a pool ; the later and more usual name for bovine disease is pearl disease ; the French name it the potatoe disease (Pommeliere),in Scotland it is called angle berries, and the common English name is grapes. All these varieties are considered to be one and the same disease, and it is that form called pearl disease which appears to be the one communicated to the human subject. It is primarily a disease of the ox or the cow. Professor Creighton believes that at a not too distant day tubercle corpuscles or minute organisms will be found in the tubercle nodules, having a close family likeness to other minute organisms. Virchow, in an address to the Berlin Medical Society in 1880, said, "we must in any case bear in mind that no man has ever yet acquired pearl nodules through partaking of tubcreulous flesh; Professor Creighton maintains that his twelve cases prove the contrary. Bovine tuberculosis is, according to Creighton, a wide-spread disease ; 2·16 of all the oxen and cows slaughtered in Augsburg in the course of 1877 were affected, among cows alone 4·75 per cent. It is a matter of much practical importance that the use of the milk of tuberculous cows is entirely uncontrolled. The disease is generally admitted to be hereditary, and is met with in its worst and most advanced stage in milch cows, especially those kept in towns, where they are subjected to close confinement and artificial food. It is said that there is no question but that the milk of cows in a more or less advanced state of tuberculous disease, is being constantly consumed both by infants and adults in this and other countries, and that in all probability the greatest source of danger lies in the use of milk from animals having tuberculous abscesses in the udders; experiments have shown that when some of the common domestic animals have been fed with milk of tuberculous cows, tuberculous infection has resulted. Guinea pigs and rabbits are most easily affected; the poison is not rapid, but of slow growth. In experiments such as the foregoing, of course there is always the possibility of the animals being already, previous to inoculation, affected with tubercular disease, therefore doubtless it will be necessary that experiments on a numerous scale must be carried out before the point is thoroughly made out, that animals inoculated with turbercular matter, become affected with tuberculosis. The 10th report of the Medical Officer to the Privy Council contains a report of a series of experiments, made by Dr. Burdon Sanderson, in which he shows that tubercle can be inoculated successfully in guinea pigs with production of tubercular disease. Dr. Carpenter, of Croydon, at the International Medical Congress, whilst admitting that meat and milk from diseased animals kept in close confined places could not be regarded as a wholesome food, yet he felt confident that they were not likely to propagate tubercle. As regards meat, 90 per cent. of animals used as food are supposed to have tubercle to some extent, and no apparent harm has resulted from consuming their flesh, and, on the other hand, tubercle mostly prevailed amongst the children of the poor working classes, who had but little milk. Dr. Gunther, of Dresden, also stated that experiments with tuberculous milk at Dresden had only led to negative results, and phthisis did not appear to be specially prevalent where milch cows were found to be most affected with the disease. I, myself, have never casually observed any particles in meat brought to table, or previously, having the appearances described; if they do exist it is probably in those parts which we do not generally see, in the lungs for instance. Then, again, tuberculous disease seldom arises in the human subject when it cannot be traced to hereditary taint. I can very well imagine, if a person is predisposed to the disease, that flesh or milk which is taken from a sickly or diseased animal cannot be calculated to nourish and in this way act indirectly without actually transmitting or propagating it. A Sussex farmer, who has had a number of cows for years, tells me that consumption in cows is unknown to him. Mr Burt, veterinary surgeon, of Brighton, says the disease is a rare one in his practice. Villemin, one of the first experimenters, regards tuberculosis as a zymotic disease, so much does he believe in its infectiveness, he experimented on rabbits and guinea pigs and dogs, and to this conviction he has been led by the following considerations. 1st. Tubercle, like zymotic disease, is rarely met with in elevated situations. 2nd. It is most prevalent in crowded populations, and especially in great manufacturing and commercial towns. 3rd. Persons who live in common and are confined in their dwellings, such as prisoners, inmates of monastic institutions, &c., are liable to tubercle. While, 4th. Those who live in the open air or lead a nomadic life are comparatively exempt. 5th. The frequency of tubercle is greater among soldiers when in barracks than in armies in the field. 6th. Those who live with phthisical individuals "in close and ill-ventilated dwellings" are apt to become phthisical. 7th. Phthisis, unknown to certain savage races before their intercourse with Europeans, is now their most destructive scourge. 8th. Bovine phthisis prevails most among animals that are confined and overcrowded. 9th. The contagiousness of phthisis has always been matter of common belief. 10th. In its development phthisis resembles several of the zymotic maladies. At present the two principal views other than that of Creighton are :—1st. That the inoculation of tubercle produces a mechanical irritation and so produces a deposit of tubercle around the particles. 2nd. That the material consists of living matter, capable of growth by assimilation of new matter similar to itself or of causing morbid transformations in the tissues with which it comes in contact. Prolonged feeding with milk of tuberculous cows has, it is said, produced the disease in the calf, lamb, goat, pig, and rabbit. Dr. Creighton calls special attention to the relation which he believes holds between the milk supply and epidemics of fever of a typhoid type ; in one such epidemic which occurred in an industrial school at Bristol all the cases which died showed a tubercular invasion of the serous membranes; he therefore inclines to believe that this was an epidemic of tuberculosis and by inference of bovine tuberculosis, and he asks whether it is not possible that an acute infectious process, not distinguishable from typhoid fever, should be set up in isolated cases by the bovine tuberculosis. Klebs believes in a tuberculous virus, and in its latest form this doctrine asserts the existence of a specific minute organism to whose agency the infection is due. 3rd. Infectious Diseases—

Diphtheria. There is at present a very strong suspicion that diphtheria is spread through the medium of milk or other drink, for of course if one fluid can be a medium for transmission so can another. Many instances are on record where the milk supply has been deemed the carrier of the disease. Dr. Jacob reports an epidemic of diphtheria at Weybridge, Addlestone, where he found that 11 families had stipulated for milk every day from the same cow; to meet their requirements the milk of two or three particular cows was set aside and distributed separately under the name of *nursery milk*, the surplus, if any, of such milk being added each day to the bulk of the supply. Out of the 11 families, nine, or nearly 82 per cent., were attacked with sore throat, while of the remaining families who drank the rest of the milk, only 15 per cent. were attacked, so that there was a special incidence on the consumers of the nursery milk. The *British Medical Journal*, March 29th, 1879, mentions that Dr. M. C. Keith, of Lincoln, Nebraska, wrote to the *Chicago Inter-Ocean* charging much of the diphtheria to eating white Irish potatoes. He says some 17 years ago, his father, Dr. Alvan Keith, late of Augusta, Maine, had his attention called to the fact that children, who were not fond of the tubers known as the Irish potatoes were not subject to attacks of that much dreaded malady—diphtheria. Following out this hint, he advised families of his friends to avoid the use of this vegetable among the children; and until his decease, he was accustomed to make the assertion that rotten potatoes produced the throat disease known as diphtheria. In my practice (says Dr. M. C. Keith) in this city and county, the offer has been to treat anyone, free of compensation, if they would avoid the use of Irish potatoes. As a sequence, not one of the patients who was not a potato eater has been threatened with the disease. In many of the inland towns of this State the writer had patients; and in some of the infected districts the families of those who have learned of this simple preventive have escaped any attack of throat disease, although the potato eaters on either side of them have, unfortunately, had cases of diphtheria which resulted fatally. The writer rests his assertion upon a record of 12 years of his father's practice prior to 1861, and 17 of his own, covering a period of 29 years, and including a personal knowledge of 1,100 cases of diphtheria. It is believed that sweet potatoes do not have the effect of producing any disturbance in the human animal economy. Talemon, in a paper read before the Société Anatomique, says he obtained by means of the cultivation of false membrane taken from eight undoubted cases of the disease, a fungus which consisted of long jointed mycelial rods, and spores of two kinds, the one oval or round, and giving rise, by a process of gradual elongation to the mycelium—the others rectangular, and shewing, after a short time, minute brilliant specks in their interior about the size of an ordinary micrococcus. These rectangular bodies he considers to be conidia, and the micrococcus-like specks which subsequently develop in them are, he thinks, the veritable germs of the fungus. In pigeons, in the false membranes cultivated on the inside of the cheeks as in the false membrane of man, are epithetical cells, fat granules, micrococci, and bacteria. Scarlet fever. —Numerous instances are also recorded where the spreading of scarlet fever has taken place by means of milk, and it has generally been traced to the fact that either some of the milkers had recovered from scarlet fever, while in the desquamating stage, and so directly infected the milk, or that some one in the family of a milker, or of some person or persons engaged at the dairy, had been suffering from the disease. Another explanation is that the persons distributing the milk, that is, the milkmen are in the habit frequently of placing their cans inside the customers' houses or in the passage while they chat with the servants, and in this way, should fever be present in the house, the milk becomes infected. From information I have received, it appears that the rule is for the milk called *nursing milk* to be put into separate sealed cans, but with regard to the ordinary delivery there are difficulties. It is most probable that milk sellers are greatly at the mercy of servants, who, as a rule, are a class who dislike trouble, and the milk carriers are expected to walk into the house and take a jug for themselves, in some cases having actually to wash it themselves before putting the milk into it. If the servants cannot have their own way, or the milk carriers or their masters object, the probability is they will lose their customers and the milk be supplied from a rival dairy. From instances observed it appears that scarlet fever, when conveyed by means of milk or other drink (for there is no reason to suppose but that if milk can be a medium so can water or any other fluid) the incubation stage is much shorter than when the atmosphere is the medium. A case occurred at Fallowfield, near Manchester, in 1879, where a child residing more than two miles from Fallowfield went to the farm and had some milk and sickened of scarlet fever in 36 hours. One of the milkers employed at this dairy lodged at a house where a boy lay in the desquamating stage of scarlet fever; this case was only one of an outbreak. An instance is also mentioned where the fever was next door to the dairy, the milk distribution from which was supposed to be the cause of the disease. Mr J. Makinson Fox relates where two adult parents and six children of varying ages were all attacked within 48 hours of one another with symptons of scarlet fever after eating American ham, none of the cases being fatal ; the only person in the house not attacked was an infant of about eight months who alone did not partake of the ham. All ate of the ham cooked in the ordinary way the day before the first case began; so sure were they that the ham was the cause that what was left was destroyed. It was said to be American ham bought in the usual way, and scarlet fever was in the district, but not in the immediate neighbourhood, sanitary arrangements, such as the water and the like, were bad. Typhoid fever—The propogation of this disease has now been well authenticated. Dr. Ballard, of the Local Government Board, was, I think, the first who called attention to the infection of milk. This occurred in an outbreak at Islington in 1870, when it was ascertained that the cans were rinsed out with water polluted by typhoid matter. Again, in the celebrated Marylebone epidemic, the cause was clearly traced to the farm where the water used for rinsing the cans was polluted with typhoid sewage. In an epidemic investigated by Dr. Airey, of the Local Government Board, it was ascertained that the milkman washed the udders of the cows with water from a stream into which typhoid sewage found its way, and that a minute portion of the water from the stream had become mixed with the milk. Dr. Ernest Hart, at the International Medical Congress, gave particulars of 71 recent epidemics due to infected milk, that have been recognised, and made the subject of detailed observation in this country, 67 of them since the Marylebone milk typhoid epidemic traced by Dr. Murchison and himself in 1873 ; the number recorded of epidemics of typhoid as due to milk is 50 ; scarlet fever, 14 ; diphtheria, 7. The total number of cases traced to the drinking of infected milk may be reckoned, he says, in round numbers as 3,500 of typhoid, 800 scarlet fever, and 500 of diphtheria ; in 22 of the cases the milk cans were washed with sewage contaminated water. In an outbreak of typhoid fever of which I have knowledge, the milk was sold from a shop; the person who sold the milk failed with typhoid fever, and about, or shortly after she had failed, typhoid fever occurred in 26 out of 91 families supplied with milk from that dairy, or at the rate of one in every three and a-half, or 28·6 per cent. of the whole number of families supplied. In addition, it was found that a specimen of the milk was reported by the Public Analyst to contain 20 per cent. of added water, and in his opinion the added water was polluted. On inspecting the house in which the dairy was situated it was found that the water from the cisterns over two closets could be used for drinking purposes, and the water from one of them, the nearest to the room where the sick-person lay, was of an evil character, containing as much as ·21 per million of albumenoid ammonia, shewing that there was a large amount of organic matter in the water. To get at the cause of the outbreak nearly 800 houses had to be visited, and enquiries made, for it was necessary not only to enquire among the customers of the suspected dairy, but it was also necessary to make enquiries among the customers of all the other dairymen supplying milk to that neighbourhood. In these milk epidemics, large milk drinkers are the most liable to typhoid, &c. Young children (ordinarily little liable to typhoid), who are accustomed to drink milk largely in the raw state, domestic servants, who after children drink the most raw milk, and large milk drinkers of every rank and station, furnish by far the largest quota of cases in each epidemic, and people who exceptionally drink of the implicated milk are attacked; the houses of the better classes in healthy situations are invaded; the poor, who take little milk, and that only in tea or coffee, generally escape. The manner in which the disease selects the streets and houses supplied by the implicated dairy is very striking. People in adjacent houses having different milk escape, and even when supplied from two sources enter the same house the disease selects those only who drink the infected milk. The contemporaneous invasion of so many households at once can only be explained by the supposition of a common cause acting on a particular set of persons and on no others. A custom is said to prevail pretty generally in dairies of mixing two milks, such as morning and evening, or the afternoon milk of one day with the morning milk of the next day, which has the effect of fermentation and renders the milk very unwholesome; this is a fact doubtless well known to practical dairymen. Dr. Cameron, of Dublin, has called attention to the liability of oysters, cockles, muscles, &c., to become the media of conveying disease when they are found at the mouths of rivers where sewage is discharged,—the oysters were of fœtid odour, and swarmed with micrococci. In the *British Medical Journal* of May 28th, 1881, is an account headed *Baptism of milk.* An army of Parisian milkwomen wait every morning at the Batignolles Railway Station for the arrival of fresh country milk, and they convert momentarily the enormous station yard into a vast "Salle de Baptême" (baptising hall). By a most fortuitous accident there is a fountain in the yard, nick-named by the milkwomen "Louisa," and every morning at least one hundred carts laden with milk cans, one-third full of milk, file past the fountain, and the cans are afterwards to be found quite full. Some of the customers had the milk analysed, and the police interfered, but the milkwomen rebelled, and the police fled, but on leaving the yard, directed the porter to shut the gates. The imprisoned milkwomen emptied the cans on the ground, but some of them were taken prisoners, and let us hope the illegal use of "Louisa" has come to an end. And now, what is contagion, and how is it carried in infectious diseases? This is a question which at the present time engages the greatest attention on the part of pathologists, and the researches of Pasteur, Tyndall, Cohn, Sanderson, and others, go to demonstrate that living organisms play a very important part in conveying contagion, and that these organisms consist of minute, short, rod-like bodies called bacteria, and seen by Pasteur with a magnifying power of 350 diameters. To see them properly, a power of 750 diameters, or one-eighth inch objective, is required, or better still, an immersion lens of high power, say one-twelfth or one-sixteenth objective. There are several varieties of bacteria. A. The bacterium lineola, the vibrio lineola, of Ehrenberg, commonly found in stale milk, supposed to convert the lactic into butyric acid, therefore called the ferment of sour milk. Cohn calls it bacillus subtilis. B. The micrococcus, minute round bodies or dots, which have generally a tremulous or vibratory movement. C. Baccillus ulna, seen in perfectly fresh hay infusion, the rods are jointed and motionless. D. The bacterium termo, the motile form of which is supposed to be the cause of putrefaction. It has been shown conclusively by Pasteur that there exists in air not bacteria themselves, but the germs of bacteria, and he proved it in this way—a solution, called Pasteur's solution, consisting of water 100, sugar 10, albumenoid, and mineral matter from the ash of yeast, ·2 to ·7 parts. This solution boiled for three minutes and air previously heated to redness was allowed access. This liquid, kept for eighteen months at the temperature of 80 degrees Fahrenheit, without showing any trace of organisms. On the access of ordinary air for a day or two, it never failed to become filled with bacteria or vibriones or covered with mould. The theory is, that the air contains myriads of germs of bacteria and other organisms which are invisible to the eye and even to the highest known powers of the microscope, and that it is necessary this germ-laden air be in contact with any fluid containing the food for their development into bacteria or other organisms. He also placed solutions in flasks with long necks of many bends; the solutions were boiled and the flasks remained open for many months without the productions of organisms; the explanation being that, by boiling the contents of the flasks, the air on first entering comes in contact with water vapour at the temperature of 212 degrees Fahrenheit, and so is rendered harmless. What follows enters but slowly, and leaves its germs or particles of active matter in the moist curvatures of the neck. After remaining many months in a warm place, the necks of the flasks are cracked off by a file mark, and in 24 to 36 or 48 hours fungi and other organisms make their appearance in the usual manner. The same effect can be obtained by boiling the solution and plugging the mouths of the flasks with cotton wool. The cotton wool filters the air and retains the germs; the solution remains pure until the plugs of cotton wool are withdrawn, allowing unfiltered air to pass into the flasks; organisms are then quickly developed. Professor Tyndall, in 1870, proved that particles in a liquid, quite invisible under an object glass, readily showing one-hundred-thousandth part of an inch in diameter, were revealed with the greatest ease by means of a beam of light. If the air was pure a beam of sunlight traversing a darkened room would be invisible, except where it struck upon a wall; it is the scattering of the floating particles or dust which makes the track luminous. Hydrogen, coal gas, air passed through cotton wool, and the air of still places, were found to be free from floating matter. He further says that air which has lost its power of scattering light—that is, has been deprived of the motes or dust which usually float in it, has also lost its power of producing life. A glass chamber filled with purified air remains dark even when placed in the track of the most powerful beam of light. Air can be rendered optically pure to this extent by simply leaving it undisturbed for two or three days. When the floating particles have subsided it will no longer transmit light, and solutions placed therein will remain unaltered, though left for months, while similar solutions, open to the ordinary air, swarm with bacteria or some other organisms in 24 hours, or at most two or three days. Air containing all its gaseous mixtures of oxygen, nitrogen, carbonic acid, ammonia, aqueous vapour, and all other gaseous matters which mingle more or less in the air of large cities and towns cannot produce putrefaction if self-cleansed from mechanically suspended matters. Such air is called moteless air, and the power of developing life in atmospheric air, and the power of scattering light are proved to be indissolubly united. In a solution full of bacteria, when allowed to remain perfectly still the bacteria will, when they have deprived the fluid of all its nutriment, sink to the bottom, and then the liquid again becomes clear. A fluid full of bacteria is opaque or turbid owing to the rapid motion. Pasteur made an interesting experiment; he found that on the glacier (Montanvert, near the Mer de Glace) there were no germs in the atmosphere, but in the neighbouring inn at Montanvert the air swarmed with life. He also found that the air in the cellars of the Paris Observatory being still, the germs subsided, and no effect was produced on the solutions, while in the courtyard the usual forms of life were produced. Tyndall says that in contact with germless air the wine *must* never ferments. Pasteur says that the pure juice taken from grapes in contact with pure air never ferments itself, nor is it *able* to produce fermentation in other liquids. Torula is formed from the germs in the air getting into the grape juice. In wine the leaven has been sown unconsciously by the growers for thousands of years, but consciously by the brewer. The experiment of boiling the solution in the flasks with tubes of many bends explains the process by which Australian and other meats are preserved by expelling the air, and even if any air remains by rendering the germs of organisms harmless by exposure to the heat; this is the principle of Appert's food preserving process. It is held in the present day that the Harveian doctrine of *omne vivum ex ovo* is the one generally adopted, and spontaneous generation is not believed in but by few. Bacon, in the *Novum Organum*, says that all putrefaction exhibits some slight degree of heat, though not enough to be perceptible to the touch, for neither the substances which by putrefaction are converted into animalculæ, as flesh and cheese and wood, which shines in the dark, are warm to the touch. In Shakespeare's *Antony and Cleopatra*, Act 2, scene vii., the mud of the Nile is said to give birth to serpents and crocodiles by the operation of the sun. In 1662, Van Helmont relates how a green leaf placed between two bricks was transformed into a scorpion, and states that living things, fish, newts, and frogs, in ponds that have been dried up, spring from the mud, and he further tells how to generate mice out of saw dust and an old shirt. Aristotle (584 B.C.) believed in the spontaneous generation of plants and animals. Redi, in 1638, made the first discovery which undermined the belief in spontaneous generation; he found that when meat putrefied, the maggots were not generated from the flesh, but were larvæ developed from the eggs of the common blow-fly. When the meat was covered with a gauze cover, there were no maggots; the flies settled on the gauze and there deposited their eggs. Some day, perhaps, this knowledge will be applied to keeping game until it has acquired that gamey flavour, so much prized by lovers of game. I have often been told that if I could only see game after it has been hung a sufficient time, that the sight of so much living matter would have the effect of preventing my partaking of it. And only imagine the countless numbers of bacteria that are swallowed under the circumstances. Luckily they are the innocent bacteria, not those arising from germs laden with infection. It has been shown how putrefaction is caused by the presence of bacteria, and the change which gives game its high flavour is the putrefactive change. I have seen a case of severe illness produced by eating a portion of hare of that peculiar high quality. There is a limit to everything, and game should not be eaten too high. Now it has been demonstrated by the experiments of Beale, Chaveau, Sanderson, &c., that vaccine lymph and small pox matter, when filtered through porcelain, loses its infective properties, thus proving that the contagion is particulate, and that the particles are very minute, probably a form of micrococci. Vaccine lymph may be diluted 10 times without losing its power. A very common form of preserving the lymph is on ivory points or pieces of glass; all the moisture is allowed to evaporate, and the solid matter remains on the point as a shining gum-like matter; on moistening this with water it is again rendered fit for use. The virus of sheep pox may be diluted 10,000 times its bulk and still produce its effects. These experiments have been followed by those of Devaine, Koch, and Klein, who have demonstrated the existence of organisms or bacteria, which give rise to splenic fever, and Klein, by similar methods to those adopted by Koch, showed that pig typhoid was also the result of a microscopic organism; also in fowl or chicken cholera a bacterium has been shewn to exist by Toussaint. The maladie de Chabert in cattle has also been investigated, and all the experiments tend to show that the infective liquids (by means of the bacteria or germs contained therein) of splenic fever, chicken cholera, and maladie de Chabert can be cultivated and diluted so as, by inoculation, to confer immunity from attacks of the disease. Dr. Salisbury, of Newark, Ohio, in 1862, suggested that the fungi (puccinia graminis) in damp straw was the cause of measles, and by inoculation he produced a disease similar to, if not identical with, measles, and which conferred immunity from subsequent attacks. Dr. Hallier, of Jena, in 1866-7, believed he had proved that the discharges from cholera patients contained certain fungi and their germs. These he cultivated outside the body, and went so far as to identify them with a fungus met with on rice in India, where cholera is endemic ; it has, however, been shown by Drs. Cunningham and Lewis that the organisms which Hallier connected with cholera do not exist in connection with rice, and that Hallier's fungi have no necessary connection with cholera. In erysipelas and diphtheria micrococci are found in all the parts affected. In relapsing fever, bodies called spirillæ have been discovered which appear to have an essential connection with this disease. Pasteur has discovered that the disease in silk-worms called pebrine is due to the presence of bacteria ; he also discovered that a number of cattle that had died of splenic fever were buried under pasture land, and that the bacteria peculiar to that disease were contained in the bodies of worms, and by this means the infection was conveyed to the cattle feeding on the pasture over where the carcases were buried; so that living organisms have been found in connection with small pox, cow pox, or vaccinia, sheep pox, chicken cholera, splenic fever, maladie de Chabert, erysipelas, diphtheria, pig typhoid, and human typhoid fever, also an organism (a bacillus) has been discovered in connection with ague, which, when cultivated, is said to be capable of inoculation with production of the disease. Klebs says he has discovered that a particular or special form, which he can recognise, of a bacillus is the medium of the contagion in typhoid fever. and that the bacillus typhosus forms at the height of its development long undivided threads containing spores, but in its earlier stages it appears as short rods containing terminal placed spores. He says the bacillus differs from the organism of ordinary putrefaction in its greater fineness and its appearing as threads. Secondly, in the fact that it penetrates the tissues which the coarse varieties never do. Professor Eborth, of Zurich, considers there is a bacterium peculiar or special to typhoid fever. The bacilli appear in shape and size not to differ from ordinary rod bacteria, but Eborth believes that they differ from them in their small capacity for taking on staining of hæmatoxylin, methyl violet, and bismark brown. Dr. Brandlecht, of Brunswick, during several epidemics of typhoid fever in the Grand Duchy, found repeatedly a species of bacillus, which he believes to be pathogenic, in the water used for drinking by the inhabitants of the infected districts. The tendency of the opinion of pathologists is in the direction that contagion is communicated by means of *germs* of organisms, and it is a moot question as to how this is accomplished, whether by the organisms themselves or by a virus which they carry or are able to elaborate within their bodies. Bacteria in themselves appear to be harmless little creatures. They or their germs swarm in millions in the air we breathe, the fluid we drink, the game we eat; they can be collected from our mouths at any time, and when washed clean by distilled water have been injected into the blood vessels without producing any harm. This goes to shew that it is not the bacteria or their germs which cause the infection, but rather that they are the carriers of the virus. The germs of bacteria abound in every pool, stream, and river. All parts of the moist earth are covered with them, every wetted surface which has been dried by the sun or air contains them, after the wet has evaporated ; from such surfaces they are wafted into the atmosphere. Professor Lister holds that bacteria also are the cause of suppuration in wounds, but we know that in abscesses deeply seated, for instance, of the knee joint, when the matter is removed the first time it cannot contain bacteria, for it has never been exposed to the air from which only it could get the germs. The same might be said of abscesses of the brain or the lungs. It appears that expired air is deprived of the germs of bacteria, that is, the air is filtered by the lung structure in like manner as is infective fluids filtered by porcelain. Probably by keeping wounds clean (cleanliness, according to Savory, being the essence of the process), together with the antiseptic treatment by means of carbolic acid spray, the putrefactive changes in the matter of wounds exposed to the air (by means of bacteria) is prevented. In former days it would have been considered a most unskilled proceeding to open an abscess of the knee joint, except by valvular incision, in order to prevent the entrance of air into the cavity, which, if it happened, was generally followed by dire results. Now a joint may be laid open much more safely by using carbolic acid spray, to slowly bathe the parts while the operation is being performed, and by using antiseptic dressings. Probably the danger, both in opening deep abscesses and abscesses of joints, was by allowing air to have access, the germs of organisms or bacteria found their way in, and produced putrefactive changes, which greatly endangered the life of the patient by the absorption of the putrefactive matter. Pasteur has clearly shown that no putrefaction can take place without an access of air containing the germs of bacteria. Further discoveries will probably show that each contagious disease is due to a species of bacterium special to itself and differing from the common organism of putrefaction, and from all others. At present, organisms have not been discovered in connection with scarlet fever nor whooping cough, but there is by analogy a great probability that such exist, and will in course of time be demonstrated. In the case of contagious skin diseases (except scabies or itch), each one is characterised by a fungus peculiar to the disease being present; this tends to the belief that all the organisms mentioned may be classed as vegetable rather than as animal organisms. It may be argued that the virus of the infection is carried by the bacteria, and is not present as a part of the organism itself, or as the effect of any peculiar action on its part. That virulent poisons, such as the various vegetable poisons, act and destroy life through the action of their alkaloids, as in the case of morphia, strychnia, &c., without the presence being discovered of any particular organism; also that no organism has been demonstrated in the septic fluids cultivated from flesh, nor in the poisons of the serpent, nor in the poisonous salvia of the rabid dog, unless it may be that the virus is carried by the bacteria which may exist in the mouth, but if so the bacteria would not be necessarily those peculiar to the infective poison of rabies. In all that has been written or said about the transmission of infectious disease through the media of food and drink, it never seems to have occurred to anyone that diseases which can be transmitted by milk and by water may also be transmitted through the medium of beer. Men have suspected milk and water, but no one has even hinted at suspecting beer. Why may not the barman or barmaid who draws the beer have been in the desquamating stage of scarlet fever, or why may not scarlet fever or typhoid fever be existing in the public house or beershop? Up to the present time no outbreak of these diseases has been traced to beer; Bacteria have been shown to exist in beer, but as a crum of comfort to beer drinkers, it is said that alcohol and the bitter of the hop are poisons to the organisms, and doubtless it may be owing to this that highly fermented beer and bitter ales can be kept for a long time and improve by keeping, bitter beer, for instance, that has been to India and back; but what is to prevent the low class beers from being adulterated, purposely or accidentally, with polluted water just as in the case of milk. I am told that whenever beer is doctored (I object most strongly to the term) the water which is added is boiled, but polluted water which has not been previously boiled is just as likely to find its way dishonestly into beer or by rinsing the cans, &c., as in the case of milk, and a person may be down with scarlet fever or typhoid fever as well in the beershop as at the dairy; but I think that, as a rule, cans and pots in public houses are wiped dry, which gives security. Not only by milk, water, and other fluids may infectious diseases be transmitted, but there is every possibility of their being conveyed by provisions which are sold from houses where these diseases exist. Food of all kinds, whether solid or liquid, most probably absorbs the poisonous or infectious effluvia to which it may be exposed; in the case of fluids this is especially marked with milk and water. As an experiment, let any one, when his house is being painted, place a pail of water or a basin of milk outside near the wall of the house, and it will be found that very soon the milk or water will smell and taste of the paint. Up to the present time, the treatment of typhoid fever has been directed chiefly to the reduction of the temperature and to steer the patient through the fever, but with the knowledge which is now assumed, that their affection really depends on the development and migration of an organism, the therapeutic indication will probably be to check the growth of organisms by antiseptic or anti-mycotic remedies. The result of Dr. Baxter's experiments on disinfectants was to prove that potassic permanganate of the strength of ·007 per cent., of chlorine ·0008, of sulphur dioxide ·123, and of carbolic acid 1·0, destroy the reproductive power of the organisms. The antiseptic action of the permanganate and chlorine is seriously impaired by the presence of albumenous compounds, whereas the action of sulphur dioxide and carbolic acid are scarcely, if at all, so effected. Hence in dealing with animal fluids the two latter are the valuable agents and the two former nearly useless. For ærial disinfection, he says it is useless to place a tray of chloride of lime in a room or to scatter carbolic acid powder about the floor, but that disengaged chlorine and sulphur dioxide are both suitable agents, and that the latter is the most effectual of the two, but that dry heat, so applied that the desired temperature is actually reached by every particle of matter included in the heated space, is the most efficient of all disinfectants. Moist heat is doubtless better still for effecting this purpose; there is a disinfecting apparatus in the

Exhibition for using moist heat. Dr. Baxter advises not to place too much faith in disinfectants, but that it is to cleanliness, ventilation, and drainage, and the use of perfectly pure drinking water, that populations ought mainly to look for safety against nuisance and infection. The precautions against the propagation of entozoa, &c., are:—The thorough cooking of all meat, especially pork, ham (eating raw ham and bacon is a common practice among the working classes), and veal, and all fish, the careful washing of all vegetables, especially such as are eaten raw, lettuce, watercresses, cucumbers, &c., the exclusion of dogs from slaughter houses, and not allowing them, as far as possible, to eat flesh offal of any kind; a skilled (and, if necessary, microscopic) examination of all meat immediately after the animals are slaughtered, which could only be carried out at a public abattoir. A systematic inspection of all the milk coming into a town from the place, farm, or dairy where it is milked to the final distribution by the milkman, that the milk cans should be locked from the moment they leave the hands of the milker to the final distribution to the customers; that no milkman, under a penalty, should take his cans in to the house of a customer, or go inside the house himself; that there should be sanitary inspection and regulations respecting the persons engaged both in milking and distributing the milk, a supervision of the men engaged, the farm premises, the dairy premises, the utensils or vessels, the feeding and condition of the cows. I am told by a farmer who has had experience in keeping cows that if the food of cows contains onions, or if the cows eat turnips, that the milk will smell and taste of both those vegetables; the same rule does not apply to mangel wurzel. The cowshed and dairies regulations now allow 800 cubic feet for each cow in a cowshed, but if tubercular disease is as prevalent among cows as has been stated, then I think it very probable that 1,000 cubic feet or more will ultimately be the minimum. A very wise precaution is to boil all milk; of course it is better to prevent the epidemic poison finding its way into the milk, but as a last resource, boiled sewage is better than raw sewage, although the former is an unpleasant alternative. That in addition to all these precautions, there should be a compulsory notification of infectious diseases to the sanitary authority. Recently a deputation to the President of the Local Government Board were told that compulsory notification would not be of sufficient utility, as patients could not be made to enter infectious hospitals, but the Board might have been told that by knowing where the first case occurs moral suasion would generally have the effect of inducing the patients to enter hospitals or sanatoria for infectious disease ; it would also enable the Health Officer to give proper advice as to the best method, under the circumstances, of effecting isolation of the sick, and proper disinfection of the house, and in the case of typhoid fever, scarlet fever, diphtheria, &c., at dairies or farms, or in the families of persons engaged in the milk trade. A knowledge of the existence of the infectious disease at the very onset would enable the Health Officers to take steps to prevent the spread of the disease. I have mentioned one instance of an outbreak of typhoid, supposed to be carried or spread by milk, where nearly 800 enquiries had to be made at the same number of houses, the enquiry extending over a month, to enable the outbreak to be traced to the milk as the cause of its spreading, whereas if there had been a compulsory notification of disease, such as exists now in several large towns, the whole of the required information would have been ready to hand, with the consequent saving of much time and labour, and a great probability of being able to stop the spreading of the fever. Addison, in one of his papers, "The Vision of Mirza," compares human life to a bridge consisting of three score and ten arches, with several broken arches, which added to those which were entire, made up the number to about a hundred. Multitudes of people were seen passing over it, and a black cloud hanging on each end of it. On looking more attentively, several of the passengers were seen dropping through the bridge into the great tide that flowed underneath it ; and upon further examination innumerable trap doors were perceived that lay concealed in the bridge, which the passengers no sooner trod upon than they fell through into the tide and immediately disappeared. These hidden pitfalls were set very thick at the entrance of the bridge, so that throngs of people no sooner broke through the cloud, but many of them fell into them ; they grew thinner towards the middle, but multiplied and lay closer together towards the end of the arches that were entire ; this discription shews how, say 100,000 people, from birth pass over the bridge of life, and how many fall through the hidden pitfalls ; the danger can be exactly measured. But the march of knowledge also shews how, in modern times, in addition to all those hidden pitfalls, which can be exactly measured, there are also accidental pitfalls into which the unwary may be precipitated, pitfalls which when found out can be removed from the bridge of life; I refer to all those insanitary conditions which the light of sanitary science has revealed, and of which diseases transmitted or propagated through the media of food and drink form a very important and interesting section. In the exercise of my professional calling, patients have frequently expressed surprise at their being ill; my answer has always been, that considering the numerous diseases, medical and surgical, to which we are subject, including those which are propagated by food and drink, my surprise was not that men should become diseased and die, but that they should remain in health and live.

A letter from the American Consul-General, at Frankfort, relates how the difficulty of getting pure milk is dealt with in that city. A police inspection had already been established, the galactometer being also in common family use. Out of 309 analyses made in 1880 in Mannheim, 245 showed impurity, and 650 reichmarks were collected in a single month as fines, at the rate of 1 mark for each 1 per cent. of water added. But, as a means of coping with not only this difficulty, but with unevenness of quality, injury from carrying, dirt, and disease in the animals, the Frankfurter Milchkind Anstalt was established four years ago largely by the medical profession. It is managed by a commission of three physicians, one veterinary surgeon, and one chemist. The cows kept are of two breeds only, carefully selected; they are kept constantly in stalls, fed with care and perfect uniformity on dry food, with every attention given to ventilation and cleanliness. To insure uniformity of quality; and dilute the power for harm of a single animal which might possibly become unhealthy, the milk of every ten different animals is poured in together. The milk for delivery is put into quart bottles, stopped with wax, and sealed with the Anstalt seal. So strict is the cleanliness required that the empty bottles are washed twice a week in a weak solution of soda, and the corks (which are only used a short time) are boiled in a soda solution after each use. Spring wagons, with apertures for ventilation, are used for delivery; in hot weather they are covered with cocoa mats, and no wagon must take out more than can be delivered in three and one-half hours. The chemist tests one bottle daily. The Anstalt milk retails for 50 pfennings (about 6d) per quart, and it is claimed to have actually diminished the number of nurses employed in Frankfort, and to have produced surprisingly good results otherwise. These are so noticeable that a benevolent movement has been started to provide the Anstalt milk half-price for all infants supported by artificial nourishment during the first year of their existence. The Frankfort plan is thus simply a milk-producing concern on a large and intelligent scale, and it is obviously useless to discover and condemn poor milk without providing better. Mortality among human sucklings,—greatest where poverty and ignorance are greatest,—might doubtless be mitigated by a plan of this sort, and it would be of commercial value as well.

General SHUTE, C.B., said, at the President's request, he had the greatest possible pleasure in moving a vote of thanks to Dr. Taaffe for his scientific and well prepared address. The lecture, it seemed to him, had been especially to the point, for, as he understood it, one of the objects of the Congress had been to show the people generally their dangers and how to avoid them. The points touched upon by the lecturer had done much towards this end, and he hoped they would all be largely benefitted by the hints which their able lecturer had given them. (Applause.)

Major F. F. HALLETT seconded, and said he, too, hoped they would all profit by the address. He for one should profit in the matter of high game by what he had heard, though bacteria were represented to be so harmless! (Laughter and applause.)

The PRESIDENT (Dr RICHARDSON) said he could not allow the resolution to pass without adding his tribute of admiration. It was thought it would be a very improper thing to hold a Health Congress in Brighton, and not invite the Medical Officer of Health of the town to deliver an address, and when the invitation was sent to Dr. Taaffe he most willingly acceded to the request. A more succinct and useful exposition of the present state of Science he had rarely listened to. It was a credit to Dr. Taaffe's practical knowledge. There were certain points in the lecture upon which he should be entirely at variance (hear, hear), but Dr. Taaffe had placed before them a perfect exposition of views current amongst large sections of the Scientific world. While differing very greatly on various points of detail, and some of principle, he might say, however, that he was at one with him in regard to the prevention of the diseases.

(Applause.) What Dr. Taaffe had advanced in relation to that point was precisely what he should have brought forward, and he congratulated Brighton upon having such a Medical Officer of Health. (Applause.)

The motion was carried unanimously.

Dr. Taaffe, in reply, said he was exceedingly obliged to all present for the vote, and to General Shute, Major Hallett, and Dr. Richardson for their kind remarks. He had done his best, and man could do no more. (Applause.)

The proceedings then terminated.

ADDRESS TO WORKING MEN & WOMEN,

Saturday Evening, 17th December, 1881.

ON EYESIGHT,

BY

R. BRUDENELL CARTER, F.R.C.S.

Ophthalmic Surgeon to St. George's Hospital.

If there be any duty which is especially binding upon mankind, either in the widest sense of the word, or as collected into nationalities, or upon the individuals by which those nationalities are composed, it is the duty of handing down, if possible increased and improved, but certainly undiminished and undeteriorated, the inheritances which have been derived from ancestors. Of such inheritances there are many ; some, as the inheritance of high rank or of great wealth, necessarily confined to a few ; others, as the inheritance of the liberties of a nation, diffused over a wider area ; others, as the inheritance of the powers of body and mind which are distinctive of man, diffused over the whole human race. It is one of the most important of the inheritances of the last mentioned class, the inheritance of the organ of vision, of which I am about to speak to-night ; in order that I may point out to you how best we may fulfil, in relation to it, the duty to which I have referred, the duty of handing it down unimpaired, or even improved, to those who will come after us upon the scene of our brief activity. It was customary, in times within the memory of many who are still living, to speak of the human eye as if it were a physically perfect organ ; and then to argue, from its assumed perfection, to the wisdom of the All-powerful Mechanician whose work it was asserted to be. By a slight shifting of the ground thus occupied it was further assumed that the eye, in its exquisite fitness for the functions it was intended to discharge, furnished abundant and incontrovertible evidence of the exercise of design by the all-wise Creator of the universe, from whose immediate fiat it was said to have proceeded. Those, however, who had closely studied the actual structure of the organs of vision were aware that the assumed perfection of these organs, and their assumed perfect adaptation to their work, were not truths but fictions, the guesses of people who were unacquainted with the reality. Those who had so studied were aware that the eyes were often very imperfect instruments ; and that almost the chief marvel about them was the extent to which their possessors acquired the power, unconsciously and during childhood, of interpreting aright indications which seemed calculated to mislead. A knowledge of these facts placed serious difficulties, it need hardly be said, in the way of the acceptance of the hypothesis of a Divine Artificer ; because, if we are to give credit to a Divine Artificer for the excellencies of the organ, great as these are, we must also give credit to Him for its faults, alike for those faults which are inherent in the structure of all eyes, and for those of an exceptional character, such as defective transparency, defective shape, or irregular curvature, which although exceptional, are yet by no means uncommon. People who were conversant with the facts came at last to perceive that the notion of the personal skill and wisdom of a Divine Artificer must be laid aside ; and that the work of the Creator, in reference to the eyes as to other bodily organs, must be of a different kind from that which had been hastily assumed by theologians, who were too often rendered rash by their ignorance of the subjects about which they busied themselves in speculation. As time went on, more and more facts were collected and recorded ; and at length, within our own near memory, Mr Darwin, by generalisations based upon these facts, furnished the clue to the solution of problems which had long appeared to be insoluble. He taught us to know that the fitness of living creatures for their surroundings had gradually arisen from the advantages conferred by favourable variations of construction, which variations, by the operation of the law of inheritance, were handed down to offspring ; so that, for example, when any kind of animal had developed, possibly as an accidental variety, an eye better adapted to the supply of its wants, and to the conditions of its mode of life, than the eyes of its congeners, that animal, thus improved, would have a better prospect than they of leaving healthy and vigorous descendants behind it. I should be detained far beyond the limits of my allotted time if I were to attempt even a sketch of the doctrine of evolution by the survival of the fittest, as applied to the history of development; but I may say that our power of understanding the main features of the process is materially assisted by the fact that the young of all species, in their growth prior to birth and independent existence, may be said to crowd together, into a few weeks or months, changes which present a general resemblance to those through which the species itself must have passed in the course of ages. By watching the processes of growth and formation in the embryo it was long ago ascertained that the eyes of animals consist essentially of modified skin; the necessary modification being produced only in the skin which covers a particular nerve, and being adapted to expose that nerve freely to the action of light, to systematise this action in such a way as to afford pictures of external things, and at the same time to protect the nerve from all other kinds of stimulation.

Speaking broadly, it may be said that the nervous system of the human body is an apparatus sensitive to vibration; and that the vibrations to which it is most exposed are those produced by contact, by the vibration of the air which is recognised as sound, by the vibrations incidental to the occurrence of chemical changes, which are recognised by smell and taste, and by the vibrations of the all-pervading ether, which are recognised as light. If we come to analyse the nervous system, we shall find, in highly developed animals, that it is specialised; in the sense that its really perceptive parts, which are called centres or ganglia, each takes cognizance of only one kind of impression, that these parts are deeply buried in protected regions, as within the skull or the spinal column, and that they are dependent for their communication with the world without upon filaments, called nerves to distinguish them from the ganglia. All this specialisation, however, is of comparatively recent date; and in the lower forms of life we find that the nervous centres are less protected, less collected together, more scattered throughout the animal, and presumably less specialised than in the higher forms; until, when we reach creatures in which we approach the confines of the vegetable kingdom, we find a sort of diffused sensitiveness to vibration, which hardly seems to be gathered up into nervous centres at all. We need not go back so far as this; but in tracing out the development of the eye we must carry ourselves, in imagination, to a time when the highest form of life upon earth was an animal in which there were nerve ganglia, with or without filaments proceeding from them, but protected by a covering of skin ; and we must conceive that some of these nerve ganglia were capable of feeling the action of light, that is to say, of tingling when exposed to the rays of the sun. We need not go far to find an illustration of such a state of existence, for we have it in the common earthworm of our fields and gardens. The earthworm has no eyes, no rudiments even of eyes, but it is sensitive to light. It is, as we all know, a creature of nocturnal habits; and birds prey upon it with such avidity that these nocturnal habits are essential to the preservation of the species. An earthworm which was insensitive to light, and which ignorantly came out of its burrow to feed in the daytime, would inevitably be itself devoured before the evening. That the sensitiveness is really to light, and not to the heat of the sun, or to some other diurnal incident, may be concluded from probability and has been demonstrated by experiment. In our climate there are many dull damp days on which the worms would not feel any effect of the sun in depriving them of moisture, or in the form of heat, but during which, nevertheless, they remain in their holes. As soon as it becomes dark, if we go out upon any grass-plot with a lantern, we may see worms feeding by scores, their tails still keeping hold of the mouths of their burrows and their bodies extended as far as possible. The feeble light of the lantern does not affect them, and, by moving about with great gentleness, we may watch their actions. If we give a stamp of the foot, we shall see how sensitive they are to vibrations produced by contact, for they will disappear into their holes with marvellous rapidity. In order to determine whether or not they were sensitive to light, Mr Darwin, in his recent work upon the action of worms in moving vegetable mould, tells us that he experimented in the following manner. He kept some worms in flower-pots, in suitable mould, so that he might be able to observe their conduct. When they were out at night, and feeding, he illuminated them by a bull's-eye lantern having slides of dark-red and blue glass, which intercepted so much light that the worms could only be seen with some difficulty. They were not at all affected by this amount of light, however long they were exposed to it; and Mr Darwin judged it to be brighter than that from the full moon. The colour of the light appeared to make no difference in the result. When they were illuminated by a candle, or even by a bright paraffin lamp, they were not usually affected at first. Nor were they when the light was alternately admitted and shut off. Sometimes, however, they behaved very differently; for as soon as the light fell upon them they retreated into their burrows with almost instantaneous rapidity. This occurred perhaps once out of a dozen times. When they did not withdraw instantly, they often raised the anterior tapering ends of their bodies from the ground, as if their attention was aroused or as if surprise was felt; or they moved their bodies from side to side as if feeling for some object. They appeared distressed by the light; but Mr Darwin doubted whether this was really the case, for on two occasions, after withdrawing slowly, they remained for a long time with their anterior extremities protruding from the mouths of their burrows, in which position they were ready for instant and complete withdrawal.

When the light from a candle was concentrated by means of a large lens on the anterior extremity, they generally withdrew instantly; but this concentrated light failed to act perhaps once out of half-a-dozen trials. The light was on one occasion concentrated on a worm lying beneath water in a saucer, and it instantly withdrew into its burrow. In all cases the duration of the light, unless extremely feeble, made a great difference in the result; for worms left exposed before a paraffin lamp or candle invariably retreated into their burrows within from five to fifteen minutes; and if in the evening the pots were illuminated before the worms had come out of their burrows, they failed to appear.

From the foregoing facts, says Mr Darwin, it is evident that light affects worms by its intensity and by its duration. It is only the anterior extremity of the body, where the cerebral ganglia lie, which is affected by light, as was observed on many occasions. If this part is shaded, other parts of the body may be fully illuminated, and no affect will be produced. As the animals have no eyes, we must suppose that the light passes through their skins, and in some manner excites their cerebral ganglia.

Now it becomes evident, on reflection, that in the case of an animal situated in this way, its food supplies might be increased, or might be rendered more accessible, by any change which rendered it more sensitive to light than previously; and it is also manifest that such a change might be structural in its character, as by a thinning out, or by an increased transparency, of the skin by which the nerves sensitive to light were protected; and that, in this case, it would not only conduce to the more vigorous growth of the animal immediately affected, but would also be of a kind to be handed down to its offspring, both immediate and remote. Other things remaining the same, the individuals in which the nerves sensitive to light were covered by the most transparent skin, so that light had the readiest access to them, would have the best chances of survival and of propagation. As time went on, successive individuals would be born with slight departures or differences from the parental structure; and every difference of this kind would be either favourable or unfavourable, either advantageous or disadvantageous to its possessor. In other words, every change must either be for the better or for the worse. A change for the better would act in the manner already indicated; that is to say, it would confer advantages in the battle of life, or, as Mr Darwin calls it, in the struggle for existence; a struggle of which the essential characteristic seems to be that there are always more mouths to be fed than there is food to fill them, so that the weakest and worst provided must go without, or must even, in many instances, be themselves devoured by their more fortunate competitors. A change of structure for the worse would reduce the individuals influenced by it to the last-named or weaker condition; so that, instead of living and propagating their kind, they would fall victims to others and would perish off the face of the earth.

This great doctrine of the process of natural selection, when first propounded by its illustrious author, was received with an incredulity which mainly rested, I think, upon the supposed inadequacy of the means to bring about the end; but this incredulity has long passed away from the minds of those who are best qualified to judge upon the questions at issue. The effects which we see everywhere around us would be far beyond the powers of natural selection if they had been accomplished hurriedly; but they are the results of slow and gradual evolution extending through ages and ages of time. As the drop of water, by constant falling, hollows out the stone upon which it falls; or as the aggregation of drops forms the illimitable ocean; so the aggregation of countless trivial changes for the better, and the constant rejection and perishing of changes for the worse, have in time sufficed to bring about all the forms and conditions of existence which we see in the beautiful and wonderful world in which we live. In the experiences of a single generation, nay, even in the more extended experience which we may make our own by study of the records left by our forefathers, the amount of change which can be demonstrated is indeed comparatively small; but the more thoroughly the process described by Mr Darwin is scrutinised by the eye of science, the more does its adequacy, when acting through long periods of time, become apparent. We have thus learnt to conceive of the Creator no longer as a Mechanician turning out handiwork much of which is of an imperfect character, but as a Lawgiver, whose gift of life to the earth has been accompanied by the gift also of a power of development, subject to which His creatures may work their way to physical perfection; just as we see that the highest of them, the members of the human race itself, are also working their way towards moral perfection, if slowly, yet I trust not the less surely. In the human race, natural selection has not fair play, because it is held in check and controlled by many correcting or counteracting influences; but still its effects are everywhere apparent. Physicians tells us that an hereditary disease, or tendency to disease, such as consumption, resolves itself into a struggle for existence between the disease and the family in which it appears; and that in time either the disease will extinguish the family, or the family will outgrow and overcome the disease. In a country like this, the diseased or weakly units, who would have no chance of survival if their struggle for existence were a real one, are aided to grow up and to become parents, too often of children like themselves, by a variety of influences and institutions which we are accustomed to describe as benevolent and philanthropic, but which, however much they may deserve those appellations with reference to the individuals whom they protect, deserve rather to be called malevolent in their influence upon the race itself, which they keep constantly supplied with feeble organisms which Nature would remove. We permit the intermarriage of first cousins, and of other near kindred, in whom the same weaknesses or tendencies to weakness, being present in both parents, are almost certain to be intensified in their children. Notwithstanding all the drawbacks arising from these and other causes, there can be no doubt, upon the mind of anyone who impartially examines the facts, that our own countrymen are in course of decided physical, moral, and intellectual improvement. Five-and-thirty or forty years ago, Lord Eglintoun attempted a revival of the tournaments of the Middle Ages; and a number of gentlemen clad in armour, and mounted on horseback, undertook to tilt at one another in lists erected for the purpose. They did not use sharp lances, like the knights of old, but blunt poles; whence, if I remember rightly, the undertaking was described at the time as an "Emasculated

Mopstick Middle Ages Recovery Society." It did, nevertheless, fully establish that the gentlemen who took part in it were bigger than their forefathers. They were mostly men of old family, in whose mansions ancestral armour had been preserved; and the first idea was that such ancestral armour should be worn by each knight at the tournament. It was found, however, in almost every instance, to be too small for the descendants of its original owners. In like manner, the athletic feats of our own day are such as have never been performed before. It is not so many years since Captain Barclay, who walked a thousand miles in a thousand hours, surpassed all previous pedestrianism; but he in his turn has been surpassed, nay distanced, by the feats of pedestrian endurance which have been performed at the Agricultural Hall. Leander, it is said, swum across the Hellespont; and so, in modern times, did Lord Byron, and Captain Ekenhead, and Mr Hyett; but it was reserved for Captain Webb to swim across the English Channel. I am not speaking of these modern feats with approbation, nor holding up those who have performed them as examples to be imitated, but merely as evidence that the physical excellence of our own day has surpassed that of any former time. The dwellers in the poorer portions of our great towns, and especially our factory operatives, often living in very unwholesome conditions, with scanty supplies of light and air, and subject to other deteriorating influences, are not, when taken alone, the finest specimens of humanity; but they are giants and athletes when we compare them with their ancestors, even of fifty years ago, when Thomas Rayner Stephens and Richard Oastler fought their battle so strenuously, and so well, that the professional politicians of the day were at last compelled to take sides in the conflict, with the result of laying the foundations of our present system of protective factory legislation. In morals, and in intelligence, it is easy to discover a parallel advance. We are in almost all respects distinctly less cruel than our forefathers, even of the last generation. We are far less cruel in our treatment of children, of women, and of animals. It now seems scarcely credible, but it is none the less true, that it was a common amusement for men of fashion, two hundred years ago, to go to one of the female prisons of London to see the women flogged. We cannot doubt that the modern abhorrence of cruelty affords evidence of a distinct elevation of our nature; even although it sometimes leads unthinking people into every foolish errors. As Mr Martin, the framer of the first Act for the Prevention of Cruelty to Animals, is said to have ridden a horse to death in quest of an overloaded donkey of which he had heard rumours, or as the poet Sterne is said to have bestowed upon a dead donkey the sympathy which he refused to a living sister, so there has sprung up, in our own day, a school of morbid sentimentalists who would cheerfully leave the human race to die in misery and agony from the most dire diseases, rather than that the knowledge by which these diseases may be controlled should be sought for by means of experiments upon living rabbits or guinea pigs. Fanaticism like this is fleeting in its very nature, and will find its way, in due course, to the limbo which has swallowed up a belief in witchcraft and in a hundred similar absurdities. Such things are the mere eccentricities of progress; and need not compel us to doubt that, in all essentials, the progress itself is real. In the direction of intellectual development the advance is no less manifest than in others; for, even if our greatest men are not greater than the greatest of those who have preceded them, if even Darwin himself, in his different line of investigation, can scarcely be held to reach the commanding height of the genius of Newton, still there has never been a period so prolific of those who may be called, without offence, men of the second order; and there has never been a period in which the general level of knowledge, in matters of science, has reached so high a point. It is commonly said that our boasted knowledge and culture are, after all, dependent upon the lives of a very small number of persons; that the simultaneous deaths of say two hundred men of science would restore Europe to a state of mediæval barbarism, would leave the human mind once more subject to the unchecked dominion of priestcraft and of superstition, and the work of the last five hundred years to be done over again. This may be true, but still, if so, there never was any former period at which the deaths of so many as two hundred would have been required for the production of the effect; just as there has never before been a time when the teachers, however few or many they may be, were able to disseminate their doctrines so widely, with such effect, or upon soil so well fitted to receive them. Not only have our leaders increased in number, and also, I think, in average mental stature, but there has been an advance all along the line. It is perfectly conceivable that a favourable development of the race, once set on foot, may proceed with constantly accelerating rapidity; and I think we may find, in the state of England now as compared with what it was only a hundred years ago, evidences of evolution which, rightly considered, should suffice to satisfy the most incredulous.

To return now from the general principle to the more special subject of my discourse, it is necessary to remember that the evolution of the eye has not been an achievement of the human race, but that it had been carried to a high degree of excellence long before the appearance of man upon the globe. We inherit the eye, in all its essential parts, from some ancestor common to ourselves and to a large proportion of the animal kingdom; and I think the evidence is entirely in favour of the belief, not only that the organ, as we now possess it, is inferior to that possessed by animals which we have far outstripped in other particulars, but that among ourselves it is at present rather in danger of deterioration than likely to be improved. It is very difficult to be certain, with regard to any particular class of impressions made upon the eye, how far the acuteness of sensation with regard to them may be due to the perfections of the eye itself, and how far it may be due to the intensity with which the attention of the mind is directed towards them; and this difficulty meets us also in the case of every other sense. Dr. Carpenter relates the case of a naval officer, who, during the wars with the first Napoleon, was signal lieutenant in one of the ships of the Channel fleet. After many hours of strained attention, he would fall asleep on the deck as soon as he was relieved from duty, and would sleep so soundly that no ordinary, or even extraordinary, noises in his vicinity would awaken him, but the merest whisper of "a sail in sight" would bring him to his feet fully upon the alert. Now here, it is manifest, the difference in his acuteness of hearing with regard to different classes of sounds did not depend upon the ear itself, but solely upon the brain; that is, upon the different degrees of mental attention paid to one and to the other; and so it may be sometimes with sight. We know quite well that the sight of many savages is more acute for distant objects, and for such things as slight marks upon the ground, marks capable of being used in tracking, than that of civilised men; and the difference may possibly be only in the degree of attention paid by the savage to indications which are essential to his welfare, but which the civilised man may and does neglect with impunity. On the other hand, it may also be due to the possession of a better, or, so to speak, a more highly finished eye; and I think it probable that both causes are concerned in the production of the result. Of late years attention has been much called to a defect of sight which, in civilised countries, is found in about four per cent. of the males of the human race, namely, an imperfect perception of colour, generally depending upon an incapacity to see one of the three colours, red, green, and violet, of which white light is composed. The effect is that the colour-blind person, as he is called, cannot see the particular colour to which he is blind, so that a surface coloured by it alone seems black or dark to him ; while he also misses this colour out of every mixture of which it forms part, and sees only the others, so that all objects present to him a different appearance from that which they present to the colour-sighted. Mr Gladstone, as some of you will know, has lately argued from the fewness of the colour-names used by Homer, that the Greeks of the Homeric age were deficient in colour-sense ; but this conclusion is altogether in excess of the slender premises on which it rests. We know of many reasons which may have induced the ancient Greeks to devote more attention to form than to colour ; and the poverty of their language with regard to colour was probably an effect of indifference to its varieties rather than of any want of power to discriminate between them. Certain Oriental nations have always possessed an extremely critical and cultivated sense of the harmonies of colour ; and the works of Hindoo and Japanese artists, in regard to them, are acknowledged to be of the highest excellence, and to have been so from immemorial antiquity. It is exceedingly improbable that any important difference in the power of perceiving colour, as distinguished from interest in accurately describing it, should have existed between two kindred races within historic times ; and Mr Gladstone's argument in the matter is further in opposition to known facts concerning ocular structure. Still, there is much reason to believe that the colour sense, in some animals and birds, is more developed than in man ; and that it forms at least one element in the extraordinary acuteness of sight which is possessed by certain birds, especially by vultures. You have all read how, when an animal falls down in the deserts of North Africa, in a few minutes vultures, previously invisible, may be seen as specks in the far distance hastening to secure their share of the prey. The acuteness of sight of savages is probably, at least in some measure, akin to this ; and the care of civilised men, in relation to their eyesight, should be first to elevate themselves to, or to maintain themselves at, the highest level of excellence, as regards vision, which has been attained by other members of the human family. It is only after this has been done that any expectation of the eventual improvement of the organ can be reasonably entertained ; and, in order to show in what way its preservation and its improvement may best be aimed at, it is necessary to devote a few moments to the consideration of its structure.

The eye consists essentially of a nearly spherical chamber or cavity, over the back internal surface of which the optic nerve, or the nerve sensitive to light, is spread out in a film of great delicacy, which is called the retina. The walls of the chamber, or the coverings of the eye, as they are called, are opaque over four-fifths of their extent; but the front portion, called the cornea, is transparent, and forms a sort of window through which light finds access to the interior. Behind this window, and visible through it, is a curtain, called, from its differences of colour in different races and persons, the iris; and in this iris is a central opening, called the pupil, which varies in size according to the amount of light which falls upon it, becoming smaller in a bright light and larger in a dim light, so that the illumination actually transmitted to the interior is somewhat equalised. The cavity of the chamber is filled by transparent fluids or substances, called humours; which, taken collectively, and one of them, the lens of the eye or crystalline humour more especially, form upon the retina an inverted picture of the objects looked at, just as the lens of a photographic camera forms upon its sensitive plate or upon its ground glass screen an inverted picture of the object which is to be copied. The way in which the picture on the retina is conveyed to the brain, so as to furnish materials for conclusions about the nature, size, and position of objects, is extremely interesting; but time forbids me now to refer to it, and I must confine myself solely to the eye itself, as an instrument for producing the picture. I have here a photographer's camera; and the perfection of the picture which it affords depends chiefly upon three elements, the correctness of the curvatures of the lens, its distance from the screen in relation to the distance of the object, and the quality of the screen itself. If the lens were of faulty curvature, the image or picture produced by it would be distorted, as we may see by looking at objects through a flaw in a pane of window glass, or through the bottom of a badly fashioned tumbler. If the lens be not at the right distance from the screen, the picture produced thereon will be blurred; and hence the photographer, by means of this screw, alters the distance between the lens and the screen until the picture becomes distinct. The same effect might be produced without altering the position of the lens, if it were possible to render it stronger, or more convex, for a near object, or weaker, or less convex, when directed to a more distant one.

In the photographer's camera, the whole of the ground-glass screen upon which the image is produced is of equal receptivity; but, as this screen is flat, while the lens is curved or globular, the lateral parts of the screen are more distant from the lens than the central parts. It follows that, when the central parts of the photographic picture are correctly produced upon the centre of the screen, the marginal parts will be too far away from the lens, and will be blurred; while, if we correct this by alteriug the distance between the lens and the screen, in such a way as to render the marginal parts of the picture clear and definite, then the central parts will be blurred. As the central parts of a picture are more important than the marginal parts, this course is not pursued; and you have all seen how, in photographs, the marginal parts are liable to be somewhat obscurely defined, or to be out of proportion to the rest. In the human eye, on the other hand, the screen or retina is curved, so that its lateral parts are at the same distance from the lens as its central parts, or nearly so; and a correctly defined image may be produced all over it. But, curiously enough, the lateral parts of the retina are much less sensitive to the presence of the picture than the central part; and it is only in the very centre, over a tiny circle called the yellow spot, that really acute vision exists. The parts of the image which lie beyond this yellow spot are seen but dimly; and, when we want to see them clearly, we have to change the position of the eye, so that the part of the picture which was lateral becomes central, and subject to the more acute perception of the central region. The difference in the acuteness of sight of different parts of the retina is one which depends upon visible differences of nervous structure; and I believe that indefinite improvement, alike in the acuteness of central vision, and in the extent of the most sensitive portion, is well within the possibilities of future evolution.

Another difference between the eye and the camera is that the former has an external window, so to speak, outside of its lens; while, in the camera, the lens itself forms the window. In the eye, therefore, we may have distortion of objects from faulty shape of either the lens or the external window; while, in the camera, there is nothing to produce distortion but faulty shape of the lens itself, and this is an imperfection which practically is not suffered to exist. A lens of faulty curvature would be rejected by the instrument maker.

In the eye, the ideal of physical perfection is reached if both the cornea and the contained humours or fluids are free from flaws or opacities, and of complete and uniform transparency; if the curves of the different limiting surfaces are spherical, and their centres accurately in line behind one another; if a line uniting these centres falls upon the centre of the yellow spot; if with the eye passive and at rest, a perfect picture of far distant objects is produced upon the retina; and if there exists a power of altering the strength of the lens in such a manner as to produce a perfect picture of near objects also, as soon as the gaze is directed towards them. This last power is called that of adjustment or accommodation; and it is exercised, not, as in the camera, by altering the position of the lens with reference to the screen, but by increasing the sharpness of its curvature, so as to make it stronger than before. The requirement that the passive eye should receive a perfect picture of distant objects is only fulfilled, I need hardly say, when the distance at which the lens would form this picture is precisely the same as the distance which separates the lens itself from the retina. Between these two magnitudes there is no necessary connection, and hence it often happens that they do not correspond. In this want of correspondence, and in the fact that each one of the above-mentioned conditions of perfection is frequently left unfulfilled, we have the most powerful possible argument against the old conjecture to which I have referred, the conjecture that the individual eye is the result of design on the part of an all-wise and all-powerful Artificer, who could not, it is obvious, have fallen into or even have permitted such imperfections in His work; and we have an argument just as convincing in support of the belief now generally accepted, that the eyes, like all other bodily organs, have been rendered what they are by gradual adaptation to the most obvious requirements of the animal; these requirements acting through long periods of time, and the completeness of the adaptation being liable to be disturbed by various external circumstances. In this way, and in this way only, can we understand why it is that the eyes are often so imperfect, or why it is that in their most faulty examples they often seem to throw back, so to speak, towards types or conditions which prevailed in the earlier and less complete stages of their developmental history.

When once this idea has been firmly grasped, and we come to recognise the way in which our eyes have been handed down to us by our forefathers, we shall soon begin to recognise also the nature of our duties concerning them as these may affect our offspring, or the future welfare of the human race. In man, as I have already said, natural selection has no longer fair play, because we foster and maintain weak or defective individuals who would perish if their fate were left to natural selection alone. Well, this being so, and it being manifest that the eyes, which have been modified, and, in a certain sense, called forth, by former generations of men, can be further modified, either for better or for worse, either towards improvement or towards deterioration, by ourselves and our successors, it is plainly our business to do all we can to foster favourable varieties, and to suppress varieties which are unfavourable. First among the latter I should place what is called short-sight, a variety which has been created among civilised people and within historic times, and which has greatly increased in prevalence within the experience of people who are now living. Short-sight depends upon the eyes being too long from front to back, being oval instead of spherical; and this alteration of shape, which may be, and often is, produced by poring over books or small objects with the eyes close to them, is also capable of being inherited, either as a fact or as a tendency, from parents. The way in which the oval shape is produced is this: when the two eyes are directed to something which is very close to them, they are both pulled round, so that their lines of sight meet upon the object, by muscles which are fixed near their front parts, and the pull of these muscles causes a tendency to bulging at the other side of the eyeball; so that, if the effort is frequently made and long continued, the back parts of the eyeball become stretched and elongated, and the more they are stretched the greater will be the degree of short-sight, and the weaker will be the coats of the eye, and the more ready, consequently, to stretch still farther and to increase this degree more and more. The altered shape of the eye becomes a matter of bodily structure, and, as such, it is liable to be handed down to offspring; so that the children of the short-sighted are often short-sighted themselves, and, moreover, generally speaking, in a greater degree than their parents. There is also another way in which the defect may be inherited. It is plain that if there were two children, both compelled by bad light or other circumstances to hold their books close to their eyes, and if one of these children had the coverings of the eye very strong, while those of the other child were thin or weak, the eyes of the latter would stretch and elongate, and would become short-sighted, sooner and in a greater degree than those of the former. The supposed thinness or weakness of the coverings of the eye undoubtedly exists in some children, and is again a matter of structure, likely to be inherited; and thus we see that children may either be born with eyes of the short-sighted shape, or they may be born with eyes so constructed that they will certainly stretch and become short-sighted if they are called upon to work under unfavourable conditions. These conditions are mainly three: bad light, books printed in bad or in too small type, and seats which compel a stooping position. If the light is bad, or if the print is defective, the book must be brought close to the eyes, or the child cannot see to read it. If the desks are too low, and too far away from the benches, the child must stoop over its work, and must bring the eyes too close to it. The eyes will manifestly be more prone to stretch during childhood, when the bodily tissues are tender and yielding, than at any later period; but, if the habit of yielding is then established, it is liable to continue throughout life.

Some among those who hear me may perhaps find difficulty in realising that short-sight is so great an evil; but to me it appears to be an enormous one. Assuming, of course, that no glasses are worn, the short-sighted person is one who cannot see clearly anything that is beyond some very short distance away from him. Let this distance be one foot, which does not represent a high degree of the defect, and then think how many things there are at which we look with pleasure or with instruction, and which are more than a foot distant from our eyes. Think of scarcely ever being able to see a human face distinctly, of losing both its beauty and the play of its expression as an index to character. Think of not being able to see the time by an ordinary clock, or the details of a landscape, or an exhibition of pictures, or the entertainment at a theatre, or the people on the other side of the street; and then think what all this amounts to, in the way of total loss, when it is continued day after day, and year after year. Think, moreover, that if a child is unable to observe, the faculty of observation is itself sure to suffer; and that dulness of mind is apt to follow from the dimness of distant objects behind which so much of the world lies hid.

Assuming all this, and assuming that short-sight is an evil to be fought against, how is this to be done? In the first place, by endeavouring to prevent its propagation ; in the next place, by endeavouring to prevent its development and increase. Individuals who are short-sighted, or who spring from families in which the defect is common, should not intermarry with those in whom there is a similar defect or a similar tendency ; it being well known that a family defect of this or of any other kind, although it may not appear in some individual member, may nevertheless reappear in his or her descendants. Next, the managers of schools should pay attention to the eyesight of children ; should have the question investigated when they are admitted as scholars, and should require that those who were short-sighted should be supplied with proper spectacles, so as to enable them to keep their books away from their eyes ; and also that they should be so placed, as regards seats and lights, that they may do this without difficulty. It should be the further business of parents, when their children go out in life, to see that the same conditions are complied with in factories and workshops ; and generally to take care that the short-sighted possess and use spectacles, such as, first, to prevent the degree of short-sight from being increased, and, secondly, to enable the children to see the world around them, and to stand upon the same level, with regard to experience of its ways, as those of their own age who do not participate in their defect.

Besides short-sight, there is a precisely opposite fault of shape in which the eyeball is too flat, or too short from front to back ; and there is also a condition which may be associated either with short-sight or with flat eye, in which either of these defects may be greater in one direction than in another. All such conditions involve more fatigue in using the eyes than attends the use of more shapely organs ; and hence the eyes of faulty shape are liable to become diseased, or to break down, under work which natural eyes can easily accomplish. Nearly all of these defects can be relieved by the use of proper spectacles ; and there is also a condition which comes to all natural eyes as life advances, namely, that while the acuteness of sight for distant objects is as good as ever it was, the power of adjusting the eyes for near objects gradually diminishes. Here, again, spectacles are required, and they perfectly restore the eyes to their original usefulness. In a few words the case may be put thus : There are several conditions in which spectacles should be worn, and in which, without them, the eyes are taxed unfairly. Eyes which are taxed unfairly are liable to suffer, and to suffer in ways which may be handed down to posterity. The faulty shape and other conditions which render spectacles necessary are examples of development in wrong directions ; of the development of defects mostly brought about by the circumstances of civilised life ; and it is very important that such faulty development should be arrested and reversed. For this purpose spectacles are necessary implements ; but there are many people who do not know this, and who neglect to obtain them, from pure ignorance. I have also heard that there are employers who object to the use of spectacles by their workpeople, and who make the use of them an excuse for a diminution of wages. Now I hold that an employer has a perfect right to demand that his workpeople shall have good sight, and that he has a perfect right to refuse to employ those who have not good sight, or to employ them at lesser wages expressive of their lesser usefulness. But I also hold, if a man requires spectacles for the comfort and welfare of his eyes, and if he has perfect sight when furnished with them, that his employer has no right to object to their being worn ; and again, if the man has perfect sight with their assistance, that the employer has no right to diminish wages on account of them. The fact of failing sight, or of defective sight, is manifestly of the greatest consequence to an employer ; but the question whether the perfect sight which he is entitled to demand is enjoyed without glasses, or is only obtained by their assistance, is of no more consequence to him than whether his workman wears a cotton shirt or a flannel one.

Another defect which is of some importance, since, as I have already told you, it exists in nearly four per cent. of the male population of the country, and renders them unfit for certain kinds of work, is defective vision for colours. This is in a marked degree a family or inherited peculiarity ; and hence it is one which calls, like short-sight, for the avoidance of marriages between the members of families in both of which the defect exists. Where there is absolute blindness to some one colour, as to red or green, I believe nothing can be done by education to restore the absent faculty ; but there are many cases which stop short of this, and in which the state would be correctly described as one of defective vision for red or green. These states, I apprehend, may either improve or undergo deterioration ; that is, either in the individuals affected or in their offspring, they may either pass into natural colour vision or into red or green blindness. They therefore call for education of the eyes in the discrimination of colour ; not, be it remembered, for education of the tongue in using colour-names, but of the eyes in seeing the differences which these names are intended to denote. This again, for the great bulk of the community, is a matter for which provision should be made by School Boards. The Government of the country has made education compulsory, and the compulsion imposes upon the authorities the duty of taking care that no important element of teaching is neglected. I think myself, indeed, that it would be of great eventual public benefit if systematic training of the eyes were made compulsory or customary at all schools, as a matter of physical education; and if competitions in distant vision, which is the true test of vision, were instituted by volunteers and other bodies of men. I see no reason why this particular point of physical excellence, which is of the highest value, should not be as much cultivated by exercise as any form of muscular strength, skill, or activity.

It is quite possible that some of my hearers who are of the working classes may say to themselves that, even supposing them to be alive to the importance of the principles which I have laid down, they have little power to carry these principles into action. They may urge that they are not admitted to the deliberations of School Boards, and that they cannot dictate to employers with regard to the use of spectacles, or with regard to the position and the sufficiency of the windows of a workshop. My answer is that they have great power, partly as voters and partly as members of trade societies, and that this power is constantly exercised for less worthy and less practicable objects. It is sometimes exercised at the bidding of professional politicians, for the attainment of ends in which no one but the professional politicians themselves have the smallest real interest, but which, nevertheless, they contrive to represent as being of importance to the public. It is often exercised to coerce employers in ways which seem to me to be neither good for the employers themselves, nor for the workpeople, nor for trade, nor for anybody except those who have no fancy for working with their hands or with their brains, and who take to working with their tongues instead. I should like to see this power exercised in sending to the School Boards men or women who would look after the physical welfare of your children, and in coercing employers, if they are to be coerced at all, in the same direction. A combination against a master who chooses to employ some wrokman whom others do not like seems to me to be unjust; and, like most unjust actions, to be a blunder as well. A combination against a master whose workshops were badly lighted, or who wished to diminish the wages of men who wore spectacles and who could see as well with them as others without them, seems to me to be a proceeding which would be justified by science, by common sense, and by humanity; all of them allies of great practical value in the attainment of any ends with which they are associated. It is part of the business of this Health Congress to teach those who attend its meetings to take proper care of their bodies; a course which, with most men, is an essential preliminary to taking proper care of their souls. If my words to-night have at all assisted you to perceive the practical importance of taking care of one small organ, I shall feel that my time has indeed been well bestowed.

The MAYOR OF BRIGHTON said it was a great thing to have obtained that night from an eminent professional man like Mr Brudenell Carter, whose time was greatly called upon in London for the benefit of those who suffered in eye-sight, a lecture which so elaborately and carefully instructed them. He asked them to join in giving a hearty vote of thanks to Mr Carter for the kindness he had shown in coming there and proving by his presence the interest he had taken in the promotion of this new Health Congress. (Applause.)

Dr. TINDAL ROBERTSON regarded it as a great privilege to second the vote. Mr Carter had gone into one of the minute points affecting human health, power, and happiness, especially amongst working men, and had shown them in a masterly way how they might protect themselves from the loss of eyesight, one of the most precious gifts of God to man. Mr Carter certainly paid the inhabitants a high compliment, because the first part of his lecture, devoted to the exposition of the doctrine of evolution, was of so philosophical a character that it might worthily have been addressed to learned governors of the classical Universities of Oxford or Cambridge. (Applause.) Nevertheless, he did not think Mr Carter had cause to regret having at the outset treated the question in that way; for he had had a most attentive and appreciative audience. (Renewed applause.) The latter part of the address had been distinctly practical, and thus they had gained scientific and useful instruction. Now Mr Carter had not given them that lecture without considerable trouble to himself, and he had come there to give them the proceeds of his work without fee or reward.

He thought, therefore, they would give him not only a unanimous vote of thanks, but one of the heartiest that had ever been accorded to any one in that building. (Loud applause.)

The PRESIDENT (Dr. RICHARDSON), in submitting the motion to the audience, said they knew as well as he did that there were two classes of teachers. The first class was always straining to get together a little knowledge and to speak it out at great length. The other class was composed of persons who, having a fulness of knowledge, endeavoured to press into the smallest possible time the most they could. He need not tell them to which class of speakers Mr Carter belonged. (Applause.) Mr Carter had spoken to them out of the richness and fullness of his knowledge upon this particular subject, and had given them an address which he was certain he was within bounds in saying could not have been surpassed. (Applause.)

The motion was put and carried unanimously amid great applause.

Mr CARTER said he was deeply touched by the flattering way in which his friends had been kind enough to speak of his humble labours, and by the way in which the audience had received him. They had heard so much that he would not venture to speak further than to say he deeply thanked them for the kind reception they had accorded him. (Applause.)

The proceedings then closed.

SERMON,

Preached in the Dome, Royal Pavilion, Sunday, December 18th, 1881,

BY THE MAYOR'S CHAPLAIN,

THE REV. JOHN JULIUS HANNAH, M.A.,

VICAR OF ST. NICHOLAS, BRIGHTON.

I. John, iv. 21—"And this commandment have we from Him, that he who loveth God love his brother also."

DURING the week which has just passed away, the place in which we are now assembled has been used for the purpose of holding a "Health Congress," at which many eminent men have come together to discuss a subject of the most profound importance to us all, viz., "How best to promote the good health and sanitary well-being of the whole human family here upon earth." And now that the labours of that Congress are over, it has seemed good to those who have had the direction of it to bring the whole matter to a fit conclusion by holding, on this Holy Day, religious services, at which we may meet together and offer up our thanks to the Ruler of us all, for whatever measure of success He may have vouchsafed to those who have thus been toiling for the good of their fellow men. And, to my mind, the conclusion which has thus been arrived at is a most excellent one;—for does it not acknowledge (as, indeed, it ought) the source from which all improvement must spring? One may plant and another may water, but God, and God alone, can give the increase to the store.

It is well that we should all recognise what the exact position is which Religion holds towards these matters. Some would fancy that the province of the religion which is taught us by our Lord and Saviour Jesus Christ is purely a spiritual matter, and has no concern with such things as sanitary reform and the laws of health; which they would consider purely secular questions. But in the present day we, whose duties are mainly, though not exclusively, concerned with the spiritual, can thankfully and joyfully say that this most pernicious idea is fast dying out, under the influence of that creed which tells us that the Son of God has redeemed all mankind, body, soul, and spirit; that the bodies of men, as well as their souls, were ever the objects of our Lord's most tender care in the days when He lived upon this earth; that He went about doing good, and healing all those that were oppressed with disease, as well as proclaiming the glad tidings of the Gospel, which, in the first instance, He came to do. And, therefore, all who really love the Lord Jesus Christ in sincerity, all who really wish to follow in His footsteps, will look on the physical and intellectual improvement of every human being as a duty hardly less sacred than a care for his spiritual welfare. "This commandment have we from God, that he who loveth Him love his brother also."

This is the first point we have to consider from the religious point of view, viz., that these are matters with which religion is concerned. And the second point is to define the province which religion and the ski . and toil of man should respectively occupy in the great struggle in which we are engaged. In all His dealings with mankind, in these days, at all events, in which our lot has been cast, God does not work by miracles, but by human agents; therefore, if we want an improvement, we must work and labour for it; we must not merely trust to Providence, and hope that some day things will mend.

Some of you will remember the fearful visitation of Asiatic cholera which attacked these islands some five and twenty years ago. The devastations caused by that dire disease were, no doubt, due, in a very great degree, to the neglect and carelessness in which we were then living. The reasons which made the scourge so terrible, doubtless, were such things as bad food, bad air, crowded bedrooms, the filth of our great cities left to ferment in poisonous cesspools, foul ditches, and marshes, and mud, and such things as these. When the plague was at its height, some called it a visitation or judgment of God. And as things got worse, the Prime Minister of the day, the late Lord Palmerston, was asked to appoint a National Fast Day, in the hope that thus the evil might, by the direct interposition of the Almighty, be alleviated or removed. He refused the request, and told people instead to turn to the work of sanitary reform, to whitewash their houses, and clear away their filth. This refusal was naturally much commented upon at the time, and many were those who condemned it as irreligious, as flying in the face of Providence, and the like. And no doubt the necessity for the one thing was no argument against the other. The Fast Day would not have impeded the cleansing, any more than the cleansing need have been considered sufficient without the fast. But there was not wanting at least one clergyman—the late Charles Kingsley—to come forward, and go so far as even publicly to thank him in these words: "As a clergyman, I feel bound to express my gratitude to Lord Palmerston for having refused to allow a National Fast Day on the occasion of the present reappearance of pestilence, and so having prevented fresh scandal to Christianity, fresh excuses for the selfishness, laziness, and ignorance which produce pestilence, fresh turning men's minds away from the real causes of this present judgment, to fanciful and superstitious ones. It was to be hoped that, after the late discoveries of sanitary science, the clergy of all denominations would have felt it a sacred duty to go forth on a crusade against filth, and so to save the lives of thousands, not merely during the presence of cholera, but every year." There is much truth in these burning words, which the Church has come at last to recognise. At last we feel that it is our duty to exert ourselves to the uttermost, lest by our apathy or carelessness our weaker brethren perish. But we who profess the faith of Christ crucified recognise also the source from which all our efforts must receive their strength if they are to succeed; and so the true and earnest Christian will in all these matters so labour as if he himself had to effect everything, but, at the same time, he will also so trust in God as if he had to effect nothing. In the words of an old English writer, "to our own safety our own sedulity is required, and then blessed for ever and ever is that mother's child whose faith hath made him the child of God." We must not sit still and wait; we must gird up our loins and quit us like men and be strong; we must work while it is called to-day, knowing how soon the night cometh when no man can work; we must do our very utmost, but we must also remember that "except the Lord build the house their labour is but lost that build it; except the Lord keep the city the watchman waketh but in vain."

"Watch and pray," this will ever be the Christian's motto. We sometimes hear it said that "to labour is to pray," and I am sure that the converse of this proposition is also often true, that "to pray is to labour," but the one is the counterpart of the other, neither is complete without the other. "These ought ye to have done, and not to leave the other undone."

It is in this spirit that I hope we are gathered here this morning, to "praise the Lord for His goodness, and declare the wonders that He doeth for the children of men;"—to thank Him for what we have been enabled to accomplish in the past, and to pray earnestly to Him to give us strength to persevere, to stir us up to yet more strenuous exertions in the time that is yet to come, that we may go forth with renewed energy and vigour to our work and to our labour till the evening of our life shall come.

Let us briefly see how this principle will show itself in some few cases to which our attention has recently been called.

"The health of the community, and how best it may be attained." This, I suppose, we may accept as a short statement of the object of the gathering which has just come to a close, and we have been told that the three main desiderata towards this end are:—1. Pure living; 2. Good food and proper clothes; and 3. Healthy dwellings. Now how are these objects to be obtained? We have heard many suggestions on this point during the last few days, many of them excellent in their way. I do not propose to discuss them this morning. It would ill become me so to do. They have been thrown out, for the most part, by men who thoroughly understood what they were talking about, and who were also thoroughly in earnest in their efforts to promote the welfare of their fellow men. All I have to do is simply to show that all these objects will be more likely to be obtained from a religious than from an irreligious standpoint.

1. To take first the case of pure living. Now nothing undoubtedly tends so much to health in after life as pure and steady conduct in our earlier years. On this point all are agreed. But, unfortunately, there "is another law in our members, warring against the law of" God. Our passions are strong, the ways of vice are smooth and pleasant, and the ways of virtue often hard and uphill and difficult; and all who know anything of human nature, specially in the case of young people, know full well to their cost the great, the exceeding, difficulty of making young folks look at these matters from a right standpoint. You cannot put old heads on young shoulders. What is to be done, then, to make young people carry out the rules you give them? You can point out the advantages. Yes, but alas the sanction is not strong enough. You will want all the help here you can possibly get, and you will assuredly find that the strongest influence you can use will be that which religion teaches. "Wherewithal shall a young man cleanse his way? Even by ruling himself after Thy word." You cannot make people sober or steady by Act of Parliament. The worst of crimes are those which the law takes no

cognizance of. But what the law cannot do the Grace of God can and will do, "teaching us that, denying ungodliness and worldly lusts, we should live soberly, righteously, and Godly in this present world."

2. Then when you come to the next point, viz., good food and proper clothes, religion also has its proper place here, and without it the task would be far more difficult than it is. We may do much to provide against adulteration and shoddy by legislation and by penal enactments, but much more, I venture to affirm, by getting men to look at these matters of trade from the highest standpoint. You may make laws as strict as you please. The ingenuity of rogues will often still evade them. "Are there yet the treasures of wickedness in the house of the wicked, and the scant measure that is abominable? Shall I count them pure with the wicked balances, and with the bag of deceitful weights? For the rich men thereof are full of violence, and the inhabitants thereof have spoken lies, and their tongue is deceitful in their mouth." Such men we know may exist and flourish under the most stringent legislation. But, on the other hand, we may point to upright and high-principled tradesmen who, without making haste to be rich, still rise to affluence by their patient efforts to do justly, and to love mercy, and to walk humbly with their God; who acquire the position they attain to by honest endeavour and successful enterprise, and whose rule it is of all that God gives them to bestow some portion on their suffering brethren.

3. And if we come to the third point, healthy dwellings, the fact for which I am contending is still more apparent. I am not, of course, speaking of the houses of the rich. They will be sure to look out for themselves. But to whom are we to appeal for healthy homes for the poor? Here they cannot help themselves, and it often pays the landlord best to leave things as they are. It is only those who have a real love for their fellow men who are likely to bestir themselves in this matter, and those are most likely to help us here who love God, and for His sake love their brother also.

My brethren, dearly beloved in the Lord, in this spirit let us go back to our ordinary avocations. If this Congress has made us think of these things, not from purely selfish motives, but from a high Christian desire to do some good towards our fellow men, then its results will be blessed indeed. We are but stewards both of our riches and our time in this world, and it is required of stewards that a man be found faithful. How does the teaching of the season chime in with what I have been saying, and warn us that this world is no sure abiding place, but that the fashion of it passes away. This is the last Sunday in Advent. Next Sunday will be Christmas Day. The first is meant to warn us of the solemn account which we must all one day give before the judgment seat of Christ. The other speaks to us of peace and good-will. Oh, let us lay to heart the warning. The Church is reminding us that the night is far spent, and that the day is at hand. Let us work while it is called to-day; for the night cometh when no man can work. We may have but little time left to us. What a startling reminder of this we received a few days ago, when one of the papers was read by one who wrote it not, its writer having suddenly passed away. "Be ye also ready, for in such an hour as ye think not the Son of Man cometh." Then turning from the past to the future, let us think of the Christmas festival which will so soon be here. Next Sunday is Christmas Day. This week the bright unfading holly will once more gladden the walls of church and home. And may this season of Christmas be blessed to you all. It is a season of joy in our hearts, in our churches, and in our homes. Let us take care, then, that our joy be Christian and not selfish joy; that while we rejoice in that plenty which a gracious Providence has preserved to us, we secure a continuance of God's blessing upon it by breaking our bread to the hungry and making the broken-hearted to rejoice. I am asked to announce to you that at the conclusion of this service a collection will be made in aid of the funds of the Sussex County Hospital, perhaps the noblest of all the charities of which this town possesses such a goodly store. I hardly know how the proceedings of a Health Congress could be more fitly closed. We have discussed the theory of health in all its bearings. Now let us put that theory to a practical test, and do something by an act of self-sacrifice to improve the health of those among our poorer brethren who at present are suffering and ill. Surely, brethren, the fire at home will burn more brightly, and the heart within rejoice with less misgiving, if we have done something this Christmastide to lighten the load of human suffering; something to fulfil the command of God, which tells us that if we love Him we must love our brother also.

[The sermon was heard in the King's Apartments, Royal Pavilion, through the Telephone, which was connected between the two buildings.]

APPENDIX.

Vegetarian Society, 56, Peter Street, Manchester,

DECEMBER 12TH, 1881.

TO THE PRESIDENT OF THE BRIGHTON HEALTH CONGRESS, B. W. RICHARDSON, Esq., M.D.

Dear Sir,—

We desire to commend to you, and to all attending the Congress now being held at Brighton, the Rev. M. de Colleville, D.D., as Representative of the Vegetarian Society at your Congress; and he will wish you in our name, "God-speed." To all such enterprises, having for their end the improvement of the health of our citizens, our Society has and claims its kindred aim; our friend and representative will not fail to point out to you, when opportunity may be afforded him, the value of a simple and unstimulating diet for all, whether on grounds of health, temperance, humaneness, or economy. Indeed, we have to congratulate you for many teachings of great value to the temperance world, and not least for those on diet.

We have the honour to be,

Your faithful servant,

R. BAILEY WALKER, F.R.S.L.

APPENDIX.

SECTION B.

FOOD IN RELATION TO NATIONAL AND DOMESTIC ECONOMY.

ABSTRACT OF THE ADDRESS

OF THE

REV. M. DE COLLEVILLE, D.D., M.I.N.G., &c.

As member of the Vegetarian Society and as honorary member of the "Sociètè Vegétèrienne de France," Dr. de Colleville urged that the question of obtaining the enjoyment of the highest *health*, without resorting to the use of the flesh of animals as food, had come to possess enormous national, economical, and domestic importance. Every speaker in that Congress had advocated a return to the closer observance of the laws of nature, in order to secure the highest earthly existence and comfort. They, as Vegetarians, did live in accordance with that law. They quoted the authority of many very eminent teachers and writers in their favour, *e.g.*, the words of Ray, Cheyne, Linnæus, Haller, Hufeland, Cuvier, Liebig, Owen, Lawrence, Carpenter, and even of Dr. Richardson himself. They had on their side the voices of instinct, common sense and experience; and they confidently invited all, who wished for health of body and mind, to a trial of the Vegetarian practice; to an examination of its principles. He would further remind the Congress that the many problems connected with Vegetarianism and its adoption had been diligently studied and carefully elucidated by students and practical men in the United Kingdom, in the United States of America, in Germany, Switzerland, and France; for, in the words of their President, Dr. Richardson, "He who has ceased to learn, begins to die." Among those investigations, Dr. de Colleville named those going forward on the important subject of bread and bread making, the chemistry of foods and drinks, the economic results of agriculture and cattle raising in relation to the supply of food and the employment of labour, on mushroom culture, on the relation of food to population and over population, &c., &c. Indeed, it was contended by Vegetarians that on the method of life which they advocated, four to five times the amount of population might be sustained,—and sustained healthfully and happily on a given average, as compared with that now sustained on a mixed diet. Who seeks his own welfare must, in justice to himself and to his family, make himself master of the very important question then placed before them. Many eminent testimonies—personal, medical, and scientific—had been given in favour of Vegetarianism. Year by year the experience of those who had adopted Vegetarian diet accumulated in its favour. Food for Vegetarians is always plentiful, wholesome, and cheap. Practical instructions were at the service of the beginner whenever he chose to ask for them; many most attractive reports had been published by the Vegetarian Society of Great Britain.

The writer appealed to all who had taken part in promoting that splendid assembly—which did so much honour to Brighton, and to the President, Dr. B. W. Richardson—not to reject as unimportant or unacceptable the subject he had laid before them. The very name by which Vegetarians were known, derived from *Vegetare*, to strengthen, to fortify, had in it sufficient meaning to challenge enquiry and to fix their attention; he hoped to induce a trial from which could follow only good results to those who try. Thus each could discover for himself the value of the advice given, and thus escape the manifold evils which lay in wait for those who consumed the flesh of animals, and the numerous perils which were attached to the feeding on pork.

If so investigated, the benevolent in heart would soon find themselves in possession of new methods of benefactions to the needy. Labourers in all Christian mission fields would find efficient help in their religious work. Temperance reformers would have another and mightier method by which to subdue the drink crave; and all, whether the busy or the leisured, the scientific or the practical, high or low, would learn from them, love for simplicity in all things,—that golden quality by which they could keep their hearts pure and open to any new source and spring of happiness.

In the name of the Vegetarian Society, he wished "God-speed" to that Congress, and to any enterprise having for its aim the social, educational, moral, and sanitary improvement of the English people. This simple and unstimulating diet, whether on the grounds of humaneness, temperance, economy, or moral, would do much for the elevation of mankind, while both Nephalian and Vegetarian labourers throughout the world felt warm gratitude to Dr. Richardson for many valuable teachings, calculated to advance the world in truth, purity, and love.

December 12th to 17th, 1881.

—§—

BRIGHTON HEALTH CONGRESS.

—§—

LIST OF ASSOCIATES.

Abbey, Mr Ald., Fair Lee Villa, Abbey road
Abbey, Miss, Fair Lee Villa, Abbey road
Abbey, W. H., Fair Lee Villa, Abbey road
Abell, H. W. G., 52 Ship street
Abell, Mrs, 52 Ship street
Abell, J. J., 173 Western road
Abell, Mrs J. J., 173 Western road
Adams, Rose, 9 Norton road
Alderton, W. M., 31 Clifton street
Alexander, Major-Gen., Drumraney, Preston road
Alexander, Mrs, Drumraney, Preston road
Allen, Dr Marcus, 38 Regency square
Allen, Mrs, 38 Regency square
Anderson, Miss, 34 Montpelier road
Appach, F. H., 13 Palmeira square
Ardley, Mrs, Buckingham road
Arthurs, Mrs, 46 Sillwood road
Attree, G., 5 Richmond terrace
Attree, G. F., 5 Richmond terrace
Attree, Miss, 5 Richmond terrace
Avenell, G. T., 9 Hanover crescent
Avenell, Miss, 9 Hanover crescent

Axford, J., 102 Marine parade
Axford, W. H., Warwick House, Southsea
Aylen, Samuel, 1 Hampton place
Aylen, Mrs, 1 Hampton place

Baber, F. C., 4 Preston street
Baber, Miss, 4 Preston street
Bacon, Councillor, Old Ship Hotel, King's road
Backhouse, A., 4 New Steine
Bailey, Rev. Canon, West Tarring
Bailey, Mrs
Baines, Miss F. M., 40 Sussex square
Baker, J. S., 38 Denmark villas
Baker, Mrs, 38 Denmark villas
Baker, Miss, 4 Park crescent
Baker, Miss, 4 Park crescent
Baker, Miss, 4 Preston street
Baker, John, Goldstone Bottom Waterworks
Bansfield, Robt., 76a Marine parade
Barnard, John, 32 Montpelier crescent
Barnard, Mrs, 32 Montpelier crescent
Barnes, Ellen, 1 Alexandra villas
Barnes, James, 1 Alexandra villas
Barnston, Miss, 16 Cambridge road
Barclay, J. E., Second Avenue
Barclay, Mrs, Second Avenue
Barclay, J. G., 1 Second Avenue
Barclay, Mrs J. G., Second Avenue
Barclay, Mrs, 125 Marine parade
Barratt, Dr, 46 Grand parade
Bartlett, J. H., 100 Abbey road, Kilburn
Barton, H., 77 King's road
Barton, Mrs, 77 King's road
Bastick, Samuel, 6 Waterloo place
Bayes, Dr, 88 Lansdowne place
Bayes, Mrs, 88 Lansdowne place
Bayley, R. B., Rev., St. Michael's School House
Beal and Co., J., 55 East street
Beale, W. E., 1 Hanover place
Bell, Miss J. E., 48 Marine parade
Bellingham, C., 12 New Steine
Benett-Stanford, V. F., 1 Adelaide Mansions, Hove
Bennett, B., Councillor, 13 Gladstone terrace
Bennett, Mrs, 13 Gladstone terrace

Bennett, Mrs W., 96 Lewes road
Bennett, Miss, Haxell's Hotel
Bernard, Mrs, Rossmore, Preston road
Bevan, R. A., Union Bank (Treasurer)
Bevan, Mrs, Union Bank, Brighton
Beverley, Rev. H. W., 6 St. George's place
Beverley, Mrs, 6 St. George's place
Beves, Edward, Melville House, Dyke road
Beves, Mrs, Melville House, Dyke road
Bigge, A., 23 Cambridge road
Billing, T., 86 King's road
Billing, Mrs, King's road
Bird, Dr P. H., Old Ship Hotel
Blyth, Dr A. W., 27 Cannon place
Blyth, Mrs Wynter, 27 Cannon place
Blundell, Mrs, Noel House, Sudeley place
Boger, Capt. C. P., R.N., 35 and 36 Norfolk square
Booth, Councillor Edwin, 70 East street
Booth, Mrs, 70 East street
Bostel, Mrs, 79 Preston road
Botting, Mr, 33 Grenville place
Botting, Mrs, 33 Grenville place
Bourchier, Lieut.-Gen., 19 Eaton place
Bovill, Mrs, 3 Montpelier road
Bovill, Miss, 63 Montpelier road
Bower, Rev. H., Blenheim House, Marlbro' place
Bowyer, W., 25 Park crescent
Boxall, W. P., Belle Vue Hall, Eastern road
Boxall, Mrs W. P., Belle Vue Hall, Eastern road
Boys, Mrs, 59 Grand parade
Bradford, T., Sandy Mount, Pendleton, Manchester
Bradford, Mrs, Sandy Mount, Pendleton, Manchester
Bradish, Mr, 14 Gloucester place
Braithwaite, J., 5 Montpelier terrace
Braithwaite, Mrs, 5 Montpelier terrace
Bradley, C. L., 28 Albany villas, Hove
Brigden, Alderman J. L., 187 Western road
Brigden, Mrs J. L., 187 Western road
Brigden, Miss, 187 Western road
Bright, J. B., 20 Bolton gardens, S.W.
Bright, Lady, 20, Bolton gardens, S.W.
Brougham, Hon. R., British Electric Light Company
Broughton, Francis, Springcroft, Preston road
Brown, A., Springfield, Withdean
Brown, Mrs A., Springfield, Withdean

Brown, Fred, Grove Lodge, Withdean
Brown, W., Tavistock House, Royston
Browning, R., London
Brownlove, Mrs, 11, Brunswick road
Buchell, Charles, Belvidere Mansion, King's road
Buchell, Mrs C., Belvidere Mansion, 61 King's road
Bull, Mrs, Hurst, Sussex
Bull, Mr, 22 Norfolk square
Bull, Mrs, 22 Norfolk square
Banguay, R., M.D., Lyme Regis, Dorset
Banner, E. G., 6 Norfolk terrace
Bunster, Mrs, Blenheim House, Marlborough place
Burgoyne, G. A., 15 Hamilton road
Burke, Miss, 91, Montpelier road
Burr, Chas., Rossmore Lodge, Hove
Burrows, W. Seymour, 62 Old Steine
Burrows, Mrs Seymour, 62 Old Steine
Burton, W. K., Brunswick Baths, Western street
Butler, Mrs, 12 Dyke road

Calvert, Miss G., 113 Lansdowne place
Campbell, G., Capital and Counties Bank
Campbell, Mrs, Capital and Counties Bank
Campbell, Mrs, 51 Regency square
Candy, Surgeon-Major, M.D., Station Hospital, Portland, Dorset
Carden, John, 82 Western road
Carden, John, Jun., Haslemere, Preston road
Cardross, Lady, 9 Denmark terrace
Carver, Molesworth House, Palace place
Carey-Walters, Mrs, 8 Marine square
Carpenter, Dr A., Croydon
Carter, Capt. E., 2 Chesham place
Carter, John, 35 St. George's road
Carter, Mrs, 35 St. George's road
Carter, Mrs, 2 Chesham place
Catt, C., West Street Brewery
Catt, C. M., West Street Brewery
Catt, E. H., West Street Brewery
Catt, Mrs, West Street Brewery
Catt, Wm. (Bradford and Co.)
Cazenan, Charles, 51 Regency square
Chadwick, Edwin, C.B.. Sheen, Mortlake
Chalk, Mrs J. C., 10 Grand parade
Chalk, Mrs, 31 Park crescent
Champion, F. S., Northgate House

Chappell, J. T., 25 First Avenue
Chappell, Mrs, 25 First Avenue
Channing, F. A., 3 Brunswick square
Channing, Mrs, 3 Brunswick square
Cheesman, Geo., 10 Prince Albert street
Childers, Mrs W., 65 Brunswick place
Churton, Miss, 45 Buckingham place
Clapham, R. C., Earsdon, Newcastle
Clapton, Miss, 9 London road
Clark, J. C., 64 Middle street
Clark, Mrs, 64 Middle street
Clark, Mrs, 2 Ditchling road
Clarke, J. J., Goldstone Farm, Hove
Clayton, C. E., 88 London road (Executive Committee)
Clayton, Mrs, 88 London road
Clayton, Miss, 3 Hanover crescent
Clement, P., 11 Tisbury road
Coad, C. G., 28 Brunswick place
Cochrane, Mrs, 24 Brunswick road
Colleville, de, Rev. Dr., 24 Chatham place
Collier, Mrs, 6 Clermont road
Colby, Mrs, 1 Sillwood place
Cooper, F. H., 38 Montpelier crescent
Cooper, G., 46 Denmark villas
Cooper, J., 7 Westminster Chamber
Cooper, W. G., 19 Brunswick square
Cooper, W. R., German House, 18 Marine parade
Conder, Rev. A., 8 Middle street
Constable, Miss, 30, Park crescent
Copleston, Miss, 16 Denmark terrace
Copleston, Miss M. E., 16 Denmark terrace
Cowan, T. W., 14 Oriental place
Cowan, Mrs, 14 Oriental place
Cowley, Frank, St. James's street
Cox, Ald. A. H., 11 Wellington villas
Cox, Mrs Ald. A. H., 11 Wellington villas
Coxed, M., Lorna House, Hove
Crabbe, M. E., 11 Clifton hill
Craven, J. C., Councillor, 1 St. Peter's place
Crawley, Fred., Ashdell-Alton
Creak, Miss, The Wick
Cripps, R. M., Novington, Lewes
Cross, Rev. J. H., 21 Sussex square
Crosskey, E., Castlegate, Lewes
Crosskey, Robert, Castlegate, Lewes

Crowley, F., Grand Hotel
Cunnington, Miss, 2 Sussex square
Cuthbert, J. H., 24 Park crescent
Cuthbert, Mrs J. H., 24 Park crescent
Cutler, Miss, 25 Oriental place
Cutler, Miss F., 5 Arundel street

Darch, Miss, 7 Belgrave place
Davis, F. A., 5 Springfield road
Davis, H. C., 5 Springfield road
Davis, Mrs, 5 Springfield road
Davis, Harry, 5 Springfield road
Davis, J. H., Church street, Hove
Davey, Ald. Henry, Grand parade
Davey, Mrs, 82 Grand parade
Davies, J., 11 Denmark terrace
Davies, Miss, 11 Denmark terrace
Davies, Mrs, 18 Glo'ster place
Dawes, A. R., 25 King's road (Executive Committee)
Day, Rev. H. G., 7 Richmond terrace
Deane, Mrs, 11 Trafalgar street
Deane, William, 11 Trafalgar street
Denman, Samuel, 26 King's road
Dennant, J., 1 Sillwood road
Dennet, Charles F., 1 St. George's place
Denton, E. B., 22 Whitehall place, London
De Paris, George, 13 Denmark terrace
De Teissier, The Baron, 7 Brunswick terrace
Dixon, Mrs, 4 Dorset gardens
Dixon, J. L. M., 4 Round Hill park
Dobede, H. J., 15 Montpelier crescent
Dobede, Mrs, 15 Montpelier crescent
Dobede, Miss, 15 Montpelier crescent
Doers, Miss, 8 Steine street
Douglas, Edward, 14 Clifton terrace
Doulton and Co., Lambeth, London
Drysdale, C. R., M.D., 17 Woburn place, W.C.
Dudeney, A., 10 Lower Rock gardens
Dudeney, Miss J. A., The Elms, Portslade
Duncombe, G., 186 Western road
Dunhill, Thomas, 20 Brunswick road
Dunhill, Mrs, 20 Brunswick road
During, Miss, 12 Sudely place
Duval, Henry, 9 Montpelier street

Eairsh, M. A., 45 Marine parade

Easton, Edward, C.E., Royal Crescent Hotel
Easton, Mrs Edward, Royal Crescent Hotel
Ede, Miss J. Laurieston, 77 Dyke road
Edis, Major R., F.S.A., 14 Fitzroy square, London.
Edmonds, Mrs, 57 Buckingham place
Edmonds, Henry, 57 Buckingham place
Edmonds, Charles, 57 Buckingham place
Edmunds, Miss, 18 Grenville place
Ellice-Clark, E. B., Town Hall, Hove
Elliott, Miss, 18 Sillwood place
Ellis, G. C., 23 Grand parade, St. Leonards
Ellis, Joseph, Hampton Lodge, Western road
Ellis, Mrs J., 16 Marine parade
Engall, G. G., 1 Sillwood terrace
Evershed, Miss, 8 London road
Evershed, Henry G., 24 College road
Evershed, Fred. J., 24 College road
Evershed, W. T., 8 London road
Ewart, Joseph, Montpelier Hall, Montpelier terrace
Ewart, Miss, Montpelier Hall, Montpelier terrace

Ferrers, Mrs, North Cottage, Rose hill
Field, W. A., 20 Preston street
Field, Mrs, 20 Preston street
Fisher, Alex., School of Art
Fisher, Mrs, School of Art
Fitzhugh, A. J., 3 Pavilion parade
Fitzhugh, Miss, 39 Lansdowne place
Fitzhugh, Miss E., 39 Lansdowne place
Flemming, Thos., 18 Ladbroke gardens, W.
Fleming-Quinton, Mrs, 88 Lansdowne place
Fletcher, L. E., Bedford Hotel
Ford, Gerard, 58 Marine parade
Forman, A., New Club, King's road
Fowler, Thos. M., 84 North street
Fox, O. A., 14 Pavilion parade
Fox, George, Kingsbridge, Devon
Fraser, W., 69 Dyke road
Freeman, C. G., 6 Hanover crescent
Freeman, G., Fairlight, Preston road
Freeman, Mrs, Fairlight, Preston road
Freeman, Harvey, Fairlight, Preston road
Freeman, J. A., Town Hall
Freeman, Mrs, Town Hall
Freeman, V. P., 9 St. George's place

Freeman, Mrs V. P., 9 St. George's place
Frere, Miss Anna, Kelveden, Essex
Frere, Mary, 39 Denmark terrace
Friend, Daniel, Stoneleigh, Preston road
Friend, Mrs, Stoneleigh, Preston road
Friend, D. B., 77 Western road
Fryday, Mrs, 15 Preston street
Fuller, F., 63 St. Aubyn's, Hove
Fuller, Mrs, 63 St. Aubyn's, Hove
Fullgains, Mrs, 8 Stanford road
Furner, E. J., 111 King's road
Fussell, Dr E. F., 23 Clifton terrace
Fyffe, Miss, 86 Montpelier road

Gainsford, Mrs, 2 St. George's place
Gardiner, Mrs and Miss, 67 Grand parade
Gardner, W. S., 52 Regency square
Garratt, B. C., 16 Finsbury square, E.C.
Gates, Mrs G., Chesham House
Gates, P. C., Q.C., 6 Warwick square, S.W.
Gibbins, J. G., Molesworth House, Palace place (Executive Committee)
Gibbins, Mrs, Molesworth House, Palace place
Gibbins, Miss, Molesworth House, Palace place
Gladstone, G., 31 Ventnor villas
Glaisyer, H., 96 London road
Glaisyer, Thos., 96 London road
Glendening, John, 26 Regency square
Godfree, G. S., 65 Preston road
Goodlake, Mrs, Cecil House, King's road
Gorringe, Rose, Miss, 6 Wakefield terrace
Goulty, Miss, 2 Sussex square
Grace-Calvert, Mrs, 113 Lansdowne place
Grace, W. F., 54 York road, Hove
Gray, Miss, 5 Salisbury road
Greenfield, Mrs, 19 Brunswick place
Griffit, J. O., Q.C., Russell House, Cannon place
Griffith, Chas., Dr, 11 Marlbro' place
Griffith, E. F. G., C.E., 18 Abingdon street, Westminster
Griffith, Henry, Montpelier Lodge, Montpelier terrace (Executive Committee)
Griffith, Mrs, Montpelier Lodge, Montpelier terrace
Grimley, Rev. H. N., 2b Compton terrace
Gritton, Miss, 8 Lewes crescent
Guerrier, W. J., 2 Sussex square
Guerrier, Miss, 2 Sussex square
Gunnaranse, Mrs, 5 Round Hill crescent

Gurney, Samuel, 48 Sussex square

Hack, Daniel, Fircroft, Preston (Executive Committee)
Hack, Mrs, Fircroft, Preston
Hack, Mary P., 99 Trafalgar street
Hackman, J., 26 Sillwood road
Hadderwick, R., Glasgow
Hadlow, F. V., Prince Albert street (Executive Committee)
Halcombe, A. F., 27 Longridge road, S.W.
Hall, Mrs, 20 Eaton place
Hall, William, 20 Eaton place
Hallett, W. H., Mayor, Buckingham House, Marine parade (Chairman)
Hallett, Mrs W. H., 141 Marine parade
Hallett, Major F. F., Manor House, Kemptown
Hallett, Miss, Manor House, Kemptown
Hallett, Miss Bessie, Manor House, Kemptown
Hallett, Miss Edith, Manor House, Kemptown
Hallett, Miss Gertrude, Manor House, Kemptown
Hamblin, Ebenezer, 12 Park crescent
Hamblin, Mrs E., 12 Park crescent
Hamblin, W. T., 54 King's road
Hamblin, Mrs W. T., 54 King's road
Hamilton, C., 10 Prince Albert street
Hamilton, E. J., 10 Prince Albert street
Hamilton, Rev. Dr., The Manse, Dyke road
Hamilton, Councillor W., 77 Dyke road (Hon. Secretary)
Hamilton, Mrs, 77 Dyke road
Hammond, John, 13 Victoria road
Hannah, The Ven. Archdeacon, The Vicarage
Hannah, Rev. J. J., The Vicarage
Hannah, Mrs Julius, The Vicarage
Hannay, J. B., 49 Western road
Hannay, Mrs, 49 Western road
Hannington, S., 3 North street
Hannington, Mrs, 3 North street
Harburton, Viscountess, 11 Orienta place
Hardy, L., 4 Brunswick terrace
Harker, T. P., 79 Queen's road
Harmer, Alfred, 12 Queen's square
Harries, T., 29 Wilbury road, Hove
Harries, Mrs, 29 Wilbury road
Harris, H. C., 17 Cannon place
Harris, H. E., 17 Cannon place
Harris, Mrs, 11 Charlotte street
Hart, Ernest, London

Hart, H. P., St. Anne's, Lewes
Haselwood, J. E., 3 Lennox place
Haselwood, Mrs, 3 Lennox place
Hawken, L., Hurstpierpoint
Hawkes, Councillor A. J., 60 Old Steine
Hawkes, Mrs, 60 Old Steine
Hawley, Sir H., Hoove Lea, Cliftonville
Hawley, Lady, Hoove Lea, Cliftonville
Hauxwell, Dr, 21 St. Michael's place
Haycraft, Mrs, 10 Evelyn terrace
Hayllar, F., 23 Glo'ster place
Hayward, Mrs W., 7 Montpelier road
Heald, C. J., Terminus Gates, Queen's road
Heath, Rev. E., 34 Buckingham street
Heathcote, Mr, 3 Clifton place
Heathcote, Mrs, 3 Clifton place
Hebb, 73 Dyke road
Hebbert, H., 4 Clarendon terrace
Hedges and Butler, King's road
Hedderwick, 26 Regency square
Henriques, Alfred G., 43, Marine parade
Herbert, Mrs, 15 Brunswick square
Hickman, E. J., 155 Fenchurch street, London
Hill, Mrs, 18 Sillwood road
Hoadly, Alfred, Royal York Hotel
Hoadly, Mrs, Royal York Hotel
Hoadley, Edmund, 15 St. George's place
Hochheimer, Miss, 5 Hanover crescent
Holder, J. J., 8 Lorne villas, Preston
Holder, Mrs J. J., 8 Lorne villas, Preston
Holman, A., County Hall, Lewes
Hollamby, W., 81 Blatchington road, Cliftonville
Hollond, J. R., M.P., 57 Lancaster Gate, Hyde Park
Hollond, Mrs J. R.,, 57 Lancaster Gate, Hyde Park
Holyoake, G. J., Grand Hotel
Honey, H., Chislehurst
Honey, Mrs, Chislehurst
Horton, W., 35 York road
Horton, W. T., 35 York road
Howlett, Castlegate, Lewes
Howlett, Mrs, Castlegate, Lewes
How, Robert, Luton
Huckerby, Mrs, 21 Norfolk road
Hudson, Alderman, 71 Queen's road
Hudson, Mrs Ald., 71 Queen's road

Hughes, Mrs W., 21 Market street
Hunt, Mrs, 35 Park crescent
Hunter, W. O., 3 West street
Hurlock, F. S., 127 Lansdowne place
Hutchinson, Miss, 60 Montpelier road

Infield, Mrs, Wellington villas
Inglis, Miss, 63 Grand parade
Innes Cosmo, Adelphi Chambers, John street, Adelphi
Innes, Mrs, 11 Upper Phillimore gardens, Kensington
Inmen, Mrs, Wilbury road
Ireland, A. A., 18 Ventnor villas, Hove
Ireland, S. S., 198 Western road
Irvine, Mrs, Montpelier Hall, Montpelier terrace
Isaac-Egerton, 2 Powis square
Isaac-Egerton, Mrs, 2 Powis square

Jackson, Henry W., 10 Marlboro' place
Jackson, W. M. M., 10 Marlboro' place
James, Mrs E., 17 Eaton place
James, Miss F., 40 Sussex square
Jeaffreson, Miss, 10 Evelyn terrace
Jeffery, Dr, Eastbourne
Jeffrey, Mrs, Eastbourne
Jerrom, Geo. B., Local Board, Walthamstow
Jinks, A., 20 Portland place
Johnson, T. Hayter, 43, Cambridge road
Johnston, W., 43 Cambridge road, Hove
Johnstone, A. A., St. Moritz House, Dyke road
Johnstone, Mrs, St. Moritz House, Dyke road
Jones, Edward, 2 Hanover crescent
Jones, Mrs E., 2 Hanover crescent
Jones, Mrs, Hampton place
Jones, Miss, Hampton place
Joseph, Mrs, 15 Brunswick square

Kane, E. A., 9 Junction road
Kemp, Mrs, 66 Western road
Kemp, Caleb R., Lewes
Kemp, Mrs C. R., Bedford Lodge, Lewes
Kemp, Miss, 29 Brunswick place
Kenna, W., 22 Russell square
Kennington, Thos., Sea View Mansion
Kent, E., 56 Blackman street, E.C.
Keysell, H. J., 7 Evelyn terrace
Keysell, Richard, 7 Evelyn terrace
Kidd. J. M., 25 Queen's road

Kidd, Miss, 25 Queen's road
Kinderley, Mrs, 44 Dyke road
King, Alfred, 30 Buckingham place
King, Mrs A., 30 Buckingham place
King, Mrs E., 22 Atlingworth street
King, W., 19 Palmeira square
Knight, J. P., Brighton Railway Company
Knight, Mrs, Brighton Railway Company
Knightley, Dr W. P., Western College, Western road
Knott, E. H., 49 Old Steine
Knowles, Rev. J. L., 26 Regency square

Lamb, Alderman, 14 Ship street
Lamotte, Rev. G. G., 6 Montpelier crescent
Lane, James L. C. P., Russell House, Preston road
Lane, Mrs, Russell House, 57 Preston road
Langdale, Rev. G. A., 70 West street
Law, James L. C. P., Russell House, 57 Preston road
Law, Mrs, Russell House, Preston road
Lawler, F., Aquarium
Lawson, 16 Old Steine
Lawton, H. A., Haxell's Hotel
Lee, John Shreeve, Clayton, Sussex
Leeney, Miss, Westfield House, Lansdowne road
Leigh, 68 Grand parade
Leon, G. I., Bedford House, King's road
Leon, Mrs G. I., Bedford House
Lester, H. F., 2 Pump court, Temple
Lethbridge, E., Hanover crescent
Lethbridge, Mrs, Hanover crescent
Leuliette, Madame, 36 Clifton road
Load, G. G., 28 Brunswick place
Lockwood, P. C., 1 Gloucester place (Executive Committee)
Lockwood, Mrs, 1 Gloucester place
Lomax, Benjamin, 11 Park Crescent terrace (Congress Secretary)
Lomax, Mrs, 11 Park Crescent terrace
Long, Jeremiah, 50 Marine parade
Long, Mrs, 50 Marine parade
Lucas, J. E., 15 Wellington road
Lucas, Mrs, 15 Wellington road
Lucas, Miss, 27 Wellington road
Lyon, Washington, 73 King's road
Lynn George, 10 Vernon terrace

Macaulay, 31 Western road
Macaulay, Miss, 95 Montpelier road

Mackay, E., 123 Western road
Mackay, J. B., 24 Buckingham place
Mackay, Mrs J. B., 24 Buckingham place
McCullock, R. A., Bedford Hotel
McCullock, Mrs R. A., Bedford Hotel
McCormick, Rev. W., 8 Evelyn terrace
McCormick, Mrs, 8 Evelyn terrace
McGarel, Mrs, 46 Brunswick road
McHaffie, 48 Lansdowne place
McHaffie, A., 48 Lansdowne place
McIntyre, Dr J., Grand Hotel
McKellar, E., Woodleigh, Preston road
McKellar, Mrs, Woodleigh, Preston
McMahon, 23 Richmond place
Malleson, R. N., 45 Marine parade
Malleson, Mrs, 45 Marine parade
Malleson, Miss, 45 Marine parade
Mann, A., 15 Lewes road
Manwaring, G., Councillor, 6 Albany villas, Hove
Maquay, Col. J. S. R. A., 22 Lansdowne place
Marriott, W. T., M.P., 22 Brunswick square
Marriott, Mrs, 22 Brunswick square
Marchant, W., 13 Round hill crescent
Marchant, Miss, 13 Round Hill crescent
Mard, Miss, Ivy Chimneys, Withdean, Essex
Marner, John, 3 Clifton terrace
Marsh, F. J. Hatherly, Preston road
Marsh, Mrs Hatherly, Preston road
Marshall, A., 37 Grand parade
Marslar, E. J., 78 Buckingham road
Martin, Alderman E., 6 Bartholomews
Martin, Alderman H., 5 Powis square
Martin, Mrs Alderman, 5 Powis square
Martin, James, Elm Lea, Withdean
Martin, Thomas, Beechwood, Withdean
Martin, Mrs T., Beechwood, Withdean
Massey, Miss G. E., 4 Round Hill park
Matson, Geo., 42 Park crescent
Maughan, S., Guy's Hospital
Mayall, J. E., 91 King's road
Maynard, J. E., Doone Cottage
Measures, H. B., 23 Bedford square
Mecorins, C. C., Markwell's Hotel
Medley, D. T., 9 Lansdowne square
Mees, Chas., Luton

Mennell, Miss, Hastings
Merrifield, Frederic, 23 Vernon terrace
Merrifield, Mrs, 23 Vernon terrace
Merry, Miss J. S., 29 Sussex square
Metcalf, J. R., 8 Belvedere terrace
Miles, E. J., 2 Hova terrace, West Brighton
Mills, Alfred, 20 St. James's street
Mills, Miss, 20 St. James's street
Miller, Mrs W., 5 Sussex square
Milner, Rev. J., 43 Brunswick square
Milner, Mrs, 43 Brunswick square
Moncrieff, W. S., West Kensington
Montefiore, J., 34 Brunswick terrace
Moon, W., 104 Queen's road
Moon, Mrs, 104 Queen's road
Moon, Miss, 104 Queen's road
Morgan, G., Harrison's Hotel
Mostyn, Mrs, 53 Montpelier road
Murphy, Shirley F., 158 Camden road, London
Murphy, Mrs, 158 Camden road, London
Mutton, David, 83 King's road

Napper, F., 25 Ship street
Napper, Mrs, 25 Ship street
Napper, Mrs, 6 Cavendish place
Nash, W. H., 21 Chatham place
Neate, Miss, 2 Clifton hill
Neate, Miss E., 2 Clifton hill
Netten, F. S., 4 Belmont, Brighton
Nevill, Thos. H., 3 Victoria Mansions, Grand Avenue
Nevill, Mrs, 3 Victoria Mansions, Grand Avenue
Neville, Miss, 43 Dyke road
Newnham, J. M., 10 York place
Newport, Miss, St. Mary's Hall, Kemptown
Nisbett, A. F., Haddington House School

Ockenden, E. J., 13 Church road
Osborne, G., 55, Gardner street

Packham, Edwin, 100 Buckingham road
Packham, Mrs, 100 Buckingham road
Paine, Cornelius, 9 Lewes crescent
Parley, Miss, 63 Grand parade
Park, Miss, 13 Clifton road
Parkhouse, A. W., 11 Park Crescent terrace

Parker-Rhodes, C.E., Brooklyn Hotel, King's road
Parsons, F. C., 18 Stanford road
Parsons, Mrs, 18 Stanford road
Parsons, J., 5 Great College street
Part, J. S., London
Parton, F., 38 Denmark villas
Paston, Mrs, 31 Palmeira square
Paston, J., 38 Denmark villas
Pattrick, Miss, Blenheim House, Marlbro' place
Peacey, Rev. T., 50 Wilbury road
Peckover, Jonathan, 18 Marine square
Peek, Mrs, St. Clair, Hayward's Heath
Penfold, Henry, 7 Brunswick place, Hove
Penney, R. H., Highcroft, Dyke road
Penney, Mrs R. H., Highcroft, Dyke road
Perry, Henry J., 156 North street
Perry, Mrs T., 34 Duke street
Peters, Stephen, 25 Gladstone plaoe
Peters, Mrs, 25 Gladstone place
Phillips, Thomas, Etgasa, D'Aubigny road
Phillips, Mrs, 8 Clifton terrace
Pinckard, Mrs, 34 Sussex square
Plumbe-Rowland, 13 Fitzroy square, London
Pollock, Miss, 52 Regency square
Pope, Frank M., B.A., M.B., 22 Portland place
Powell, Joseph, Regency Cottage, Preston street
Pryke, Mrs E., 18 Grenville place
Pye, Henry, 37 Park crescent

Rabbits, Mrs, Blenheim House, Marlboro' place
Ramsden, Miss, 7 Belvedere terrace
Randolph, Admiral, 70 Brunswick place
Ransford, 47 Buckingham place
Ray, Surgeon-General G. H., New Club, King's road
Reading, Mrs Pym, 115 Lansdowne place
Reed, C. G., 26 North street
Reed, G. L., 33 Montpelier crescent
Reeves, Alderman, Queen's road
Reeves, Mrs, Queen's road
Reynolds, E. K. P., 10 Adelaide crescent
Reynolds, Rev. H. P., 10 Adelaide crescent
Reynolds, Miss, 10 Adelaide crescent
Richardson, Dr, F.R.S., 141 Marine parade
Ridding, Miss. 2 Denmark terrace
Ritchie, S.
Robins. T. U., 11 Salisbury road, Hove

Robins, Mrs, 11 Salisbury road
Robinson, J. W., 91 Western road
Robinson, Mrs, 91 Western road
Robson, J., Langton Villa, Buckingham place
Robson, Mrs, Langton Villa, Buckingham place
Rodriguez, E., Grand Hotel
Rogers, R. J., 40 Cannon place
Rogers, Mrs, 40 Cannon place
Rogers-Tillstone, B. T., Moulscombe place
Rogers-Tillstone, Mrs, Moulscombe place
Rogers-Tillstone, Miss, Moulscombe place
Rolfe, 11 Oriental place
Robertson, Dr, 9 Belgrave terrace
Rolling, Wm., 33 Grenville place
Rolling, Mrs W., 33 Grenville place
Ross, Douglas, 17 Park crescent
Ross, E., 17 Park crescent
Ross, Dr J. H., 8 St. George's place
Rosher, W. H. B., 13 Clermont terrace, Preston
Roth, Bernard, Rossmore, Preston road
Roth, Mrs, Rossmore, Preston road
Rowlans, J. B., M.D., 2 Lansdowne terrace
Ruff, E., 31 Bloomsbury place
Rumbold, Mrs, 38 Sussex square
Russ, William, 39 Cedars road, Clapham
Russell, Miss S., 40 Marlboro' place
Ryde, Geo., 44 Silwood road
Ryde, Geo. Mrs, 44 Silwood road
Ryde, G. W., 73 Western road (Executive Committee)

Salmon, R. H., 2 Queen's gardens
Salmon, Mrs R. H., 2 Queen's gardens
Sandeman, Capt., 8 Queen's gardens
Sandeman, Mrs, 8 Queen's gardens
Sanders, Mrs, 8 Powis square
Sattin, E. J., Elm grove
Saunders, Horace, 32 Upper Rock gardens
Saunders, Mrs H., 32 Upper Rock gardens
Saunders, J., 48 Coleman street
Saunders, Councillor J., Parklands, Keymer
Saunders, Mrs, Parklands, Keymer
Savage, W. D., 23 East Park road
Savage, Mrs W. D., 23 East Park road
Sawyer, G. D., 55 Buckingham place
Sawyer, Mrs G. D., 55 Buckingham place

Sawyer, F. E., Buckingham place (Executive Committee)
Sawyer, Mrs F. E., Buckingham place
Sawyer, Jno., 29 St. George's road
Saxby, Henry, 57 High street, Lewes
Seatliff, Dr, 11 Charlotte street
Scatliff, Mrs, 11 Charlotte street
Scott, C., 28 Vernon terrace
Scott, E. E., 46a Regency square
Scott, Miss E., 31 Russell square
Scott, Mrs, 28 Vernon terrace
Scott, Mrs Ritchie
Scott, Moncrieff, 1 Fairholme road, Kensington, W.
Scovil, Rev. Canon, 4 Bedford square
Seaton, Joseph, M.D., 19 Chesham road
Sendall, Mr Councillor, 35 Duke street
Sharp, Mr, Grand Hotel
Sharp, Mrs, Grand Hotel
Shaft, G. T., 7, Lower Rock gardens
Shepherd, Mrs A., 38 Lansdowne place
Sherwill, D., Aquarium
Sherwill, Mrs, Aquarium
Shoesmith, E., 133 Queen's road
Shoesmith, Miss, 133 Queen's road
Shute, Gen., C.B., 12 Brunswick place
Simcocks, Rev. G. S., 6 Bedford place
Simpson, T., 16 Ship street
Simpson, Mrs, 16 Ship street
Simpson, Miss E. A., 16 Ship stree
Skirrow, Miss, 3 Codrington place
Sleight, W., Deaf and Dumb Institution
Smith, A. W., 8 Prestonville road
Smith, Alderman David, 11 Arundel terrace (Executive Committee)
Smith, Mrs David, 11 Arundel terrace
Smith, Geo., 36 St. George's road
Smith, Capt. H., Grove Villa, Prestonville
Smith, John, Councillor, 25 St. James's street
Smith, Mrs J., 25 St. James's street
Smith, Mrs Joseph, 7 Walpole road
Smith, J. P. M., 118 Western road
Smith, Miss L., Grove Villa, Prestonville
Smith, Miss M., Grove Villa, Prestonville
Smith, Thos., 13 Gloucester place
Smith, Mrs T., 13 Gloucester place
Smith, W. J., 43 North street
Smythe, L., St. Anne's House, Lewes

Smythe, Mrs, St. Anne's House, Lewes
Snell, H. S., Markwell's Hotel
Snell, Mrs H. S., Markwell's Hotel
Snoad, Essex
Snuggs, Miss, 141 Marine parade
Soames, Miss, Tramore Lodge, Park road east
Soper, S. H., Councillor, 80 North street
Soper, S. H., jun., 80 North street
Souper, E. C., Withdeane court, Brighton
Sparkes, Miss, 8 Brunswick road
Spong, A. D., Rev., 19 Ventnor villas, Hove
Spong, Mrs, 19 Ventnor villas
Spong, Miss, 19, Ventnor villas
Steele, Mrs, 3 Regency square
Sterie, G., 2, Waterloo street
Stephens, H. C., Avenue House, Finchley
Stevens, W. G., 26 Marlbro' place
Stevens, Mrs W., 26 Marlbro' place
Stevens, Mrs, Broad Hill, Keymer
Stevens, Henry, Town Hall
Stevens, W. H., 16 Stanford road
Stevens, Mrs, 16 Stanford road
Stewart, A. J. R., 28 Palmeira square
Stewart, Mrs, Belvedere Mansions
Stewart, Miss, Belvedere Mansions
Stikeman, Mr, 8 Brunswick road
Stikeman, Mrs, 8, Brunswick road
Stocken, H. F., 67 London road
Stocken, Mrs, 67 London road
Stowell, Thomas, M.D., Church Street Dispensary
Strachan, J. A., 37 Medina villas, Hove
Strachan, Mrs, 37 Medina villas, Hove
Streeter, Jabez, Littlehampton
Strevens, W. H., 16 Stanford road
Strevens, Mrs W. H., 16 Stanford road
Suffield, Thomas, Old Ship Hotel
Sullivan, Miss, 51 York road, Hove
Swinburne, E., 18 Atlingworth street
Swinburne, J., 18 Atlingworth street

Taaffe, Dr R. P. B., 45 Old Steine (Executive Committee)
Taaffe, Mrs, 45 Old Steine
Tamplin, W. C., Major, Lennox place
Tankard, W. S., 12 Richmond place
Tester, Lieut.-Col. H., 1 Stanford avenue, Preston Park

Tester, Mrs, 1 Stanford avenue, Preston Park
Thomas, D., 53 King's road
Thomas, Mrs, 53 King's road
Thomas, J. O., 133 Marine parade
Thomson, A. D., 12 Pembridge villas, Bayswater
Thomson, Miss C., 29 Brunswick road
Thompson, A., Brush Electric Light Company
Thorncroft, S., 22 Richmond place
Thornton, J., 7 Grafton street
Thorowgood, S., Castle square
Thorowgood, Miss, Castle square
Thorowgood, Miss M., Castle square
Tillstone, F. J., Town Hall
Torry, G. B., 32 Regency square
Tuller, Mrs F., 63 St. Aubyn's, Hove
Tuppin, Mr, Wilbury road
Tuppin, Miss, Wilbury road
Turner, W., 1 Sillwood road

Uhthoff, John C., M.D., 46 Western road, Hove
Urlin, R. Denny, 22 Stafford terrace, Kensington, London.

Vallance, Catt, and Co., West Street Brewery
Varley, E., 30 Black Lion street
Vaughan, Chas., New Ship Hotel
Venables, Charles, Grand Hotel
Venables, R., 9 Wilbury road
Venables, Mrs R., 9 Wilbury road
Venables, Miss, 9 Wilbury road
Verrall, H., Lieut.-Col., 26 Gloucester place
Verrall, Mrs, 26 Gloucester place
Verrall, Spencer, 95, Western road
Von Glehn, Mrs, Flower Lodge

Wade, T. T. W., 22 New England hill
Wagg, Mr, 40 Bryanston square, London
Wagg, Mrs, 40 Bryanston square, London
Wakeling, T., 14 Alexandra villas
Waller, Thos., 47 Fish street hill, London
Wallis, E. W., 9 Conduit street, London
Wallis, Geo., C.E., Eastbourne
Wallis, H. E., 9 Bridge street, Westminster
Wallis, Robinson, 7 Westminster Chambers, London
Wallis, Marriage, Springfield, Withdeau (Vice-Chairman)
Wallis, Mrs Marriage, Springfield, Withdeau
Wallis, W. C., 5 Bartholomews (Executive Committee)

Walsh, Mrs, 28 Ditchling road
Walter, John, 21 York villas
Walter, Mrs, 21 York villas
Walters, Mrs, 8 Marine square
Ward, Mrs, 8 Goldsmid road
Warner, Thos., 47 Sussex square
Warner, Mrs, 47 Sussex square
Warre, C. B., Lindfield
Warren, Mrs, 28 Vernon terrace
Webb, Mrs, 72 Grand parade
Webb, Miss E., Blenheim House, Marlboro' place
Webb, Miss, 42 Montpelier street
Webber, John, Arundel House, Warleigh road
West, H. G., Union Bank
West, Mrs W., Union Bank
Weston, Oliver, Councillor, St. Catherine's House, Marlbro' place
Weston, S. P., Councillor, 19 York place
Wharton, Miss, 64 Grand parade
Wheatley, Chas., Bedford Hotel
Whitehead, 23 Clifton road
Whittle, Dr, 65 Dyke road
White, Robt., 86 Marine parade
White, A. M., 86 Marine parade
White, Jessie, 86 Marine parade
White, A., Cuckfield
Whiting, C. J., 40 Sillwood road
Wilkinson, Miss Agnes, 7 Marlborough place
Wilks, J. A., 41 Brooker street, Hove
Willett, G. W., West House, Portland place
Willett, Mrs G. W., West House, Portland place
Willett, Henry, Arnold House, Montpellier terrace
Willett, Mrs, Arnold House, Montpellier terrace
Willett, P. A., West Street Brewery
Williams, W. J., 17 Middle street
Willock, Mrs, 28 Marine parade
Wills, J., 80 Montpellier road
Wilson, Alderman J. L., 6 Chichester terrace
Wilson, Mrs, 6 Chichester terrace
Wilson, Mrs Robt., Sutton Lodge
Wilson, Miss, 6 Pavilion buildings
Wilson, George, M.D., 23 Claremont road
Winan, Mr, First Avenue
Winan, Mrs, First Avenue
Winder, Richard, Upper St. James's street
Winder, Miss, 5 Chesham place

Winham, Rev. D., Western House, Western street
Winham, Mrs D., Western House, Western street
Winter, Thos., 1 Alfred road
Winter, Mrs Thos., 1 Alfred road
Wise, Geo., 22 Medina villas, Hove
Wood, Mr Councillor, Carlisle House, Pavilion buildings
Wood, F. D., 13 Marine square
Wood, Rosa, 13 Marine square
Wood, John, 12 Pavilion buildings
Wood, Mrs John, 12 Pavilion buildings
Woodman, James, 29 Albany villas
Woolley, Charles A., Clifton Lodge, Dyke road
Woolley, Mrs, Clifton Lodge, Dyke road
Woolley, Charles J., 18 Gladstone terrace
Woolley, Mrs, 18 Gladstone terrace
Worsdell, Thomas, Dykelands, Ulverstone, Lancashire
Wright, Miss, Lion Mansion
Wright, Miss R., Lion Mansion
Wright, Miss G., Lion Mansion

Yates, Miss, 26 Gloucester place
Young, Miss Harriette, 46 Sillwood road
Young, Mr, The Drive
Young, Mrs L., Second Avenue

DAY TICKET HOLDERS.

Asford, W. H., M.B., Warwick House, Southsea

Bailey, Rev. Canon, D.D., West Tarring
Barclay, Mrs, 125 Marine parade
Barton, Mrs, 77 King's road
Bell, J. E., 48 Marine parade
Bradish, Mrs, 14 Gloucester place
Brownlow, Mrs, 11 Brunswick road

Campbell, Mrs, C. M., 51 Regency square
Clapham, R. C., F.C.S., St. Leonards
Clapton, Miss, 9 London road
Colby, Mrs, 1 Sillwood place
Copleston, Miss, 16 Denmark terrace
Copleston, Miss M. E., 16, Denmark terrace
Crabbe, Mary E., 11 Clifton hill
Cripps, R. M., Novington, Lewes
Curtis, Dr, 29 Norfolk square
Curtis, Miss, 29 Norfolk square

Denton, E. Bailey, 22 Whitehall place
Dixon, S., 4 Dorset gardens
Dixon, Mrs, 4 Dorset gardens
Dobede, Mrs, 15 Montpellier crescent
Dudney, Miss J. S., The Elms, Portslade

Eairsh, M. A., 45 Marine parade
Ellis, G. C., 23 Grand parade, St. Leonards
Elliott, Miss, 18 Sillwood place
Ellis, Mrs J., 16 Marine parade

Fraser, W., 69 Dyke road
Frere, Mary, 39 Denmark terrace
Fullgains, Mrs, 8 Stanford road

Goodlake, Mrs, Cecil House, King's road
Green, Miss, 10 Charles street
Griffin, Dr, 20 Marlborough place
Gripper, Miss, 4 Pavilion buildings

Hardy, Mrs L., 4 Brunswick terrace
Hart, H. P., St. Anne's, Lewes
Heathcote, Mrs, 3 Clifton place
Heathcote, Miss, 3 Clifton place
Hunt, Mrs, 35 Park crescent, Brighton
Hutcheson, Miss, 10 Montpellier crescent

Innes, Mrs Cosmo, Brunswick Baths

Kane, E. A., 9 Junction parade
Kemp, 29 Brunswick place
Koe, S. L., 8 St. Michael's place

Lane, Dr E., 4 Harley street, London
Leach, Margaret, Eastbourne
Leslie, Mrs P., 8 Walpole road
Lloyd, Miss, 18 Montpellier crescent

Malleson, R. N., 45 Marine parade
Malleson, P. A. T., 45 Marine parade
Malleson, Rhoda V., 45 Marine parade
McMahon, Mrs, 28 Richmond place
Margret, Mrs L., Grange road, Eastbourne
Matson, Geo., 42 Park crescent
McCrieff, Mrs, 8 Wilbury road
Medley, C. N., 9 Lansdowne square
Merton, Mrs H., 17 Regency square
Mus, Chas., Luton

Neirde, Miss, 43 Dyke road
Nennell, Miss, 18 East parade, Hastings
Nicholson, Mrs, 17 Regency square

Partridge, Rev. Canon, D.D., West Tarring
Parson, J. L., The Wallands, Lewes
Pinnock, Robert, Newport, Isle of Wight

Roberts, Mrs, Egremont place
Rolfe, Mrs, 11 Oriental place
Rumbold, Mrs, 38 Sussex square
Rux, W. C. E., 39 Cedars road, Clapham

Shepherd, Mrs Arthur, 38 Lansdowne place
Smith, Miss Rosalind, 21 Sillwood place
Smith, Mrs J., 7 Walpole road
Stanford, Mrs Benett, Preston
Stewart, H., Belvedere Mansion
Strong, Dr, Croydon

Telford, Mrs, 3 Park crescent
Thornton, Mrs J 7 Grafton street
Turner, E. S., 5 Bath street
Turner, C. M., 15 Redcliffe gardens, S.W.

Vines, Mrs, 20 Atlingworth street

Waff, Mrs C., 25 Brunswick terrace
Warton, Montpellier road
Warton, Miss, Montpellier road
Watson, S., Victoria Park, Manchester
Watson, Mrs S., Victoria Park, Manchester
White, A. Warden Court, Cuckfield
White, Miss, 22 St. Michael's place
Woolley, Miss, 53 Brunswick road
Woodfall, H., Sydney Villa, Albert road
Woodward, J. P. S., Plumpton