

INDEX OF SUBJECTS

The numbers refer to pages

- a-coefficient** of Van der Waals, 128, 138, 148, 161, 175
- Absolute Zero** of temperature, 11
- Absorption spectra**, 386
- Adiabatic Invariants**, 412, 415, 417
 ,, motion, 186, 235, 246, 335
 ,, ,, (radiation), 368
- Aerostatics**, 334
- Aggregation, molecular**, 91, 193
- Air**, constitution of, 340
 ,, ratio of specific heats of, 188, 189
- “Allowed” Motions**, 404
- Assumption** of molecular chaos, 17, 54, 59, 103, 109
- Atmosphere**, constitution of earth’s, 340
 ,, equilibrium of earth’s, 334
 ,, of a rotating planet, 339
 ,, outer of earth, 337, 339
 ,, radiation of, 337
 ,, rate of loss of, 342
- Atmospheres** of planets in the solar system, 347
- Atom**, structure of, 383
 ,, radius of, 333
- Atomic dissociation**, 91, 204
 ,, heat of a solid, 395
 ,, theory, 11
- Avogadro’s Law**, 7, 117, 202
 ,, Number, 7, 8
- b-coefficient** of Van der Waals, 127, 134, 138, 148, 161, 175
- Balmer Series of Hydrogen**, 386, 387, 427, 429
- Band spectra**, 390
- Boiling point**, theory of, 145, 201
- Boundary**, effect of, on law of distribution, 28
 ,, density at, influenced by cohesion, 159
- Boyle’s Law**, 117, 118, 131
 ,, ,, deviations from, 125, 327, and *see* Pressure
- Brownian Movements**, 1, 8, 360
- Calorimetry**, 183, 187, 203, 391; *see also* Specific heats
- Carbon-dioxide**, isothermals, 146, 154
- Carnot’s Law** ($C_p - C_v$), 185
- Chaos, molecular**, 17, 54, 59, 103, 109
- Characteristic equation** of a gas, 149
 ,, ,, satisfied by distribution-function f , 207
- Charles’ Law**, 117, 118, 202
- Chemical affinity**, magnitude of, 195, 205
- Clausius**, equation of state of, 153
 ,, virial of, 130
- Cohesion**, 2, 193, 202
 ,, in gases, 124, 134, 159, 173, 193, 202
- Collisions** between elastic spheres, 18, 261
 ,, between molecules with law μr^{-8} , 213, 282
 ,, in a gas, dynamics of, 18, 213, 260, 267, 279
 ,, in a gas, law of distribution of velocities in, 258
 ,, in a gas, law of distribution of relative velocities in, 36
 ,, in a gas, number of, 10, 35, 259
 ,, in outer atmosphere, 342
- Conduction** of heat in a gas, Ch. XII, 206, 224, 244, 246, 290
 ,, of heat in a solid, 226, 302, 403
 ,, of electricity, 226, 303, 403
- Conductivities**, ratio of thermal and electrical, 227, 304, 403
- Conservative system**, final state of, 75
- Continuity**, hydrodynamical equation of, 165, 232
 ,, of liquid and gaseous states, 125, 143, 200
 ,, of path. Maxwell’s assumption, 101
 ,, relation of assumption of molecular chaos, 109
- Continuous medium**, dynamics of a, Ch. XVI, 395
 ,, ,, specific heats of a, 359, 395
- Convective equilibrium** of atmosphere, 335
- Correlation** between velocity and positional coordinates:
 absence of correlation assumed in statistical method, 17, 56; justification, 64
 ,, between components of velocity: absence assumed by Maxwell, 56; justification, 27
- Corresponding states**, law of, 149, 150, 154

- Critical point**, 147, 150, 161, 164, 201
 „ pressure, 148, 161
 „ temperature, 143, 147, 161, 201
 „ volume, 148, 161, 164
- Dalton's Law** of pressure, 117, 118
 „ of atmospheric constitution, 334
- Degrees of freedom**, 66
 „ „ of a molecule, 189, 205
 „ „ of a continuous medium, 349, 395
- Demon, sorting**, of Maxwell, 183
- Density**, exact definition of, 14
 „ in solid and liquid states, 330
- Diameter** of molecules, *see* Size
- Diatomic Gases**, 189, 192, 205, 393
- Dieterici**, equation of state of, 161
- Diffusion of Gases**, Ch. XIII, 6, 206, 227, 246, 307
 „ „ (num. values), 320, 321, 323
 „ „ thermal, 323
- Discontinuous motion** on Quantum-Theory, 376, 378, 407, 408
- Displacement Law** of Wien, 368
- Dissipation of Energy**, 7, 83, 72
 „ of planetary atmospheres, 342
- Dissociation**, 91, 196, 204
- Distribution**, laws of, *see* Law
- Dynamics** of molecular collisions, *see* Collisions
- Effective molecular density**, 63, 157
- Effusion of Gases**, 121
- Elastic solid**, degrees of freedom of an, 349
 „ „ energy of an, 394, 400
- Electrons**, charge on, 8
 „ in a solid, 302, 306, 403, 405
 „ in a solid, pressure of, 118
 „ loss of, from atmosphere, 348
 „ radiation from, 364
- Entropy**, 78, 178, 80
 „ of radiation, 367, 369
- Equalisation of Temperature**, 113, 180, 181
- Equations of state**, 148, 151, 153, 161
- Equipartition of Energy**, 80, 87, 110, 112, 357, 402
- Error-function**, 34
- Ether**, statistical mechanics of, 349, 375
- Final state** of a conservative system, 73, 80
 „ „ of a non-conservative system, 72
- Fine Structure** of Spectral lines, 417, 427
- Freedom**, degrees of, 66, 205, 349
- Free electrons** in a solid, 118, 302, 306, 403, 405
- Free path**, 4, Ch. X
 „ „ calculation of, 35, 250, 252
 „ „ numerical values, 10, 257, 327
- Gas-thermometry**, 135
- Gaseous medium**, statistical mechanics of a, 39, 349
 „ „ energy of a, 354, 355, 402
- Generalised space**, 39, 69, 103, 157, 374, 410
- H-theorem**, 22, 64, 106
 „ relation to theorem of increasing entropy, 181
- Heat**, conduction of, *see* Conduction
 „ mechanical nature of, 1, 4, 131, 402
 „ mechanical equivalent of, 11
 „ specific, *see* Specific heat
- Helium atom**, 190
 „ **Spectrum**, 386, 388, 427, 429
- Historical notes:**
 Atomic Theory and Growth of Kinetic Theory, 11
 Law of distribution of velocities, 55
 Theorem of Equipartition of Energy, 96
- Hydrodynamical equations** of a gas, 165, 167
 „ theory, 32
- Hydrogen Spectrum**, 386, 388, 427
- Ideal Gas**, 114, 118, 140
- Internal Energy** of atoms and molecules, 185, 205, 297, 391
- Inversion**, atmospheric temperature, 338
- Irreversibility** of motion, apparent, 38, 65, 180
- Isothermal layer** of atmosphere, 338
- Isothermals**, 139 ff., 151, 162
 „ (experimental), CO₂, 146, 154
 „ „ isopentane, 163
- Law of distribution**, definition of, 16
 „ „ of coordinates (positional), 45, 83, 89, 99, 355
 „ „ of coordinates (velocity), 5, 31, 50, 55, 58, 88, 99, 112, 357, 402
 „ „ of coordinates, gas not in a steady state, 206, 218
 „ „ of relative velocities in collision, 36
 „ „ of velocities in collision, 258
- Law of force** between molecules:
 μr^{-5} , Ch. IX, 219, 238, 298
 μr^{-8} , 134, 213, 248, 282, 286, 299, 318
 numerical values of s , 284
- Light-quanta**, theory of, 378
- Line-spectra**, Bohr's theory of, 383
- Liouville's Theorem**, 73
- Liquid state**, 3, 143
 „ superheated, 144

Index of Subjects

441

- Loss of planetary atmospheres**, 342
- Low temperature phenomena** :
- conduction of electricity, 306, 404
 - specific heats of gases, 189, 192, 392
 - specific heats of solids, 394
- Mars**, atmosphere of, 347
- Mass and molecular motion**, 30
- ,, of molecule, 9
- Mass-motion**, equations of, 165, 167
- Mean free-path**, *see* Free path
- Mechanical equivalent of heat**, 11
- Mechanism of Radiation**, 381
- Metals**, electron theory of, 118, 302, 306, 403
- Mixture of gases**, diffusion of a, 311, 319
- ,, ,, law of distribution in, 90
 - ,, ,, persistence of velocities in a, 264, 313
 - ,, ,, pressure in, 115, 117
 - ,, ,, viscosity in a, 287
- Molecular chaos**, 17, 54, 59, 103, 109
- Molecules of a gas** :
- mass, 9
 - number per cu. cm., 8
 - size of, 9, 289, Ch. XIV, *see also* Size
 - velocity of, 9, 119
- Momentoids**, 97
- Monatomic gases**, 189, 191, 299, 300, 392
- Moon**, absence of atmosphere on, 348
- Non-conservative systems**, 72
- Normal properties**, defined, 74
- Normal state**, 54, 73, 74
- Number of molecules per cu. cm.**, 8, 11
- Osmotic pressure**, 118
- Outer atmosphere**, 337, 339
- Partition of Energy**, 76, 96, 103, 355
- Persistence of velocity**, 260, 275, 299, 312, 313
- Photo-electric phenomenon**, 381
- Planck's theory of radiation**, 372, 374; *see also* Quantum-theory
- Planetary atmospheres**, 338, 342, 347
- ,, ,, loss of, 342
- Positional coordinates**, *see* Law of distribution
- Pressure in a gas**, 6, Ch. VI
- ,, calculation of:
 - in a gas at rest, 13, 114, 129, 154, 171, 201, 403
 - in a gas in motion, 169, 223
 - ,, -coefficient of a gas, 135
 - ,, physical interpretation of, 6, 131, 169, 201
- Probability integral**, 34
- Quantum dynamics**, 191, 406
- ,, of energy, 378
 - ,, of light, *see* Light-quanta
 - ,, theory, Chaps. XVII, XVIII, 7, 13, 374
 - ,, theory, physical basis of, 378
- Radiation**, atmospheric, 337
- ,, black body, 366
 - ,, from atoms, 385
 - ,, from free electrons, 364
 - ,, from resonators, 361
 - ,, thermodynamics of, 366
- Radiation-formula of Planck**, 372
- Radius of molecules**, *see* Size
- Reduced equation of state**, 148, 162
- Relativity Separation of Spectral Lines**, 420
- Relaxation**, time of, 242, 244
- Resonators**, radiation from electrical, 361
- ,, in Planck's radiation theory, 374, 402
- Rotating planet**, atmosphere of, 339
- ,, gas, equilibrium of, 88, 339
- Rotational energy of molecules and atoms**, 189, 192, 390, 392, 393
- Rydberg Constant**, 386, 388, 427
- Self-diffusion of a gas**, 310; 318, 321
- Shape of molecules**, 328; *see also* Structure
- Size of molecules**, Ch. XIV
- ,, of molecules, determinations of:
 - from *b*-coefficient, 139, 327
 - from conduction of heat, 327
 - from densities of solid and liquid, 329
 - from dielectric constant, 332
 - from diffusion, 323, 324, 327
 - from viscosity, 289, 327
 - ,, of molecules, dependence on temperature, 282, 284, 328, 331
- Solid**, specific heat of a, 394
- ,, state, 2, 395, 402, 403
- Sorting demon of Maxwell**, 183
- Sound**, propagation of, 120, 186
- ,, velocity of, 120, 186
- Specific heats of a continuous medium**, 359, 395
- ,, ,, of a gas: 183, 392
 - at constant pressure, 184, 187, 203
 - at constant pressure (num. values), 190
 - at constant volume, 184, 187, 191, 203
 - at low temperatures, 189, 192, 393
 - ratio of, 13, 185, 188
 - ratio of (num. values), 190

- Specific heats** of a solid, 394
Spectra of atoms, 385, 417
Spectroscopy, 385, 417, 435
Stark Effect, 422, 429, 435
Statistical mechanics, 39, 68, 354
 ,, method, 15, 109
 ,, method, imperfections of the, 110
Stefan's Law, 366
Stirling's theorem, 45
Stresses in a gas, 169, 223
Structure of atoms, 383
 ,, of molecules, 189, 205, 393, 400
Super-cooled vapour, 144
Super-heated liquid, 144
Sutherland's formulae, 284, 331
Temperature, 78, 111
 ,, absolute zero of, 11
 ,, equalisation of, 113, 180, 181
 ,, inversion (atmospheric), 338
 ,, thermodynamical, 78
Thermal Diffusion, 323
 ,, effusion, 122
Thermodynamics, 78, 176
 ,, second law of, 78, 178, 367, 371
 ,, of radiation, 366
Thermometry, gas, 135
Time of relaxation, 242, 244
Transfer, Maxwell equations of, 231
Upper atmosphere, 337
Van der Waals' equation, 125, 135, 148, 149, 151, 152, 153, 161
Vapour, 3, 201
 ,, super-cooled, 144
Velocity, persistence of, 266, 275, 299, 312, 313
 ,, of molecules, law of distribution of, *see* Law
 ,, of molecules, numerical values, 119
 ,, of sound, 120, 186
Viscosity of gases, Ch. XI, 33, 206, 223, 243, 246, 268
 ,, of gases at low pressures, 279
 ,, of gases, variation with density, 277
 ,, of gases, variation with temperature, 279
Virial, 130
Volume-coefficient of a gas, 137
Wiedemann-Franz Law, 304
Wien's Displacement Law, 368
X-ray Spectrum, 383, 389, 428, 435
Zeeman Effect, 422, 435
Zero, absolute of temperature, 11

INDEX OF NAMES

- Amagat**, 147, 152, 153
Andrews, 146, 147, 154
Baly and Donnan, 330
Bannawitz, 300
Bartoli, 367
Bauer and Moulin, 368
Behn, 330
Bernoulli, Daniel, 12
Berthelot, 154, 163, 164
 ,, and **Ogier**, 203
Bestelmeyer, 285
Birge, 373
Blake and Duane, 383
Bohr, 227, 304, 383, 412, 422, 435, 436
Boltzmann, 13, 14, 56, 97, 133, 196, 198, 199, 207, 245, 255, 272, 274, 297, 302, 332, 367, 412
Born and Karman, 402
Boyle, 117, 277
Brackett, 386
Bragg, W. H., 394, 401
Bragg, W. L., 333, 394, 401
Breitenbach, 285, 288
Brillouin, 278
Bryan, 339
Bunsen, 122,
Burbury, 15, 56, 57
Burgers, 412, 417, 436
Cailletet and Mathias, 330
Callendar, 11, 136, 139
Capstick, 192, 193
Carnot, 185
Chapman, 219, 248, 276, 287, 288, 289, 299, 302, 316, 318, 319, 322, 324, 325, 329, 340
 ,, and **Hainsworth**, 324
Chappuis, 136
Claude, 340
Clausius, 12, 13, 129, 145, 153
Coblentz, 368, 373, 380
Conrau, 295, 299
Crommelin, 152

Index of Names

443

- Crookes**, 279
Cuthbertson and Metcalfe, 332

Dalton, 117
Darling, 330
De Bort, 338
Debye, 395, 435
Deutsch, 320
Deville and Troost, 199
Dewar, 164, 329, 330
Dieterici, 161
Dines, 336, 338
Dittenberger, 301
Dootson, 325
Dorsman, 163, 278, 286
Drude, 302
Duane, 383
Dulong and Petit, 394
Dunoyer, 4

Ehrenfest, 412, 415
Einstein, 378, 382, 401, 403, 407, 412
Elliott and Mason, 325
Enskog, 229, 230, 287, 288, 289, 300, 319, 322, 324
Epstein, 417, 429, 433, 435
Eucken, 192, 300, 301, 302, 329
Evans, E. J., 387

Fabry and Buisson, 428
Fletcher, 8
Fowler, 388
Frankland, 336

Gassendi, 12
Gay-Lussac, 124
Gibbs, Willard, 182, 199
Gold, 336, 337
Graham, 122, 288
Günther, 317

Hainsworth, Chapman and, 324
Hann, 341
Hauer, 405
Herapath, 12
Hercus and Laby, 300
Hertz, 381
Hertzfeld, 403, 405
Hilbert, 318
Holborn and Henning, 190
Holst, 163
Hooke, 12
Hughes, 382
Hull, 383
Humphreys, 341

Ibbs, 325

Jackmann, 320
Jäger, 200
 ,, and Diesselhorst, 305, 405
Jones, J. E., 345
Joule, 12, 124

Kamerlingh Onnes, 125, 139, 151, 152, 153, 164, 278, 286, 306, 330, 400
Keesom, 125, 133, 147, 164, 400, 402
Kelvin, Lord, 13, 124, 181, 321
Kia-Lok Yen, 288
King, 299
Kirchhoff, 13, 57
Klemenčić, 332
Knietsch, 330
Knudsen, 117
Koch, 188, 189
Königsberger, 403
Kramers, 435
Krönig, 12
Kuenen, 177, 288, 315
Kundt and Warburg, 190
Kurlbaum, 368

Ladenburg, 381
Langevin, 316, 318
Leduc, 136
Lees, 305, 405
Lenard, 381
Lenz, 403
Leslie, 122
Lienhop, 381
Lindemann, 395, 403
Liouville, 73
Lonius, 320
Lorentz, 13, 56, 219, 227, 229, 365, 379, 403
Lorenz, 304
Loschmidt, 7, 321, 322
Lyman, 386

Masson, Elliott and, 325
Mathias, 164
Maxwell, 7, 13, 14, 55, 56, 96, 97, 98, 101, 110, 131, 145, 183, 213, 219, 231, 277, 288, 315, 316
Merton, 428
Meyer, 57, 257, 277, 291, 297, 307
Michel, 372
Michelson, 368, 428
Millikan, 8, 288, 368, 382
Milne, 340, 345, 348
Moissan, 340
Moseley, 389

Natanson, 196, 197
Naumann, 192
Nernst, 373, 395, 401, 403

- Neumann**, 200
Nicholson, 385
Niemeyer, 190

Olszewski, 164
Onnes, Kamerlingh, *see* Kamerlingh Onnes

Paschen, 386, 388, 427, 428
Patterson, 163
Perrin, 8
Pickering, 387
Pidduck, 318, 322
Pier, 301
Pirogoff, 57
Planck, 7, 372, 374, 406, 436
Pohl and Fringsheim, 381
Poincaré, 67, 245, 376
Puluj, 288

Ramsay, 152, 190, 330, 340
 „ and **Travers**, 330
Rankine, 203, 285, 288
Raveau, 150
Rayleigh, Lord, 13, 96, 101, 102, 190, 283, 284,
 285, 359
Regnault, 125, 136, 138
Reynolds, Osborne, 123
Richardson, 8, 118, 227, 304
 „ and **Compton**, 382
Richter, 403
Roche, 339
Rose-Innes, 139
Rubens, 372
 „ and **Michel**, 372
Russell, 347
Rutherford, 383

Sarrau, 153

Scheel and Heuse, 190
Schmidt, E., 320
Schmitt, K., 285, 286, 288
Schultze, 281, 288
Schwarze, 300, 301
Sommerfeld, 295, 417, 422, 427, 428, 429, 435
Stark, 429
Stefan, 297, 315, 316, 367
Stokes, 277
Strecker, 193
Sutherland, 284, 285
Swann, 190, 304

Tait, 13, 37, 255, 274, 299
Taylor, 379
Tetrode, 402
Thirring, 402
Thomson, J. J., 192, 197
Travers, 330, 332

Valentiner, 368
Van der Waals, 13, 125, 138
Vogel, 288, 301

Warburg, 278
Waterston, 12, 96
Weber, S., 278, 286
Wegener, 341
Weyl, 353
Wien, 306, 368, 405
Winkelmann, 301
Witkowski, 164
Wood, E. W., 117, 389
Wüllner, 301

Young, S., 152, 162, 163, 164

Zeuner, 203