

INDEX TO VOLUME I

- Action, general character 417, invariance 426. MacCullagh's optical 425: extended to electrics 447, in metals 493
- Action, Hamiltonian Varying 65
- Action, minimal, is fundamental 31, 44, 59, 70, 345, 430: verified for dynamics of a system of particles 44: adapted to physical systems with latent cyclic motions 46: for solids moving in fluid 55. Historical 59, 67. Action surfaces and wave-surfaces {61: in optics 340. Analytical proof 62, modes of freedom 63. Applied to vibrations in condensers 371. Applied to electric aether 390, 490. Electrodynamic 403: and mass 671, invariant 673
- Aether, history 392, 513: distinct from matter 520
- Aether, loaded mechanical, applied to optical dispersion 533, to convection 534
- Aether, solid elastic type, estimates of density and rigidity 381, scheme worked out 382, details 386. Sources as imbedded nodules, very small 381: medium as stagnant 479, untenable unless of great density 594. Nature of electric 595, 616, 629, as ultimate simple medium 631
- Aether, electric 389: as *quasi*-gyrostatic 391, 491, its general dynamics 496: vibrations, with vortex rings 498: intrinsic internal pressure 497: inertia very great 483, consequences 484: Kelvin's vortex sponge 501
- Aether-pressure, essential to the electron model 639
- Airy, Sir G. B., diffraction at caustics 174, 216: magneto-optics 312
- Ampère, A. M., his magnetic atoms 505, are not vortices 506
- Amperean force requires internal stress 547, not found to exist 548: necessitates currents of electrons 548, analysis 549
- Analogies, physical 378
- Analysis, evolution of physical 609, history 611: contrasted with geometry 612
- Arago's rotations 11, 23
- Astatic systems of forces, history 82: equilibration by two forces 88, cases 89: mutually astatic solids 90
- Aston, F. W., isotopic atoms and their masses 669
- Atmosphere, induction of currents in Earth's 26
- Atom, as an electronic orbital structure 516, very open 587: its secular specification 516: orbital system of two ions 524, speeds 525, its mean equivalent at a distance 587: models 597, of minimal energy when steady, so cannot radiate 596
- Atomic dimensions deduced from voltaic polarization 139
- Atomism, foreign to relativity 670
- Atoms, and radiation 488, 517: must have non-radiating states 541, 632
- Barrow, Is., on geometrical optics 601
- Boltzmann, L., on motion of solids in fluid 57: his test of Maxwell's electrodynamics (anecdote) 247
- Boys, C. V., on Arago's rotations 26
- Brachistochrones and free orbits 38
- Braking of Solar rotation by emergent radiation 483
- Capillary electrometer 136
- Capillary theory, after Gauss 350: influence on velocity of waves 423
- Catenaries and orbits 40, stabilities 41: helical flexible current in magnetic field 42, in radial field 43
- Caustics 39: diffraction bands along 175, 214, the bands of high order 219
- Chain, vibrations on gyrostatically dominated 206, reflection at a place of change 210
- Chromosphere, Solar, as supported by the radiation 664
- Circuits, historical theories of currents in open 626, crucial experiments negative 627
- Coherence of scattered radiation, for gas molecules and for dust particles 668
- Compression spoils scheme of dielectric displacement 450
- Compressional waves, absent in optics 364
- Condensers, free vibrations in electric 356: special cases 362, spherical 364, Leyden jar 371
- Conductance, surface 526
- Contact action, too narrow a scheme 629
- Convected system, relativity 618
- Convection, optical 480, 539, 540: analysis of 565, indicates second-order effect 566, annulled by a correlation of frames 566
- Convection, uniform, how far inessential 645
- Convection of charge as current 466
- Coordinates, electric curvilinear 356
- Cotes, R., general optical theorem 67
- Crystals, reflective stability 295: magnetic near optic axes 305: give clues for general optical theory 435
- Curie, P., law of magnetism and temperature 638
- Current, reversible in condenser circuit 453, need not excite radiation 453: field displacement traced 454: not a continuous vortex 456, 463, 575: as a slow drift of electrons 555, Hall effect

814

Index to Volume I

- 526: energy of, located 527: question of tension along 529, and at terminals 529: open currents involve radiation 625
- Current, total Maxwellian 556: analysed 553: electrolytic not relative to the conductor 574: permanent cyclic 575, dissected 553, 581: crucial test by rotating charge 582: inertia, Maxwell's test of 582
- Current element, replaced by moving electrons 538: not circuital by itself 556, as shown by nature of radiation 557
- Currents in wire systems, their cyclic components 104, analysis in terms of dissipation function 107: conjugate conductors 109, bridge 110: minimal theorems 110: with induction 112
- Currents, induction as by contour integrals 165: images 172. Dynamical Action 235, 461. Elastic analogy to field 399: must be of electrons 468, 475, circuital 470, dissected into species 553, 581
- Cyclic flow, conserved momenta 54
- Cyclides 98, Ivory's relation 99, orthogonal systems 100
- Darboux, G., distance relations for quadrics 94: on cyclides 100
- Diamagnetism of atoms 515
- Dielectric, high constant involves loose molecular aggregation 473: current due to spinning 535
- Dielectric equilibrium 448, introduces Maxwellian potential and displacement 449, but spoiled by compression 450: involves tangential traction 450, against the displacement 451
- Dielectrics, energy and stress in 277: vibrating cylinder, free periods of 377: Faraday's model 405: nature of electric displacement in 470
- Diffacted beam, from corrugated surface 291: an equivalent lens 291
- Dilute atomic systems 637
- Dispersion, optical 540: theory of inertial load 532, its models contrasted with electric 533; is usually small 564: MacCullagh's static formulation for crystals 564: Lorentz static equivalent 633: selective 633
- Dispersion, relation to curvature of spectral lines 203
- Dissipation function 485, in optics 323, 409, and electrics 490
- Distance relations of sets of points, on plane or sphere 95, in space 96
- Double electric sheet 133: at interfaces 145
- Drude, P., on magneto-optics 333
- Dupin, Ch., foci in space for conics 94, 152
- Dynamical analogues for optical rotation 315
- Dynamical type in physics, criterion for 68, generalized 69
- Dynamics, electric 550, generalized to continuous media 551, can avoid the internal stresses 552, deals simply with latent momenta 550, fails for currents unless electronic 553
- Dynamo, broken circuits essential to 463: unipolar type 575
- Earth's magnetism 26, Solar influence must be indirect 27, atmospheric influence 27
- Elasticity, rotational electric 373, is superposed on fluidity 390, and its pressure 496, 499: illustrated 446
- Electric field scheme, simplest 220, mechanical elastic analogy 221, for vibrations 225, a criterion 245: stability of field in crystals 295: magnetic steady field 507, general equations 509, in moving frame 510. Two energy functions required 545
- Electrodynamics, generalized after Helmholtz 232: theories of magneto-optics 328
- Electromotor, Faraday's initial 11
- Electron in rapid flight, effective mass alters with the frame 672
- Electron with helicoidal inertia, would have finite magnetic moment 679
- Electrons 451 *seq.*, 468, 537, 615: so named by G. J. Stoney 516: formulation of free 514: positive, why absent 475: model 545, mass 522: interaction of 523, and radiation 530: statistics of 541: electrodynamics as theory of 543, in relation to field 569
- Electrons, rotationally elastic model 474, are demanded by Amperean theory 548: model with vacuous core 571: magnetic spectral effect determines the mass 623
- Electrons, dynamics of a field of 573, 630, including convected medium 576
- Electrons, tested as regards faculty for radiation 650, confirming Maxwell's theory 651, after Faraday 652
- Electrostriction 452
- Energy, available, and osmotics 620: general method of 614
- Energy, its actual field-distribution fundamental 414
- Energy, magnetic, of field 458, in terms of its electric currents 459: general scheme for electrons 573, mechanical forces 578
- Entoptic diffraction of caustic type 218
- Entropy, relation to optical relativity 482, fails 567
- Eulerian Action 48, 57
- Euler's polyhedral relation, extended 105
- Exchanges, theory of radiant 477, 481
- Faraday, M., on magneto-optics 310: his law of electrodynamic induction universal 581
- Faraday's early electromotor 11, its commutator 463
- Fermat's Least Time for rays 39, in relation to convection 481

Index to Volume I

815

- FitzGerald, G. F., Action theory of magneto-optic field 321, electric interpretation of MacCullagh 412, 427; improved Maxwellian model 502: explores current linked with inactive ring electro-magnet 548: continuous electric currents untenable 594: on osmotics 619: on Zeeman effect 623
- Foam-medium, Kelvin's optical 354
- Focal conics in space, conjugate 152: extensions 154, to curves on quadrics 157
- Focal lines, conjugate 187, relation of correspondence 266, generalized 267, simple cases 268, 270: of diffracted beam 289
- Foci, conjugate optical, for sphere 600
- Forces, local constitutive 590: in electric field 635, constitutive stress 636
- Forces, reduction of system of 83: latent forces of constraint 416
- Frames of jointed bars 71, deformable hyperboloids 71: extensions, very limited 75
- Fresnel, A., his wave-surface generalized 298: analysis of circular polarization 312: laws of optical reflection 352, in relation to electric vectors 425: optical retardation in convected medium 479
- Functionality, physical aspect of 158
- Gauss, C. F., volume integral theorem 160: his formulation for capillarity 350: secular planetary theory, applied to atom 516
- Geometrical methods in physics 607: historical 608
- Gibbs, J. Willard, general electric scheme 300, in magneto-optics 334: introduces theoretical osmotics 620
- Goldhammer, D. A., on magneto-optics 332
- Gratings, general dioptrics of 288
- Gravitation, pulsatory scheme 499, compressible 499
- Green, G., image system 170: optics of crystals 351, contrasted with MacCullagh's scheme 351
- Greenhill, Sir A. G., on flexible jointed hyperboloids 71
- Grubb, Sir H., law of curvature of prismatic images 203
- Gyrostats, on pendulum 51: on chain, its vibrations and waves 205: in extended medium 248, not of electric type 253: *quasi*-optical medium 341
- Hall, E. H., his magnetic influence on resistance 336, Kelvin and Maxwell on 336
- Hamilton, Sir W. Rowan, history of his career 640, relation to other investigators 642: introduction of dynamical momenta as variables in analysis 66: reciprocal relations in dynamics 66: general method of dynamical approximation 67: conical refraction 292
- Hamiltonian function in optics, reduced form 189, 193, 641, amended Vol. II, p. xxi, reciprocity 191: applied to gratings 288
- Heaviside, O., generalized wave-surface 432
- Helical inertia, dynamics of 677
- Helical motions of solid in fluid 78, 677, isotropic helicoid 79, 678
- Helmholtz, H. von, on Least Action 31, 45, extended 70: on voltaic polarization 134: generalized electrodynamics 233: crucial experiment of spinning charged body 582
- Herman, R. A., on physical images in spheres 187
- Hertz, H., electric induction in spinning spheres 26
- Hicks, W. M., on hydrodynamics 66: pulsatory theory of gravitation 499
- Himstedt, F., electric induction in spheres 29
- Horopter of vision 146, its direction in the field 149, geometrical theory 143
- Hydrokinetics of solids, symmetries in 77, 677
- Identity, test only by correlation 644
- Illumination, expressed by contour integrals 164
- Images, electromagnetic in spheres 170
- Impulses, of latent spinning movements 47
- Induction, electrodynamic in sheets 8: unipolar 581
- Inertia, complex, of solid moving in fluid 77, helical features 677
- Integrals, surface transformed into contour 160, double contour 162
- Inversion, geometric, applied to orbits 33: images 170
- Ionization as catalysis 596
- Ions essential to electrics 445
- Ivory, Sir J., theorem on confocal surfaces 71, 93, 97
- Jacobi, C. G. J., correlation for quadrics and planes 93, generalized 96
- Kelvin (W. Thomson), on solids in fluid, cyclic motions 45, 677: electric currents and vortices 55: motion of a spherule round a vortex core 56, analogy to rays in optics 53: dynamical analogies in magneto-optics 313, 315, gyrostatic medium 341, 411: on density and rigidity of aether 381, atoms 386: labile optical medium 397: hydrodynamic analogies to magnetism 506: model for optical dispersion 533: osmotics 621
- Kinematics, analytic, Lagrange's 613
- Kinematics of paths 194, in solid, inflexions, cubic locus 195, circle of inflexions 199, curvatures 196
- Kinetics, of electric currents 461, must be discontinuous 462: Maxwell's test for inertia terms in energy 464

- Kirchhoff, G. R., analogy of pendulum with *elastica* 50, partial analogy of electric current fields to vortices 55: motion of solids in fluid 58: electric flow in wire system 104: dynamics of optical reflection 346, critique 348, 422
- Lagrange, J. L., general dynamical equations 65, modified for latent momenta by Routh and Kelvin 67: his analysis as generalizing agent 613
- Lamb, H., on hydrodynamic symmetry 77, 678
- Laplacian operator, transformations of 119
- Latent electric stress, reveals itself at interfaces 424
- Leathem, J. G., scheme of magneto-optic analysis 327
- Liénard, A., formula for retarded potentials 653
- Linear electric current, its nature and field 401
- Line-geometry, extended to forces 83
- Lippmann, G., capillary electrometer 136: his coloured photographs 380
- Localization, of energy in elastic medium 324, revealed by interfacial conditions 325, 331, 344, an essential feature in optics 432: of electrostatic energy 455
- Lodge, Sir O. J., on aberration of light 481: disproves mechanical striction in electric currents 548: examines influence of magnetic field on rays 483: high aethereal inertia 484
- Lorentz, H. A., coefficient of optical convection 535: ionic electrodynamic theory 515: and Zeeman effect 623
- MacCullagh, J., his optical theory, 340, 411, historical 421, neglect of 415: masters dynamics of reflection 342, also for crystals 343: forerunner of Maxwell's theory 343, history 353: analysis by Action 425: static formulation for crystalline dispersions 564
- Magnet, spinning in its own field 579: of the Earth inoperative electrically 515
- Magnetic effect on spectrum, fixes mass of electron 623
- Magnetic field-vectors, analogues of 539
- Magnetic images, in mass of iron 170
- Magnetization, mechanical gyratory reaction to 675, involves the frame of reference 676
- Magnetism, as vortical 467, yet cannot have continuous cores 507, nor its electrons open tubes of circulation 508
- Magnetism 504, energy 528, equivalent currents 588, internal relations for iron 589, energy 591, effects of stress on 593: temperature relation 638
- Magneto-optic dispersion, general scheme 318, requires electrons 485: vortical Action theory 320, 425, localized 325
- Magneto-striction 283, illustrated 593
- Magnets, why permanent 504, 508
- Mass, effective hydrodynamic 543
- Mass, effective, interpretation of inconsistency 672: of electron, only partly located in field 672, Vol. II, 807
- Mass, intrinsic, determined by internal steady Action 671: conserved, Lavoisier 670
- Masses of atoms, as integral numbers 670, except for the Aston residues 671
- Masses of planets, astronomical, measured in Solar frame 674
- Matter, as a very open structure in aether 477: electric theory of 523, 530, 542
- Maxwell, J. Clerk, on generalized dynamics 69: on laws of flow in wire systems 104: on optical ray-systems 185: simplest electric scheme 220, test by a dielectric criterion 245: balanced electric field-stress 276: on magneto-optic dispersion 317: his aether scheme 397, model 502, electro-optic scheme consolidates and absorbs all special models 433: his field-theory as condensed into two circuital relations 555: test of inertia of currents 522: field-stress 571
- Mechanical forces in field, relation to electric energy 402: expressed by a stress 403: act only on true electron currents 538
- Medium with both vortices and electrons 471, Vol. II, 810
- Metallic reflection 229, 493, 633
- Metals, optical propagation in 409: reflection, apparent discrepancy resolved 492
- Miller, W. H., exact measures of bands in diffracted rainbows 174
- Milner, S. R. and Hawnt, J. S., on the Maxwellian radiation from arrested electrons 651
- Minkowski's fourfold map of cosmic history 647
- Models are provisional 412, 417, 420, but valuable 541, 545, 631, 639: Maxwell's model more complete than his abstract equations 538: of electron 571
- Molecular voltaic sheets 133
- Momenta, interchange of convective and gyratory 676
- Momentum of radiation 655, and extra initial impulse 657: is potent inside a star 665
- Monomolecular voltaic layer 137, consists of ions 141
- Moving charge, electrodynamic force on, deduced directly from the field 655, simpler indirect method of field momentum 655
- Nebulae, contrast of gaseous and dust types 667
- Neumann, F. E., his optical theory 346, its relations to MacCullagh 346, 421: Kirchhoff's version 347, critique 349: electrodynamic energy formula for linear currents 400
- Newton, Sir I., construction in geometrical optics 601

Index to Volume I

817

- Opacity, implies ionization 559
- Optical constants of metals 560: theory of dispersion 561, as confirmed for the noble metals 562, demands free electrons 562, their number 562
- Optical deviation, oblique, by a prism, 605
- Optical dispersion, static crystalline after MacCullagh 440, not affecting form of wave-surface, only positions of the axes 441, and reflection 443
- Optical path across general system 264
- Optical rays, direct dynamics of 434, total reflection 436
- Optical reflection, mastered by MacCullagh 342, metallic 437
- Optical rotation, types 313, composite medium implied 313, aether-pressure absent 322: energy term, localised form 325: satisfies relativity to second order, explanation, now amended 317: final magneto-optic scheme 339: gyrostatic medium 341
- Optical system, analysis of axial 181, 598, of asymmetric 185, equivalent lenses 191, 269, 641, amended, Vol. II, xxi: thin 602
- Optical theories correlated 341, historical 419
- Optics, graphical methods 598, refraction at spherical interface 599, focal lines 602
- Orbits, transformation by Action 33; correlation to optical rays 39
- Orr, W. McF., helical motions in fluid 677
- Oscillations, kinetic, near position of neutrality 2, their types and periods 6: of solids in fluid cavities 80
- Osmotic pressure, general theory 619, and solubility 619, and ionization 621: theory of dilute systems 637
- Pascal, B., his hexagram applied in optics 604
- Pendulum, analogy of motion to strained wire 49, extended to gyrostatic pendulum 51
- Photographic action 384, occurs at electric nodes 384
- Planimetry on travelling plane, related loci 1
- Pocklington, H. C., stability of electrified vortex ring 596
- Polarization, circular, reflection of waves on gyrostatic chain 210: optical types 254, 303
- Polarization, molecular, forces acting on electric 592, magnetic 592
- Polarization capacity of a cell 137
- Potential, kinetic, of a system 64
- Potential, retarded 512: vector introduced 528, to express forces of field 537, and on electrons 569: Maxwell's unretarded 568, of electron 569
- Potential, scalar electric, whether propagated 243, as a criterion 245
- Potentials, retarded, extended to moving sources 653, but by annexing a factor from Action 654: theory inapplicable in a space of even dimensions 654, or to doubly refracting media 654
- Potentials, variational analysis applied to 113, as defined by form of distance elements 114, 358
- Prism, oblique deviation by 605
- Purser, J., theory of motion of solids in fluid 57
- Quadric surfaces, distance relations 93
- Quartic curves, bicircular, Ivory relation extended to 103
- Quincke, G., measures of stress in dielectrics, analysed 278
- Radiation, atomic periods absolute, restrict nature of atom 488
- Radiation, is of disruptive origin 387: nature of 485, how excited 487, not by slow motions 512
- Radiation, reaction of emerging 661: dispersal by free ions 662: much slighter by atoms, their polarization equivalents 662: its sustaining force on Sun's chromosphere 664
- Radiation, requires electrons 453: pressure of free 539, 585, giving forces on matter 585
- Radiation from disturbed electrons, confirmation of 651, analysed 652
- Radiation pressure, operates through deviation or absorption of rays 656
- Rainbows, diffracted 174, 217
- Rayleigh (J. W., Baron), dissipation function in optics 323, 490: on standing light waves 380: his law of blue sky 663
- Rays, analogy of spherical corpuscles moving in fluid 53
- Rays, convection of 476, relativity holds up to all orders 482
- Reciprocity, in optics 191
- Reflection, as affected by convection 480: metallic, crystalline 494
- Refraction due to steady cyclic causes, but dispersion to free vibrational periods 563
- Relativity, is perfect for any static convected system 618
- Relativity, in theory of linear currents 235: entropy, and optical 482, 567
- Relativity, is merely postulated, beyond second order 644
- Reversibility, optical, MacCullagh, Stokes 424
- Ripples, as influenced by surface tension and electric charge 201
- Röntgen, W. C., experiment on spinning excited dielectric 535
- Rotating vibration of waves on gyrostatic chain 206
- Rotational elasticity, as the type of electric 373, 443
- Routh, E. J., dynamics modified for cyclic motions 45, the equations 49, 67
- Rowland, H. A., on magneto-optics 337: experiments on electric convection 466, demand electrons 583
- Rutherford, Sir E., protons and atom 514

- Safety, factors of elastic 256: types of flaws, cylindrical 250, spherical 261
- Saha, M. N., phase theory applied to stellar atmospheres 666
- Scattering of radiation, 662
- Schrödinger, E., quantal field equation, early analogue 518
- Screening, electromagnetic 9, counter-vailing charge 10: by spherical shell 11: telephonic 13: by globe 14, if dielectric 15, soakage 17: by spinning shell 19, resulting torque 22, damping of torsional oscillation 23; general problem 25
- Screw-propellers, dynamics of ideal 80
- Sheets, vibrations in condenser 356: in sheets of gas 361, spherical shells 364: electric analogy of elastic solids 374
- Ship, general theory of stability 3
- Sky, colour of, Rayleigh's law 663
- Slip, eased off by layer of vortices 479
- Solids moving in fluid 52, cyclic case 53
- Space and time, as ultimate personally 648, thus present the problem of relativity of the world 648
- Sphere, moving in fluid, its path brachistochronous 53
- Sphere, optical refraction by 600
- Spheres, electric induction in spinning 14, tests 29: images in 168
- Spherometer, measures mean curvature 272
- Spin characteristics, of free motion of solids in fluid 678
- Stability, range of, for a ship 3
- Standing light waves 379, active at nodes 380
- Star, structure as determined by internal free radiation counteracting gravitation 665: free electrons there potent 664, storage of energy by atoms 664: thermodynamic phase theory applied to atmospheric ions 666
- Stokes, Sir G. G., integral theorem 161: reduction of Airy's caustic integral 174, 219: spectral lines, curvature of 203, oblique slit 204
- Stoney, G. J., on electrons 516
- Strain around a flaw 260
- Stress, electric 278: nature of Maxwell's 591, Vol. II, 800
- Stress, examples of rotational 408
- Stresses, mechanical, as electric criterion 274: Maxwell's balanced 276, 404: bipolar type illustrated 283
- Stress-strain relations, generalized 122: dynamical equations by variation 125, polar and cylindrical 130: equations of curl 132
- Striction, electro- and magneto- 593, 638
- Surface tension, voltaic 145, influence on ripples 201
- Symmetry, inertial, for motion of a solid in fluid 77, if viscous 80
- Temperature, nature of 636
- Thomson, Sir J. J., on magneto-optics 339
- Thomson and Tait, on Least Action 31, 44; motion of solids in fluid 52, the principle justified 55
- Thread loci 156, on ellipsoid 157
- Torpedo, ideal, driven by a screw 81
- Torsional shaft, effect of flaw in 260
- Unitary systems, relations between various electric 658, relevant only to free space 660
- Variational analysis for stress strain 125, for field of linear currents 235
- Vector notations 419
- Vectors of the electric field 557
- Verdet, E., law of magneto-optic dispersion 316
- Vibrations in condensers 356, excitation 366, persistence 366: across composite flat plate 369, elastic analogy to their field 399
- Virial, in relation to effective mass 670
- Voltaic potential, cause of 142: interfacial layers 472: law of series, only for metals 473
- Vortex atoms, instability of charged 406, and their magnetism 467, coreless 468, permeability 478, structure 503, mutual forces reverse of Amperean 552
- Vortex ring, image in sphere 172: stability of electrified ring 596
- Vortex sponge, Kelvin's 501
- Wave-fronts, optical axial 183, asymmetric 185
- Wave-surface, two-sheeted 293, sheets may not intersect 295: generalized 298
- Waves along electric cables 374, soakage 375, estimates 376
- Weber, W., his electron theory at a distance 579
- Wiener, O., activity in stationary light waves 379
- Wire, strained, forms of, pendulum analogy 51
- World as real, with aspects changing 649
- Wrenches or force-systems 83: the complex of astatic wrenches 85, congruences for assigned pitch 86, Minding's special theorem 86
- X-rays, may be partly resonant 558
- Young, T., on nature of optical dispersion 294
- Zeeman, P., magnetic influence on spectra 622

INDEX TO VOLUME II

- Aberration, in relation to relativity 806, influence of medium xxiii: of radiation pressure, potent in stellar constitution 754
- Absolute, the optical personally, contrasted with relatively 808, latter must be inherent in astronomy 708
- Absorption band, structure of simple 55, definite trend of graph 56: as square of density 55, under conditions 758: attainable without friction 62
- Action theory, its essence 203, 783: fits latent structure 205: and stress in medium 207, 801. Orbital planetary 786, corrected 803: the Einstein effects deduced 770, by aid of fourfold auxiliary Action 774, 786, 790, its nature 782
- Action, translated into fourfold space-time 135, dissected 136: forces across duplex medium involved 801, xxx
- Action, in electric field as an invariant scalar, transformed to electron variables 159, and potentials 160, of incompressible quality 160, total circuitual current 160: electrons as singular points 161
- Action, for orbital system of electrons in fourfold 794, reduced to related potentials in space and time 795, but free radiation not included in scheme 796, involving restriction to slow speeds 797: for system of two ions 799
- Action, method of 297: for system of sources, is fourfold in form 794, limitations 797: correlation for atom with Schrödinger's equation 567, 809
- Adam, N. K., lines of discontinuity on thin films 100, 509
- Adams, J. C., early dynamical estimate of Moon's secular retardation 475
- Aeroplane, resistance, reckoned from vortices thrown off 675, summary 690: lifting force of its vortices 677, they must be paired 682: historical 686
- Aeroplane, with body vortex, lift as half due to stream of end vortices thrown off 689, 691: analysis of motion, xxvii
- Aether 372: as seat of electric transmission 421: and material media, duplex scheme 11, xxx: as physical space-time 24: progress of ideas 202
- Aether, historical 13: a medium necessary 14, 201, not constituted like matter 15: its fluid quality 15, essential xxx: rotational model, and permanent magnets 42: great inertia required 17, in contrast with early ideas 200: labile elastic xxi
- Aether-pressure, essential to an electric cosmos 809, ix: but must derange the proton as an atomic nucleus, unless compensated 811
- Airy, Sir G. B., analysis of tidal lag 472: gravity in excess on islands 662: on gravitational isostasy 665: on wave-groups 555
- Albrecht, K., map of Polar wanderings 326
- Amperean force on electron as a dynamical result of the field 450
- Andrews, T., 507, as experimental originator of doctrine of concomitant phases 709, 710, instability around the critical point 511, xxiv, his diagram 510
- Anisotropic potentials 248, are weak 251
- Anthropomorphism, unavoidable in science 296, 411: and *quantia* 761
- Astronomy, necessarily constructed on lines of optical relativity 777, 808
- Astrophysics, early history 586
- Atmosphere, structure of 742
- Atom, magneto-optic effect on orbital 142, negative electrons effective 143: Zeeman effect as a transition to new orbits but with final steady precession 175
- Atomic polarizations, are slight 176: generalized atomic refraction 53: ferromagnetic aggregations 177
- Atomic system, stress in polarized 73, transition, crystals 73, local interatomic field 73, analysed out 74, limitations 201, 745: justification of continuous field analysis 750
- Atomism, history 344: limitations of 360: the identical secular types 372
- Atoms, history 207, 354, 396, 775, relation to mind 776: as permanent constructs in aether 23, 199, their interaction across it 24, xxxii: vortex rings as significant type of models 209, 346: Young's early estimate of size 349
- Atoms, orbital type, their modes of vibration 51: reduce to cyclic types 205, canonical form of Action 52, disturbed by field 52: nature of their radiation 143, 766: their steady precessions after encounter need not radiate 29: possible storage of energy 631: multiple nuclei 170: fourfold scheme 794: limitations, indicating unfathomed structure for the proton 811
- Attractions, history of idea of 345
- Available energy 85, and entropy 87, history 87: temperature, its double nature 85
- Available energy, unaffected by passive changes of state 79: in relation to laws of solution 99: determines reactive equilibria 101: Kelvin-Helmholtz-van't Hoff temperature formula 103
- Available energy of magnetism in iron 232, is of thermal origin 236: hydraulic analogue 232: and hysteresis 233
- Becquerel, E., law of magneto-optic dispersion 178, 179
- Bergson, H., on personal time 788

- Bidwell, S., stress and magnetization 91
 Birtwistle, G., on recent quantum mechanics 566
 Boltzmann, L., his deduction of law of natural radiation 230: entropy 399, 413: statistical theory 743
 Boys, C. V., on wave travelling with a bullet 657
 Brace, D. B., test of local optical relativity 275
 Bradley, J., his scheme of practical astronomy, remains fundamental xii, 754
 Brit. Assoc. Address (1900), obituary and record of the year 194, recent progress 195, electronic 197, aether-theory 198
 Broglie, L. de, on relativity relations of convected vibrators 805: the Bradley aberration 806
 Brown, E. W., discussion of changes in sidereal day, his diagram 469: favours cataclysmic causes 480
 Bryan, G. H., on available energy 724
 Bullet, rapid motion in air 657, back suction 657: compared with advancing slab of aereal compression 658, is more complex 661
 Callendar, H. L., on entropy 602: on critical transitions of phases in fluid xxiv
 Caloric and entropy 602
 Capacities of condensers unaffected by residual polarization 624
 Capillarity, molecular range, monomolecular sheets 81: and atoms 348: theory of surface forces 504
 Carathéodory, G., on an abstract entropy 603
 Carnot, Sadi, his thermal principle 215, 285, 593, analysed 591, 725: applied to magnetism 115, 735: apparent discrepancy with Joule 594: his analysis into ideal simple engines 593: foundation must be on finite ranges of temperature 596: anticipations of later theories 598: fundamental ideas 601: in relation to natural radiation 270
 Catalytic reaction 98, 363, intensified in confined spaces 370: ionized crystal facets as a seat of 622
 Caustic surfaces 696: cylindrical, giving rise to plane caustic curves 697
 Cavendish, Hon. H., refraction on slope of Schehallien 487: on protection from lightning 459: on Earth's free precession 330
 Celestial spaces, clearance from dust by radiation 436: obstructing nebulae not opaque xxvii
 Chandler, S. C., early analysis of Polar wanderings 326
 Characteristic equations of Gibbs 291, 720, forms of 292, 715: the integral equation for a homogeneous phase 716: mixed equations of state and quantity 717: equation involving state alone, as fundamental 719
 Charge, residual 627: has no effect on capacity 628
 Chemical equilibrium of phases: Kirchhoff, Kelvin, Gibbs, van 't Hoff 103
 Chemical reactions, as ultimately binary 745
 Chemical statics 289: reactions in gases 364, as ultimately bimolecular 364, 374: statistical equilibria 363
 Chiral vibrating systems 185, as in magnetic field 185: representation 186, conditions for circular types 187: compared with magnetic type 187: generalized 188: energy types and periods 189: source of Zeeman spectral subdivision 189
 Chirality, molecular and structural 625
 Choking magnetic defect in rotational aether 42
 Chree, C., law of tidal alterations of level 521
 Circuital relation, of Ampère, of Faraday 32: latter restricted to uniform convection 155
 Clairaut, A. C., on law of terrestrial gravity 7
 Clausius, J. E. R., 103; the virial 123: formulates entropy 286: Gibbs' estimate of his work 287: his special thermodynamic engine avoided complications of general theory 595
 Clocks, efficiency of control by free pendulum 481
 Coherence, as essential to law of scattering of radiation by particles 746
 Cohesion of thin liquid films 504, is sluggish 511
 Cohesive stress 79, mode of its equilibration 77
 Colloids, charge on particles 626
 Comets' tails 119, test of Solar repulsion xxiii
 Condensation, heat of, in relation to intrinsic fluid pressure 92
 Condenser, stress in electric, determined 120, 156
 Conductance, inoperative on speed of radiation 640
 Constants of Nature, their source xxiv
 Constitutive atomic residues in physical fields 74: of stress, analysed 75, the axial case 76: compensation necessary 75, unless stress is of Maxwell type 76, illustrated by bunch of hanging magnets 77: the local strain 78: historical 80: energy may involve higher gradients than first 77, are evaded by varying elastic moduli 78
 Constitutive relations, must be empirical in atomic media 34: unaffected by uniform convection 156
 Continental drift impossible, with isostasy 670
 Continuities across field-interfaces 33, electric, reduced to four 34
 Continuous analysis, applied to atomic systems 750
 Convection, steady, of a charged system 37, its constitutive moduli not affected 156, the Lorentz correspondence, exact and involving shrinkage of frame 38

Index to Volume II

821

- Convection of radiation, partial, after Fresnel 39, not relativist xxii: of polarization 31
- Correlation of observer's world with auxiliary fourfold 790, is limited in scope 799
- Correspondence, direct binary, of observers' spaces and times, reversion to 803, xxxii
- Cosmos, fourfold auxiliary, characterized 782
- Cotes' theorem xxi, dynamical aspect xxvii
- Cowell, P. H., analysis of frictional forces in Earth-Moon system 476: changing eccentricity invoked 477
- Critical point in fluids, whether definite 511, widened range of instability 509, gradual change 512, xxiv: extension into a theory of interfacial films 509: over unstable region, diagram is valid 510
- Croll, J., Arctic ice and the sidereal day 470
- Crystal facets, ionized or not 621, compensating ionic surface charge as a half layer 622: pyro- and piezo-electric 623, cubic 624, inference from its absence 627
- Crystal, polarization can be compensated by a density of free ions 624
- Crystal units for X-ray diffraction, may be multiplex layers 503, 620
- Crystal, atomic spirality 625, scheme 626: optical effect of strain estimated 625
- Crystal grating, operates by strata not surfaces 503, thus Hill's lunar equation applicable 503
- Crystal lattice, electric 620, ionized non-polar 621, paths of free electrons in 807, contrasted with rays 807, types of ionic facets 622: theory of stress in 73
- Curie, P., magnetism and temperature 115, 117, 235, 737
- Current system, energy of 229, specified as field energy 229, conversely 230
- Current, establishment by radiation, requires a circuit 426
- Current, ideal total circuital, of Maxwell 67
- Current sheet, mode of subsidence of plane 394, Kelvin's graphs 395
- Cylindrical analysis, electric waves 425
- d'Alembert, J. le R., his dynamical postulate 82
- Dalton, J., his gas postulate, and entropy 724
- Darwin, C. G., scope of Becquerel's magneto-optic law 179
- Darwin, Sir G. H., analysis of tidal deformations 385, on Earth's rotation 320
- Determinacy in physics 243: evaporates in *quantum* theories 746
- Diaphragms, why impermeable to solute 97: polarized by ions 104
- Dielectric, molecular equivalents 45: moduli determined by refraction of a uniform field 123: temperature test of molecular electric moment 235, 730
- Dielectric interfaces, traction on 65
- Dielectric stress, and its striction 81
- Dielectrics, pressures explored in fluids 123, strain in solids 121, also intrinsic expansions 126: theory of convection of 153
- Diffraction, telescopic 634, the rays in images are produced by straight edges of the field 636: also entoptic rays 637: general triangular aperture 636: beaded rays due to parallel edges 638
- Diffraction of electric waves 639, relations of scale 639: by stratified medium 503
- Diffraction of light 241, its polarization 263
- Diffusion and electric potential 103, analysis of, for ionized electrolytes 104, the diminution of interfacial voltaic effects by 105
- Dilute systems, general theory 95
- Dirac, P. A. M., triplex vector wave-fields xxxi
- Dispersion, a classical theory 51, its features general 57, 59: with orbital atoms 52: general formula in terms of free periods 54, is additive 54: molecular equivalents 49: at absorption band 75, its trend 69, explained 700, 758: contrast of electric and mechanical theories 62
- Dispersion, optical history 337, selective 514, trend of curve 69, 299, 700: inherent in optical relativity 566
- Dispersive medium, permanent pulses in 559: standing ripples 559
- Dissipation of energy, history 284, 288, in vital activity 288, cosmical, physical, chemical 289, in terms of entropy 290: implies incomplete control 605, 726, but reversible paths presumed 726
- Distance influence, inherent in field Action xxx
- Doppler, C., effect, in Sun differentiated from selective dispersion 518
- Double refraction, its cause 50, 190
- Drude, P., on metallic conduction 339
- Dynamics, mechanical and atomic 199: descriptive 200, characterized 209: ideas of Leonardo da Vinci 793
- Dynamics, general, as improved by Kelvin 416: systems with imperfect 231, as iron magnets 233: history xxi, xxix
- Dynamos, self-starting 765, operated by electric instability after a threshold speed 764
- Dyson, Sir F. W., seasonal analysis of Polar wanderings 327
- Earth, its free precession 1, influence of yielding 3, 381, of its elasticity 382, 489, Hough's rule generalized 383, 490: as a datum for geophysics 4, viscosity 5, tidal influence 5, 8, negligible 500, meteorological 6
- Earth, its interior is in hydrostatic equilibrium 9, its rigidity 9, its effective resistance to deformation 385: two resultant tidal moduli 490, estimated 496, amended for compression 497
- Earth, its magnetism, effect on length of day 335: source of 615

- Earth's axis, irregular movements 316, 328, must be limited 329, round a mean position 333, its degree of stability 494: change through loss of energy 331: referred to rotating axes 319, estimated 322: influence of Arctic ice 320, of shift of material 320, 327, 386, of tides 323, meteorological 381, of sub-oceanic earthquakes 386, of actual subsidences 386, estimates 470, causes excluded 334, 471: Kimura term 321: disturbing torque 332, its graph changes smoothly 334, being a test against catastrophic change of rotation 471, 480: follows Moon xxxii
- Earth's rotation, retardation of 380: by tidal lag 473, involving loss of relative energy 499: sustains most of the loss of energy in Earth-Moon system 475: its stability and symmetry 489: secular change 331, 489, effect of drag of radiation insensible 445: thermal acceleration 479
- Earth-Moon system, tidal effects 474: reconciled by invoking change of eccentricity 477
- Earthquakes, sources not deep 669
- Eccles, W. H., on atmospheric electric wave transmission 642
- Eddington, A. S., very dense radiation in stars 755, as determining their size 756
- Edser, E., reflection of light from receding surface 466
- Education, scientific 193
- Einstein, A., his gravitational effect on spectra viewed as one of *quania* 588: on statistics of atoms and radiation 410: law of opalescence 750: his relativity predictions, in relation to dynamical Action 770, 791
- Elastic fatigue, in Earth's tidal strain 500
- Elastic medium, nuclei of stress in 19: location of energy in, affects only internal stress 20, stress function separated out for a molecular medium 21: Lagrange, Green not wide enough for optics 21, medium *plus* sources 22, on analogy of vortex rings in fluid medium 23
- Electric fields, how established 421, 696, scheme of 424: double sheets 94
- Electric moment of molecule explored, through temperature 127, 325
- Electric surges on a charged conductor 144, transient 144
- Electric transmission in a thin beam 649
- Electric tubes of force, are convected only in two special cases 438
- Electrodynamic field, as ascribed to boundary sheets 250, formulae 262
- Electrodynamic schemes summarized 150, with electric atoms 150, field as smoothed out 154, developed 165
- Electrodynamic systems, images 388, of travelling electron 389, orbital 391, shielding by plane conducting screen 393: momentum in field 453
- Electrolytes, defect of ionic mobility in strong, historical 106: chains of ions, excluded 97: ionic atmospheres 748
- Electromotor, Faraday's, reversible into a dynamo 764
- Electron 212, travelling, its field and its radiation 145, how propagated 148, expands in shells 146, intensity 149, mode of polarization 149
- Electron, its nature open to speculation 43: model as a construct in aether 17, creation in pairs 19, permanent 18, possibly not eternal 18, contrast with Maxwell's earliest model 19: demands relativity 40: the absent positive electron 361, 811
- Electron, as a shadow in a wave-field xi
- Electron, helicoidal, acquires a magnetic moment when travelling 807: the hydrodynamic type permissible 807
- Electron, law of force on travelling, deduced from Action of the field 166, 452; or from the mutual energy 453, but electrons necessarily paired in field analysis 451
- Electron model in rotational aether as dynamically complete ix, xxx: helicoidal features, permissible 807, provide a magnetic moment and a periodic spiral path 807, but not a Bohr atom 811
- Electron paths and ray paths in crystals 807
- Electrons, free and bound 66, negative orbital in atom 143: in metals 700: imbedded in a dielectric 280
- Electrons, mutual forces 168, atomic groups 170, in orbital atom 179, ejection 633
- Electro-optics, Gibbs' general scheme 294
- Electrostriction, in spherical solid 121: in any thin dielectric sheet 122, the expansion 122, influence of the edge is local 122: verifications, spherical and cylindrical 124, point also to an intrinsic expansion 124
- Energetics, intensity and quantity factors 706
- Energy, true location in field, adjusted 108, 124, limitations 109: kinetic part as derived from law of flux 113: of magnetic body dissected 114
- Energy, flux of, that of sources excluded 112
- Energy theory of reactions 101
- Energy, in electromagnetic field, analysed 231: internal, of a magnet 455
- Energy, is relative to frame 774: constitutive alone persists at absolute zero 30: residual as in gases 28: limitations of internal equipartition 29
- Energy, history 283: as basis of theory of steady states 284: free isothermal energy 291, extended by Kelvin into a general theory 727: its statistics 534, equipartition only on large scale 545: principle of available or free energy 591, Faraday on 600, excludes latent heats 591

Index to Volume II

823

- Energy cells specified 401, 415, their large scale 404: probabilities of distributions therein 401, maximum property leads to idea of temperature 402, in contrast with Einstein 402: dynamical foundation of quantified cells 404
- Energy, and human faculties 81, 411: available in *quanta* 82, which are large and provisional 83
- Engine, working by pressure of stream of radiation 218
- Engines, reasoning from combined thermal 592, but of finite range 596
- Entropy, interpreted 399: is absolute 290, 719: partial analogy to caloric 602: not an *à priori* 603, 158: as deduced from principle of availability 399, 606, contrasted therewith 728: correlated to temperature but wider 399
- Entropy, and radiant energy 699
- Equipartition, limitations of 701
- Equipartition of energy 409, imposed by atomic encounters 631: modified form 732: in radiation only valid after Rayleigh for low frequencies 746: in *quanta* is dynamically inexact 746
- Escapements, and *quanta* 630
- Euler, L., dynamical equations of rotating Earth 317
- Ewing, Sir J. A., magnetic molecular models 117
- Eye, rays of diffraction accompanying images 634
- Faraday, M., magneto-optic law 179: on conservation as intuitive 600: very early electrodynamic studies 763, 767: leading to his electric motor model 764
- Ferromagnetics 79, 177, 738
- Films, energy theory for monomolecular 100: abrupt transitions on 100, 509
- Films, liquid, why permanent 293
- FitzGerald, G. F., on Ramsay's gas equation 30: shrinkage of convected system 38: relativity, its shrinkage 276: test of local electric relativity 225: on comets' tails 119: electrodynamic adjustments xxxi
- Flame discharge, of electric crystals 625
- Fluid motion, Kelvin's advances 416: vortices produced, along slip sheets 678, by jets 679, by cavitation 679: slip can be avoided by a cancelling circulation 681, its lift 686: stabilized wake 687
- Fluid motion, limitation of models 692, of relativity of motion 693
- Fluid pressure, nature of transmitted 88, 90, of intrinsic 91, 508, Newton on 91
- Fourfold relativity as a geometry of the complex of possible ray paths 798: of limited scope 804, 791: radiation outside 797
- Fourier, J., overrates cooling by radiation 30: his series theorem 529, historical 564, challenged, with vast results 540: its residue 565, fluctuation 566, limits the physical scope 565: his integral theorem 535: interpretation of coefficients as adjustment to mean square 565: behaviour at abrupt transition 565
- Frames of reference indispensable 40, 791
- Free isothermal energy 291, extended 727
- Fresnel, A., diffraction 241: his wave-surface, the two sheets not independent 251, 261: convection factor 39, xxii
- Gases, imperfect, thermodynamics of 739: magnetization of 175, 738
- Gas theory illustrated by rays 224
- Gas theory, in terms of cellular *quanta* 414, inclusion of radiation as involving a new cosmic constant 415: and spin xxviii
- Gauss, C. F., a static potential is determined by a limited field of it, however small 293
- Gibbs, J. Willard, analysis of an entropy paradox 95: theory of dilution 101, its energy expressed 101: life 281: generalized thermodynamic formulation 282: theory of dissociation 369, his procedure and Rayleigh's 718: his tribute to Clausius 287: his graphical schemes 289: characteristic equations 291, one of state alone 717: phase rule 292: electro-optics 294: discontinuities as expressed in Fourier's series 565
- Glacial epochs 494
- Gravitation, approximate relativity for planetary 771, 793: affects time scale, as also does convection 789: analogy of warped plate 792: and mass 789
- Gravitation, early views on 25: pulsatory 26: of optical corpuscles 586
- Gravity, Clairaut's formula 7: is in excess on islands 662, 665: estimates of local influences on 667: local fields of disturbed potential 665
- Green, G., his principle of determinacy for fields 240, extended to propagation 244
- Groups of waves 546, fade away in front 555: as elongated by optical analyser 555
- Gyrostatic influence on stabilities 60
- Gyrostatic model of aether (Kelvin) 16
- Hale, G. E., on Sun's magnetic fields 654' and vortices xxv, xxvi
- Hamilton, Sir W. R., on wave-groups 299: Varying Action, applied to groups of systems 809, gas systems 595
- Hamilton-Jacobi, Action formulae for groups of systems 567
- Hardy, Sir W. B., cohesion of films 504
- Hayford, J. F., enlarges practical scope of isostasy 665
- Heat, nature of 591: is eliminated in Kelvin's available energy formula 101, 727
- Helicoidal electrons, and their spiral paths, giving magnetic quality 801
- Helmholtz, H. v., wide outlook on transformations of energy 601: on entropy 604: extension of Green's theorem to undulatory fields 238: on free or available energy 88: on electric osmosis 94:

824

Index to Volume II

- Helmholtz, H. v. (*cont.*)
 on fluid motion 679, his unstable slip replaceable by smooth circulation 680
- Herschel, Sir J., telescopic diffraction patterns, analysed 637: case of general triangular aperture 636: his beaded rays 638
- Hertz, H., on transfer of Moon's tidal pull to solid earth 480
- Heterogeneous field of statistics 570
- Hicks, W. M., pulsatory theory of gravitation 26: close orbital analysis of Zeeman effect 633, 734
- Hill, G. W., his equation in Lunar Theory 502: solution applied to stratified diffraction by a crystal 503
- Hills, E. H., disturbed free Polar precession 332
- Hodograph of precessing terrestrial Pole 332
- Hopkinson, J., stress in fluid dielectrics 124
- Hough, S. S., on Earth's free precession 1, its elasticity deduced 3, 382
- Huygens, C., his wave principle 240, made precise 242, first by Stokes 263: and Cotes' optical theorem xxii, xxvii
- Hydrodynamics, Kelvin's progress in principles 416, 693
- Hydrodynamics of immersed solids 677: their associated momenta 672, method of the impulse 693, paradox resolved 694: local inertia found to determine distant motion 693: smooth circulation round the body can replace unstable slip motions 680
- Hysteresis, in dielectrics, analysed 627, null in crystals 624: the loss of energy 737
- Ideal system, reasoning from an 95, from unstable part of Andrews' diagram 96
- Identity, test of 279
- Images, of electrodynamic systems 388
- Impact, analysis of crushing by 504
- Impulse, theory for solid in fluid 693
- Indeterminateness, statistical, may affect *quanta* 761
- Inductance, electric, of wire 427, corrected 426
- Inertia in relation to energy 761, is relative to frame of reference 774, of projected electron 794
- Inertias of travelling radiators 672, 806
- Instability, electrodynamic, as making dynamos possible 764
- Instability of electrified fluid surface, dielectric 127, 157
- Interfacial traction, whether affected by interposed film 112
- Interferences, may fade in a dispersive medium 656
- Interferences of wave-groups 555: duplex condition in dispersive medium 656
- Invariance, limitations on the physical algebra of 796
- Ionization of solutions 365, 379: polarization 695
- Ions, metallic, *quasi*-pressure 104
- Ions in upper air, can affect long waves 641, without damping, owing to long free paths 643: amplitudes of their oscillations 646: limits to penetration of waves 653
- Isostasy, Pratt on 664, Airy's flotation idea 665: oceanic, would leave no gravity anomaly 665 but actually over-corrected 666, 668: estimates for local influences 667, degree of local adjustment 669, its rapidity 670: possible origin 669, uncertainties 670
- Isostasy 664, 682: oceanic defect of density compensated in part by its change of level 663: illustrative examples 667: its cause 669: course of terrestrial evolution 671
- Jacobi, C. G. J., on the Hamiltonian groups of systems in dynamics 567: kinematic view of his last multiplier 704
- Jamin, J., air bubbles in columns of sap 305, not essential to its rise 305
- Jans, Sir J. H., on law of natural radiation 409: on its viscous reaction 673
- Jeffreys, H., on tidal friction in shallow seas 480, uncertainties as regards its reaction 498
- Jets, spurted from charged liquid dielectrics 157
- Johnston, W. J., applies the Clifford symbolic algebra to the electric fourfold 797, 804
- Jones, H. Spencer, on disturbed sidereal day 469
- Joule, J. P., first introduces an absolute temperature 739
- Kelvin (W. Thomson, Baron), gyrostatic influence on stability 60: theory of dielectric and magnetic polarization 78: on retardation of Earth's rotation 380, 469, his early estimate 472, irregularities and their causes 381: proves the Earth to be rigid 381. Perplexity about Joule's energy principle 594: foundation of temperature 597: determination of scale 739: his equation of free energy 727, heat eliminated from it 727: discontinuous graphs of Fourier series 565. Papers on dynamics and hydrodynamics 416: mode of travel of wave-groups 309: graphs for fields of vortex rings, and currents 395, mode of decay of latter 395: fluid slip reduced to circulation 680, the impulse 693
- Kimura, his term in free oscillation of Earth's Pole 321, 485, xxiv
- Kirchhoff, G., on vortex systems 685: on coexistent phases of matter 713: expression of principle of Huygens 240, anticipated more rigorously by Stokes 263: more general formula 256, is limited by forward-ray postulate 257: formula for analysis at a wave-front 259, general formula 259: electrostriction in a sphere 121: magnetostriction 132

Index to Volume II

825

- Klein, F., variational analysis for atomic field stress 137, 802
- Klein, F. and Sommerfeld, A., on Earth's free precession 335
- Knowledge, its provinces may be isolated 784: structure of 202
- Kundt, G., selective dispersion 60, its type restricted 299: refraction by metal prism 65
- Lamb, H., on Oseen's viscous flow past a solid 692, xxvii
- Langevin, P., magnetism and temperature 116, statistics for a gas, analysed 737, 746: effect of spin xxviii
- Larmor, J. S. B., range of lightning rod 459: oceanic tidal torque 496
- Latitude variation, precautions 487, influence of oceanic waters on 489: Pole follows Moon xxxii
- Leathem, J. G., correction to force of field on moving magnet 72
- Leonardo da Vinci, on dynamical concepts 793
- Levels of potential for heat 591
- Liénard, A., formula for delayed potentials 162
- Lightning, nature of 702: protection from 703
- Lightning, shielding from 457, Maxwell's *dictum* 459, best mode of protection 461: its boring progress, how set up 457, its direction 458, magnitudes 458: area of protection by vertical rod 459, graph of its field 462, of field of discharging point 463
- Local molecular influence, the method of an equivalent cavity 47, restriction of its application to inverse square law 47
- Lorentz, H. A., relativity transformation 39, its shrinkage 276, limitation 276, xxii: refraction equivalents 45: second-order cubic anisotropy 45: his electrodynamic scheme xxxi
- Love, A. E. H., on tidal deformation of Earth 385
- Magnet, energy in the equivalent current 153, how far available 229, Carnot cycle 235, complete cyclic hysteresis 237: effects of moving, purely relative 455
- Magnet, Sun as a 611, 613, possible causes 612, actually due to rotation combined with radiation 615, xxv: magnetic shielding in Sun 514, 654: Earth's great magnetic changes, otherwise of no account 612
- Magnetic circuit 130, reversible 237, its theory 238, with gap 238: its electromagnetic energy and work 237, convertible for soft core 238, reason 239
- Magnetic flux, latent round travelling system 390
- Magnetism, statistical theory applied to 738: effect of a molecular spin xxviii
- Magnetization, and temperature 115, Curie's law deduced directly from Carnot's principle 115, comparison with Langevin's statistic 746: effect of stress on 131: of gases in relation to Zeeman effect 175: heat of 235
- Magnetized nails, stress in sheaf of 77
- Magneton moment 737: as arising in a travelling helicoidal electron 807
- Magneto-optics, superposed field 167: Becquerel's expression for Faraday effect 179, intensified near absorption band 180
- Magneto-optics, Zeeman 138: effect of field on planetary atomic system 141, simple precessional triplication of periods 142, analysed 169, for massive positive ions 170: field also displaces the orbits 175: rotational dynamics applied 178
- Magneto-striction, cyclic theory 111: traction across air-gap 130: stress in sphere 132
- Mass, essential, as affected by radiation from system 443: is additive chemically 348: interacting with gravitation 789
- Mathematical Society, London, history of 522, increasing abstraction and bulk 525, contrast with fluent physical processes 527: losses in the Great War 527
- Matter, electric foundation of 277, 801: electrodynamic field force on 33: in the fourfold merges in energy and loses reality xxxii
- Maxwell, J. Clerk, his view of electricity in original model 19, total current 65, xxxi: his theorem of equilibrated stress 72, wider than the theory 137: local balanced stress of tensor theory 76, 801: free precessional top 317, 381: applies statistical science to gas theory 297: on Willard Gibbs' thermodynamics 705: factors of energy 705: co-existent phases 710, his anticipation of theory 711: his illustrative demons imply *quanta* 411: generalized statistical dynamics 744, ergodic paths 744: rate of settlement of mixed gases 744: relation to Faraday 767, stress 802
- Mechanical force acts only on the carriers of true current 69: on magnet, its corrected expression 72: aggregate 155
- Mechanical stress, electrodynamic, in dielectric medium 66: discrepant by a torque 71, now removed 72: involves a field momentum 72: interfacial traction derived 67, 71
- Mechanical stress in spherical condenser shell 121, generalized to any thin sheet 122, 156, an intrinsic expansion also required 157
- Medium, duplex constitution essential xxix, whether by vectors or by atoms xxxi
- Metallic conduction 336, 700: established in metals very promptly 338, metallic refractive index 338, theory and fact 338, electron paths in metals only incipient 339, their numbers and speeds 339

826

Index to Volume II

- Metallic refraction anomaly, removed 57
- Michell, John, early astrophysical theories and results 586
- Michelson, A. A., inland test of tidal changes of level 385
- Minds many, Nature one 775
- Mirage 649, of electric rays 645: independent of linear scale 519
- Models, function of 353: necessarily provisional 263, and incomplete 263, ix
- Molecular magnet, energy dissected 231: electric moment 127
- Molecular medium as smoothed into continuity 46, 761, residuals 76: historical 48
- Molecular theory, of interfaces 504, 695, local energy, static 506, nature of forces deduced 507, stability of surface 507, xxiv
- Molecule, gyrostatic optical 60
- Momentum, precessional 2: distribution in electric field 71, 228, 453, as required for dynamical conservations 455: cyclic, around a magnet 455
- Monomolecular electric layer 81, 695
- Moon, reaction of tide on 474, effect on latitude xxxii
- Motion in unlimited viscous fluid, steady motion depends on how initiated 693
- Motivity, thermodynamic, as relative 290
- Moving matter, field equations, on Maxwell's scheme 31, xxxi
- Nature, scope of feasible analysis of 412, 777
- Nebulae, gaseous and dust 752, 759, their fields of radiation 761: source of light of 749: dark, need not be opaque 758: refraction of radiation in xxvi: colourless xxviii
- Nernst, W., law of diffusion of ionized matter across diaphragms 105
- Newcomb, S., elastic influence in Earth's free precession 2, 328, 469
- Newton, Sir I., on atoms 347: his astronomical time 478: law of reaction 211
- Observers, an essential element in Nature 777, 786, 795: their personal times identical, thus absolute 778, 808, but are only intervals, without epochs 788: their personal frames reduced to one Solar frame 792: have no place in the fourfold map of relativity 796
- Ohm, G. S., *rationale* of his law of electric conduction 422
- Opalescence, law of 747, 760
- Optical medium, heterogeneous 486, coherence in xxv
- Optical rotational qualities, analysis by energy 481: dielectric quality unaffected 182: visualized scheme 182, for crystals 183: Airy's law for oblique transmission in quartz 184, involves a double refraction 184, not constitutive 184: order of magnitude reasonable for the chiral strain 629
- Osmotics, anticipated in theory by Gibbs 489, as constraint 722, other types 723: pressure 97, 304, energy theory 92: ionic 93, its balancing potential 101: applies to high columns of sap 303, as sustained without great fluid pressure 304
- Pascal, B., hydrostatic principle 88, 90, 508, for polarized fluid 89: on the stars 754
- Peltier effect, its voltaic analogue 699
- Periodogram 536, interpretations 563: for sporadic disturbance is uniform 583: form for case of natural radiation 583
- Periods, analysis of complex statistics for 536, effect of limited range 537: purity 541: extraction of a free period 572, 577, its error determined 561, 579: residues 539: periodicity of structure, in space or time, as a filtering agent 560, 563
- Petzval, J., theorem of addition of wave-energies 549
- Phases, concomitant, of matter 292, limited in their number 292, determined 723: stability of 708, 714: explosion and catalysis 709: nature of the transitions 709: history 710, xxiv
- Physics, historical 589, xxi, xxx
- Planck, M., on law of diffusion of ionized solute 104: phase space quantified as h^3 407: his resonators not essential to theory 410: view on anthropomorphism 411: his cosmic constant 415
- Planetary rotations, assisted thermodynamically by Solar radiation 479
- Planetary theory, closer formulation of 793, the basic space 798
- Poincot, L., model of precessional motion 3: adapted for shrinking body 330, for loss of energy 331, 334, 495
- Poisson, S. D., scheme of magnetic polarization 75
- Polarization of great masses, effects intense, but can be annulled by free charges 611: while magnetic field of their rotation remains 612
- Polarization, the equivalent static density 66, 75: permanent 117, of an atom slight 176: for gases and magnets, history 117, 191: convection of 31
- Polarization, mechanical internal stress, magnetic 70, electric 71, in gas 96: intense in crystal 612: and temperature 628
- Polarization of diffracted light, electric theory in contrast with elastic 264
- Polarized media, theory restricted 27: residual energy 27: convection of 31
- Potential, static, determinacy theory 242: modified to propagated potentials 244: as due to source distribution on an enclosing boundary 246, with however vibrations in free modes extra 247: anisotropic 248: electrodynamic 249: Maxwell's, unretarded 154: retarded, in relation to fourfold xxix

Index to Volume II

827

- Poynting, J. H., his application of energy flux to electric field 112: drag of radiation-pressure on the emitting body 435, 446, 752, xxv: on aberrational braking of orbits by dispersal of the Solar radiation 273, 673
- Pratt, J. H., his idea of isostasy 664
- Precession, Earth's free 1, 3, 17, its induced oceanic tide 8: for a shrinking body 330
- Pressure, molecular transmitted 508: may be negative, within limits 512
- Preston, T., magneto-optic law of chemical types 171
- Prism, optical metallic 64, law of deviation of rays 65, two relations involved 66
- Propagation in waves, without trail, is a special type 251, in elastic solid, relation to rays 261: influence of friction 640
- Proton as atomic nucleus, involving unknown type of structure 811
- Pulses, optical, are double 308: refracted 58, in echelon 309, 700: are maintained in dispersive medium 310, refracted like a travelling source 313: in relation to time of relaxation 315: restrictions on xxiii
- Purser, J., on partition of tidal loss of energy between Earth and Moon 475
- Pyroelectric crystals 623, cubic 624
- Quanta*, and escapements 630, as intra-atomic 632: relation to scattering of radiation 699, 750: may be statistical indeterminates 761
- Quanta*, and physical convergence 585, 744, may be an essential limitation of map of possible knowledge 412, 761, and anthropomorphism 411: and reversibility 607
- Quincke, G., on electric osmosis 94: stress in dielectrics explored 123
- Radiation from atom, early ideas 29, involves internal rupture 29: amount may be small 147, conditions for complete absence 632: how it may be stimulated by electron impact 638
- Radiation, an elastic parallel 697: classical theory not paradoxical 745: intrinsic field and radiation field 148
- Radiation, dynamics of 420: effect of a body's loss of energy by its own radiation 441, does not affect its velocity 447, summary 448: pressure on moving reflector 464, 219: of waves of sound 618: law of independent scatterings 749, problem of dust nebulae and gas nebulae 753, 759: pressure of, in stars 756
- Radiation, natural 306, 542, 749: justification of continuous analysis 750: specification of its structure 220, 409, 415, 543, its differential 546, homogeneity 547, the test 550: statistics of energies, alone possible 552: intensity related to atomic data 408, in convected enclosure 271, 442: repulsion on absorbing medium 266, by reflexion 268: in relation to Carnot's principle 271: its dependence on refractive index 273, necessary thermodynamically 217
- Radiation field, of a scattering particle must be in part local 752, 759
- Radiation, retarding effect on sources 673, not on its own source 672: Poynting's clearance of celestial spaces 674: damping of currents in stars by internal 673, owing to the relative aberration 673
- Radiation, free, as outside the relativity scheme 786, 796, theory 702, xxv: for γ rays 220
- Radiation pressure, aberration of 751, effect on cosmic dust 751, on rotation of stellar atmospheres 752
- Radiator, capacity of, in a natural field 408
- Raman, C. V., on scattering of radiation, and opalescence 747, 759, xxviii, discovers new type 751
- Ramsay, Sir W., his form of gas equation 30
- Rankine, W. J. M., supports MacCullagh's rotational aether 14: his thermodynamic function in relation to entropy 286
- Rayleigh (J. W., Baron), magnets and rotational aether 42: available magnetic energy in iron 232: radiation box, indeterminateness involved 761: theory in chemical statics 289: his phase process in relation to that of Gibbs 719: on addition of energies for wave-groups 549: law of optical resolving power 556: tentative law of natural radiation 409, not paradoxical because limited 745, 760: on statistical dynamics 743: on scattering of radiation 759, its concentration forward as cause of refraction 757, xxvi: history 746
- Rays, as elements in statistics 405, ray-cells, adaptation of equivalent 406: their extent definite, after Planck 407: limited in length 256, coherent 260, even in Sun xxv
- Rays, electric, as curved by the ions in upper air 645: limits to penetration 653: mirage effects 654: groups of waves 656: influence of Earth's magnetic field 650: as the essentials 793
- Rays, swarm of corpuscular 223, intensity 223, generalized into Maxwellian statistics 223: thrust along 273
- Reaction, law of kinetic, expanded 211
- Reactions, slowness of dilute 98: ternary must be catalytic 98, analysis of multi-molecular 102: dynamics of 101, 103
- Reciprocal relations in dynamics 717
- Reflector, dynamics of moving optical 219, 464, analogy of waves on travelling cord 219
- Reflexion from receding surfaces 465, no polarization when total 466
- Refraction, horizontal atmospheric 645
- Refraction, law of astronomical 482: as disturbed by dome of telescope 483, by slope of ground 487: field of mirage in Sun, same as in a small model 519, xxvii

828

Index to Volume II

- Refraction, molecular equivalents 45:
atomic, is same at all intensities 648:
double, possible causes 56
- Refraction, regular, of the lines of an
electric field 123: conjugate case 123
- Relativity, cannot avoid a frame of refer-
ence 28: its fourfold as an auxiliary to
space and time 793, xxxii: the pre-
sumption of an aether, from the slow
motions of the stars 28
- Relativity, optical transformation, as
exact only to second order 40, xxii
- Relativity, change of frame, applied to
radiation 443: in relation to magnets
455: as prescribed by the electron
40, xi
- Relativity, local optical 274, involves
dispersion on change of frame 366:
intrinsically inherent in Maxwellian
scheme vi, 278: for isolated travelling
radiator 672: within the atom 806
- Relativity, local electric, tested 225, by
charged condenser 227: theory, general
227, historical 225
- Relativity, electrodynamic, formulated
for steady systems 226: required to
evade perpetual motions 227: alter-
native method 228: for viscous flow
xxvii
- Relativity, as an ideal 779: its predictions
consistent with dynamical Action 791:
optical, demands Maxwellian scheme
703, 810: its fourfold implies a closed
universe 786, 796
- Repulsion by radiation, in relation to
field stress 467: by sound-waves 618:
by electric alternators 70
- Residual atomic field energy 151
- Resonance, multiple atomic, produced by
incident spectral period 558
- Resonators repelled by incident waves
120, 618
- Retarded potentials, how they arise from
the fourfold 795
- Reversibility 591, fundamental idea 604,
implies a quantified scale of precision
607: reciprocities involved 717
- Ripples, on polarized liquid dielectric
127: influence on velocity 128: also
that of a free surface charge 128: in-
stability of the excited surface 157,
relieved by projection of jets 158
- Rotating frame, electrodynamics in 167:
analogue of magnetic field 168
- Rotation, absence of differential, con-
sistent with finite 43
- Rotational aether, in conflict with abso-
lutely permanent magnets 42
- Routh, E. J., on free dynamical pre-
cession 317
- Scattering of light in a gas, its cause 63,
608: by anisotropic molecules, polariza-
tion produced 191: in crystals 610:
the drain of energy affected by the dis-
persion of its periods 610
- Scattering of radiation, by gases, cause of
759, by fine dust 753, 759: by uniform
dense matter is superficial 759: does
not disturb a continuous theory of dis-
persion 759, xxv: of X-rays in forward
direction 757
- Schrödinger, E., his atomic equation,
analogous theory of atomic Action 552,
567
- Schrödinger, E., *quasi*-Action theory for
the atom xi, 567, 809, xxxi
- Schuster, Sir A., periodogram analysis
536
- Scintillation, cause of stellar 588
- Shielding, magnetic 393, the reaction 393
- Shock, of elastic impact 504
- Shrinkage, significance of, in optical rela-
tivity 41
- Sidereal day, no abrupt changes 334,
gradual change 387: astronomical evi-
dence 469, estimate of the tidal re-
tardation 472
- Sitter, W. de, on the problem of astro-
nomical time 480
- Sky, colour as due to the molecules of air
63, 609, 748
- Slip surfaces in fluid replaced by circula-
tions 680
- Solar radiation, its pressure at the Sun
646, produces magnetism of rotating
Sun 615, xii, of vortical sunspots 616
- Solar personal time the astronomical
standard 769, as related to observer's
time 783
- Solution, dynamics of 97, available energy
101
- Solvent, potent influence of high dielec-
tric capacity 61, 367: heat effects
368
- Sound, pulse in air 659: repulsion by 618
- Sounding-board analogy, without storage,
for radiation 313
- Source, limitation on idea of 251
- Specifications, must be incomplete, so
inexact, for atomic systems 745
- Spectra, 201, effect of density on absorp-
tion 61: theory of bands 174, double
lines 174
- Spectral lines, displacement by pressure
(by density) 341, 698, an estimate 342,
compared with facts 342
- Spectral lines, mutual repulsion 515,
compared with observed values 516,
for metallic vapour 517, in Sun 517
- Spectrum, history 355: how far made by
analyser 307, when caused by refrac-
tion 308, by grating 310
- Spectrum analysis, nature of 542: re-
solving power 556, limit to sharpness
557, echelon analysis 556: pulses give
a uniform spectrum 583, unless double
pulses, more like natural radiation 583
- Spinning conductor in magnetic field 35,
767, compensation in axial case 35
- Spirality in crystalline structure 626: of
free path of helicoidal electron 807
- Stability, formulation for secular 735
- Stars, their slow motions suggest an
aether 28: their atmospheres xxv
- Star-gauging, 587, xxiv
- Star-images, the ray-patterns attached to
telescopic 634

Index to Volume II

829

- Statistical dynamics 102, contrasted with thermodynamics 296, 745
- Statistical dynamics 295: only energies are determinate 375: steady state, criterion 397: of opportunities, formulated in terms of distribution in cells 598
- Statistical view, of chemical reactions 375: influence of latent momenta xxviii: has to be restricted to agree with thermodynamics 296, 378
- Statistics, molecular, historical 742: method completely valid yet provisional 285, 296: of temperature of radiation 402, 410
- Statistics, thermodynamic, in rapidly flowing media 741
- Statistics, utility of 531: tidal 532: periodic type 533: ranges and residues 533: criterion for homogeneity 569, test 584, as in natural radiation 573
- Stellar atmospheres, their rotation opposed by the emerging radiation 615, 673: application to close double stars 674
- Stellar atmospheres, their rotation opposed by Bradley aberration of the outward radiation 752, xxv
- Stewart, B., anticipates drag by a body's own radiation 216, 440, 672: history 221
- Stokes, Sir G. G., on gravity excess on islands 662, explanation, insufficient 663, theorem as amended 664: mathematical theory of diffraction 241, 253, anticipating Kirchhoff's formulation of Huygens' principle 263, and giving its polarization, now corrected to suit the electric theory 263
- Stokes, Sir G. G., on energies as additive for waves 549: on pulses and trains 311
- Stokes, Sir G. G., on resistance as due to eddies 679
- Stream and flux vectors, gradients 154
- Street, R. O., practical discussion of tides in Irish Sea 498, dissipation estimated, discrepancies revealed 498
- Stress, specification usually confined to lower gradients of strain 77: how far determinate 107
- Stress, theories of electric 106, 801: in relation to electrostriction 107, 110: magneto-striction, cycle 111: in excited dielectric body, spherical 36: in magnet 130
- Stress, derived from energy field 24: electric, historical 135: an invariant tensor form in fourfold 135: and Action xxix
- Stress tensor, dissection of fourfold 136: gravitational, not invariant 136, 802
- Stress, Maxwellian field of, involved in Action 801: tensor, as the foundation of relativist dynamic 802, requires duplex medium xxx, 802
- Structural local compensations 151
- Sun, anomalous atmospheric dispersion absent 519, refraction belowspots xxvi, criterion against Doppler deviation of rays 518
- Sun, why it is a magnet 611: must arise from electric flux 613, differential, as of ions driven by radiation 613: estimates of required ionized field 615, are reasonable 615, xxv
- Sunspots, magnetic field in 514, 614, in relation to a possible Kelvin thermoelectric gradient 616: its vortical origin 618: cause of their darkness xxvi
- Sunspots, the period 539, historical 568, 576, statistics not homogeneous 569, graphs of their analysis 572: cause of their magnetic fields 618, xxv
- Surface intrinsic charge, for crystal with ionized components 622
- Swarm of orbital meteors, law of spread 212
- Taylor, G. I., on tidal friction in shallow seas as influencing Earth's rotation 480, uncertainty 498: hydrodynamic moment connected with effective inertia 677, 693
- Telegraphy, wireless atmospheric 639, why possible to very long range 641
- Temperature, absolute, implied in Carnot 270, 597, its formal source 606, combined with entropy 647: physiologically given 400, physically interpreted 400, 413
- Temperature, physical nature of 410, 743
- Terazawa, K., on tidal load 520
- Thermal energy as residual 398
- Thermodynamic equilibrium, involves mechanical as well as thermal 719: based on statistic 295, limited scope, anthropomorphic 296: all latent in Carnot's axiom 597: generalized formal 705, history 705, trend of a system 721: with separate partial balances in compound systems 378: Brownian movements 724
- Thermodynamic surface, of Gibbs, based on entropy 289
- Thermodynamics, more definite than cognate statistical theory 102: its limitations 214: applied to living organisms 215: of permanent magnets 229
- Thermo-voltaic circuit 699
- Thomas, L. H., relativity within the atom 806
- Thomson, G. P., diffraction rings round electron paths 805
- Thomson, James, his unstable reach in diagram of state xxiv, 709
- Thresholds, nature of dynamical 765: illustrations 766: generalized 766
- Tidal influence on Earth's free precession 5, 492, estimated 493, its own oceanic tide 8, 490: tidal energy is relative to Earth's rotation 499; on latitudes xxxii
- Tidal deformation of solid Earth 385, relation to oceanic tide, if of long period 385: involves two resultant moduli 490: law of local changes of level 520
- Tidal lag, Airy's analysis of 473

830

Index to Volume II

- Tidal friction in shallow seas 480, 498
 Time and space, personal 768, is subjective and absolute 772: correlated for different observers 790, but by an algebraic process which passes beyond time and space 769, as exhibited on a four-fold map 772, an analogy 792
 Time, the practical astronomical standard of 480, 778, 793: is distinct from space 806
 Traction, in dielectric 65, 67: at an interface independent of nature of the transition if thin 68: reaction to stress may be a pressure, actual for fluid 65: may include surface torques 77: as altered by foreign interfacial layer 111
 Trail left by pulse of radiation 251, finite breadth as propagated in crystal 251, in space of even order 261
 Transition layers very thin 91
 Transmission, electric, as entirely through the aether 421, xxx: transfer of momentum by waves 432: of sound 618
 Transmission of stress, material, aethereal 118: by radiation 119, must be supplemented by permanent fields of the sources 212: stress latent in Action 801, also forces at a distance xxxii
 Trees, propulsion of sap 303, is osmotic 303, surface tension not effective 305
 Trend to thermal equilibrium 721, minimal tendencies 604, 722, traced on the Gibbs surface 722: as affected by osmotic constraints 722
 Trouton, F. T., tests local electric relativity 225
 Tubes of electric force, not entities 438
 Turner, H. H., on mean terrestrial Pole 328
 Uncertainty, as inherent, in physical world 538, and *quanta* 411, 761
 Universes, cyclic transformations can create new ideal 279
 van 't Hoff, J. H., and Kelvin, heat of reaction 103, 727
 Vaporization, as a link in cyclic argument on solutions 99: historical 100: critical point xxiv
 Vapour pressure, of drops, depressed by electric charge 94, 129: as affecting forms of interfaces 129
 Vector field, the fourfold as a, of Clifford type 801: Dirac's multiplex field xxxi
 Virial theory, practical limitations 633: applied to gas pressure 74, 134: to fluid pressure 90: internal part separately compensated 134: for multiple nuclei 170
 Viscosity, acts slowly by diffusion xxvii: as augmented by internal flux of radiation 673, 751
 Viscosity in relation to ionic statistics 748
 Viscous motion, not unique, may depend on how originated 692
 Vitality and thermodynamics 288, 766
 Voltaic cells, theory of reversible 103, 295, 367: cells working by diffusion 103: passive change of state inessential 295
 Voltaic potentials 695, relation to temperature 699: thermo-voltaic circuit 700
 Volterra, V., on permanent shells of radiation, 251, 261
 Vortex atoms, provided an influential physical model 209
 Vortex system, travel of a steady 682: diffusion of xxvii: rudder action 684
 Vortices, momentum and energy of 675, interpreted 677: stabilizing sheets of 679, initiation of 679
 Wave-detector, principle of early magnetic 762
 Wave-groups 299, 546, 644, energy speed and phase speed 547, 309, 300: groups not permanent 300, 548: generalized groups 302: energies additive 549: separated by dispersion 552: interferences local 562: pulse of permanent type 553, 561: echelon train formed on refraction 310, 555
 Wave-patterns, from bodies moving on water, are established with the group speed 314
 Wave-sources in a crystal, a pulse travels out bounded by the two sheets of wave-surface 251, 261
 Waves of sound, pressure on obstacle 617, theory as amended 618, momentum 619: contrast with electric slowing in matter xxiii, xxvi
 Waves, diffraction of electric 639, inadequate to carry them round Earth 639: as also is conductance of strata 640: fading of signals 656
 Waves, electric, the function of wires 422, as guides 424, genesis of currents 426: curvilinear analysis 265
 Waves, balance of energies in 301: general theory of their pressure 428, along a cord it is a compound effect 429, 435: how far it is essential 430: electric 431, momentum carried 432, pressure on moving radiator, or absorber 434, 464, xxiv
 Waves, electric, in upper air 643: its electric transparency 647: long waves cannot escape outwards 650: group transmission 644: influence of Earth's magnetic field 651, is rotational 653, when along the rays 651, when transverse 655
 Waves, idea of Huygenian analysis by secondary, limitations 251, made secure by Stokes 263
 White light, its statistics 311, limits 761, xxv
 Whittaker, J. M., on Action in a Dirac triple vector field, xxxi

Index to Volume II 831

Wien, W., radiational displacement theorem 407, simplified isotropic analysis 217, by uniform shrinking 257
Wilson, C. T. R., on magnitudes in lightning discharges 458
Wireless transmission 639, fading effect in 656
Wires, as guides to electric radiation 425: how currents in wires are established and become uniform 424: inductance and capacity 427
Wolfer, J., sunspot records 576
Wood, R. W., regular spectral satellite lines in resonance 559, 751, dynamical analogy 357
World to be accepted as existing, not deduced or explained 216
Yamaga, N., statistics of sunspots 568
Young, T., on atoms 348, on optical dispersion 351, on capillarity 507
Zeeman, P., his magneto-optic effect, historical 138: is sharp 173: relation to Faraday effect 139, analysed 169: with massive positive ions 170, effect of several in the atom 171, 172: Preston's rule 171: is a dynamical problem of cyclic systems 173, inferences 173: serves as an atomic indicator 174: changes the system of orbits and adds a precession 175: dynamics, the inverse effect 178: Fresnel convection factor xxiii