

INDEX.

A.

Abrupt widening, 402
 Absolute magnitude, 57
 — resistance, 183
 Acceleration and combination of velocity, 41
 —, normal, 47
 Action and re-action, 57
 — of an unlimited stream, 480
 Adhesion, 57
 Aëriiform bodies, 58
 Aërodynamics, 58
 Aërostatics, 58
 Aggregation, state of, 56
 Air, density of the, 346
 —, efflux of still, 428
 — in motion, efflux of, 431
 —, strata of, 345
 Angle of friction and the cone of friction,
 the, 148
 Angular tubes, 396
 Areometer, 335
 Attwood's machine, 241
 Axes, free, 254
 Axis, equilibrium of forces about an, 112
 —, pressure on the, 111
 Axle and wheel, 238
 — friction, 156
 —, pointed, 165
 —, the thickness of, 213
 —, wheel of an, 142

B.

Balance, hydrostatic, 334
 Ballistic pendulum, 298
 Beams, hollow, 196
 —, hollow and elliptical, 205
 —, rectangular, 193
 —, strongest, 203
 —, the strongest form of, 210
 Bodies, aëriiform, 58
 —, centre of gravity of, 98
 —, dynamics of solid, 58
 —, flexure of, 188
 —, floating, 458
 —, free descent of, 30

Bodies, impact of free, 279
 —, mechanics of solid, 58
 ————— fluid, 58
 —, perfect elastic, 279
 —, rotary, 295
 —, statics of aëriiform, 58
 —, statics of solid, 58
 —, strongest form of, 185
 Breaking twist, 223
 Buoyancy, 322
 — centre of, 332

C.

Catenary, 135
 Centre of buoyancy, 332
 — of gravity, 88
 ————— of bodies, 98
 ————— of curved surfaces, 97
 ————— of plane figures, 92
 ————— of lines, 90
 — of parallel of forces, 83
 — of percussion, 299
 — of pressure, 311
 Centrifugal force, 245, 246
 ————— of extended masses, 248
 Centripetal force, 246
 Chains, rigidity of, 178
 Circular lateral orifices, 360
 — pendulum, 265
 Co-efficient of efflux, 367, 434
 ————— through rectangular ori-
 fices, Tables I. and II. from Poncelet and
 Lesbros, 370, 371
 ————— for circular orifices,
 table of corrections of the, 378
 — of contraction, 365
 Co-efficient of velocities, 364
 — of discharge by wiers, 373
 — of resistance, 384
 — table of efflux and velocity, 390
 — of friction, 147, 447
 — of friction, Table of the, 394
 — of the friction of repose and mo-
 tion, Table of, 151, 152
 — of resistance of curvature in tubes,
 398
 Cohesive force, 57

Columns, 218
 Combination of velocity, 42
 Communication, vessels of, 416
 Components, 64
 Composition and resolution of velocities, 41
 ————— of forces, 64
 ————— in a plane, 79
 Compound motion, 37
 ————— pendulum, 273
 ————— vessels, 411
 Compression, rupture by, 214
 ————— under, 216
 Cone of friction, the, 148
 Conical tubes, 389
 Constrained paths, 259
 Cords, friction of, 170
 ————— rigidity of, 179
 Contraction, effect of imperfect, 408
 —————, co-efficient of, 365
 —————, imperfect, 377, 387
 —————, maximum and minimum of, 374
 ————— of the fluid vein, 366
 —————, partial, 375
 Corrections for the Poncelet wiers, Table
 of, 381
 ————— for wiers over the entire side, or
 without any lateral contraction, 381
 ————— of the co-efficients of efflux for
 circular and rectangular orifices, 378
 Coulomb's experiments, 180
 Couples, 82
 Crushing, Table of the modulus of resist-
 ance to, 215
 Curve, elastic, 190
 Curved motions in general, 46
 ————— tubes, 397
 Curvilinear motion, 74
 Cycloid, 270
 Cycloidal pendulum, 271
 Cylinders, 197
 ————— and prisms, 232
 Cylindrical tubes, 383

D.

D'eau, jets, 399
 Declivity of water, 438
 Density, 54
 ————— and pressure, velocity of efflux, 353
 ————— of the air, 347
 Depth of floatation, 325
 Descent, free, of bodies, 30
 Determination of the centre of gravity, 89
 Different velocities in the transverse section,
 438
 Discharging vessels in motion, 362
 Division of forces, 56
 ————— of mechanics, 57
 Docks, floating, 330
 Dynamical stability, 120
 Dynamics of aëriiform bodies, 58
 ————— of fluids, 58, 350
 ————— of rigid bodies, 225
 ————— of solid bodies, 58

E.

Edges, points and knife, 166
 Effect of imperfect contraction, 404
 Efflux, 350, 425
 —————, co-efficient of, 367, 434
 ————— of air in motion, 431
 ————— of still air, 428
 ————— of water in motion, 379
 ————— through tubes, 382
 —————, regulators of, 454
 ————— under decreasing pressure, 432
 —————, velocity of, 351
 —————, velocity of pressure and density, 353
 Elastic body, perfect and imperfect, 279
 ————— curve, 190
 ————— impact, 281, 288
 ————— pendulum, 276
 Elasticity and rigidity, 182
 ————— and strength, 183
 —————, modulus of, 183
 —————, or spring force, 57
 Elliptical beams, hollow and, 205
 English, French, and German measures
 and weights, comparative tables of, xv.
 Equality of forces, 51
 Equilibrium, kinds of, 110
 ————— of bodies rigidly connected, 109
 ————— of forces about an axis, 112
 ————— in funicular machines, 127
 ————— of water in vessels, 309
 ————— with other bodies, 322
 ————— and pressure of air, 338
 Excentric impact, 302
 Experiments on beams, 200
 ————— on friction, 149
 ————— of Rennie, 150
 Eytelwein, 201

F.

Fall of water, 438
 Flexure of bodies, 188
 —————, reduction of the moment of, 194
 Floatation, depth of, 325
 ————— oblique, 332
 Floating bodies, 458
 ————— docks, 330
 Floods, 451
 Flow through tubes, 436
 Fluidity, 304
 Fluid surface, the, 306
 ————— vein, contraction of, 364
 Force, 50
 ————— about an axis, equilibrium of, 112
 —————, centre of parallel of, 83
 —————, centripetal and centrifugal of extended
 masses, 246
 —————, cohesive, 57
 —————, composition of, 64
 —————, direction of a, 57
 —————, division of a, 51, 57
 —————, equality of, 51
 —————, in a plane, 67

- Force, in a plane, composition of, 79
 —, in space, 69, 83
 —, living, 62
 —, magnetic, 57
 —, measure of, 53
 —, muscular, 57
 —, normal, 245
 —, of inertia, 57
 —, of heat, 57
 —, parallel of, 81
 —, parallelogram of, 65
 —, resolution of, 66
 —, simple constant, 58
 Formulæ of stability, 118
 Free axes, 254
 — descent of bodies, Table of, 30, 31
 French, English, and German measures and weights, comparative tables of, xv.
 Friction, axle, 156
 —, Table of co-efficients of, (from Morin,) 156
 —, co-efficient of, 147, 447
 —, experiments on, 149
 —, kinds of, 146
 —, laws of, 147
 —, of cords, 170
 —, of motion, 152
 —, of repose, Table of the co-efficients of the, 151
 —, pivot, 164
 —, resistance of, 391
 —, rolling, 168
 —, the angle and cone of, 148
 Funicular machines, 127
 —, polygon, 130
- G.**
- Gases, tension of, 338
 Gay-Lussac's law, 346
 Geodynamics, 58
 Geomechanics, 58
 Geostatics, 58
 German, English, and French measures and weights, comparative tables of, xv.
 Gerstner, 201
 Graphical representation, 34
 Gravity, specific, 55, 334
 Gravity, 57
 —, action of, along constrained paths, 259
 —, centre of, 88
 —, determination of the centre of, 89
 — of lines, centre of, 90
 — of plane figures, centre of, 92
 — of curved surfaces, centre of, 97
 Gauges, 453
 Guldinus's properties, 107
- H.**
- Hardness, 287
 Hollow beams, 196
 — and elliptical beams, 205
- Horizontal and vertical pressure, 319
 Hydraulic pressure, 355
 Hydrostatics, 58
 Hydrodynamics, 58
 — balance, 334
 Hydrometers, 335
 Hydrometry, 453
 Hydrometric sail wheel, 461
 Hydrometrical pendulum, 464
- I.**
- Impact, doctrine of, 228
 — of isolated streams, 467
 —, elastic, 281
 —, excentric, 302
 —, inelastic, 279, 288
 —, in general, 278
 —, imperfectly elastic, 290
 —, oblique, 291
 Imperfectly elastic impact, 290
 Imperfect contraction, 371, 387
 —, effect of, 404
 Impulse, maximum effect of, 469
 — and resistance, theory of, 466, 474
 — oblique, 471
 — of a limited stream, 470
 — and resistance against surfaces, 475
 — to bodies, 576
 — of water, 466
 Inclined plane, 152, 259
 —, theory of the, 122
 Inelastic impact, 279, 288
 Inert masses, reduction of, 228
 Inertia, 52
 —, force of, 57
 —, moment of, 227
 —, radius of, 230
 —, reduction of the moment of, 229
 Influx, velocity of, 351
 — and efflux, 425
 Intensity of a force, 57
 Irregular vessels, 424
- J.**
- Jets d'Eau, 399
- K.**
- Kinds of support, 109
 — of equilibrium, 110
 — of friction, 146
 — of motion, 225
 Knife, edges of, 166
 Knots, 127
- L.**
- Lateral pressure, 310
 Laws of friction, 147
 — of Mariotte, 341
 — of Gay-Lussac, 346
 — of statics of rigid bodies, 76

- Lever, mathematical, 113
 ———, equilibrating, 332
 ———, material or physical, 113
 ———, theory of the equilibrium of the, 113, 163
 Living forces, 62
 Liquids of different densities, 337
 Loading beyond the middle, 208
 Locks, 426
 Long tubes, 394
- M.
- Machines, Attwood's, 241
 ———, funicular, 127
 Magnetic force, 57
 Manometer, 339
 Mariotte's law, 341
 Mass, 53
 ———, reduction of inert, 228
 Masses, centrifugal forces of extended, 248
 Mathematical pendulum, 266
 ——— lever, 113
 Material pendulum, 266
 Matter, 51
 Maximum and minimum of contraction, 374
 ——— effect of impulse, 469
 Mean velocity, 440
 Measure of forces, 53
 Mechanics, 50
 ——— fundamental laws of, 50
 ——— division of, 57
 ——— of solid bodies, 58
 ——— of fluid bodies, 58
 ——— of air, 58
 ——— of a material point, 58
 Mechanical effect, 60
 ———, transmission of, 73
 Media, motion in resisting, 477
 Metacentre, 328, 332
 Modulus of elasticity, 183
 ——— of working load and strength, 184
 ——— of elasticity and strength, 186
 ——— of relative strength, 201
 Moment of inertia, rotation and mass, 225, 227
 Morin's experiments, 151
 Motion in resisting media, 477
 ———, accelerated, 27
 ——— and rest, 25
 ———, compound, 37
 ———, efflux of air in, 431
 ———, in general, curved, 46
 ———, kind of, 25, 26, 225
 ——— of water, permanent, 439
 ———, of rotation, 226
 ———, mean velocity of a variable, 35
 ———, parabolic, 43
 ———, rectilinear, 225
 ———, rolling, 263
 ———, simple, 25
 ———, uniform, 26, 445
 ———, uniformly variable, 27
 ———, variable, in particular, 33
- Motion, variable, in water, 448
 ———, curvilinear, 74
 Mouth pieces, 382
 Muscular force, 57
- N.
- Notes, 127
 Normal acceleration, 47
 ——— force, 245
 Notches in a side, 418
 Numerical values, 187
- O.
- Obelisk shaped vessels, spherical and, 422
 Oblique impact, 291
 ——— pressure, 207
 ——— floatation, 332
 ——— additional tubes, 386
 ——— impulse, 471
 Orifice, triangular lateral, 359
 ——— rectangular lateral, 368
 ——— circular lateral, 360
 Oscillation, time of, 266
- P.
- Parallelogram of the velocities, 38
 ——— of accelerations, 42
 ——— of forces, 65
 Parallelopiped of velocities, 41, 119
 ———, rectangle of, 231
 Parallel forces, 81
 ———, centre of, 83
 Parabola, 43
 Parabolic motion, 43
 Particular cases of impact, 282
 Partial contraction, 375
 Pendulum, hydrometrical, 465
 Pendulum, circular, 266
 ———, ballistic, 298
 ———, elastic, 276
 Percussion, centre of, 299
 Permanent motion of water, 439
 Perimeter, 438
 Permanency, 439
 Phronomy, 25
 Physical lever, 113
 Piëzometers, 413
 Pile driving, 285
 Pipes, thickness of, 320
 Pitot's tube, 464
 Pivot friction, 164
 Plane of rupture, 209
 ———, composition of forces in a, 79
 ———, forces in a, 67
 ———, inclined, 153, 259
 ———, theory of the inclined, 122
 Pneumatics, 58
 Points and knife edges, 166
 Pointed axles, 165
 Polygon, funicular, 130
 Poncelet and Lesbros, two tables of co-effi-

cients of efflux, through rectangular ori-
 fices, 370, 371
 Pontoon, a, 102
 Pouce d'Eau, 456
 Pressure, 51
 ———, horizontal and vertical, 319
 ——— in a definite direction, 315
 ——— on the axis, 111
 ——— of bodies on one another, 115
 ——— of oblique, 207
 ——— of efflux under decreasing, 432
 ——— on curved surfaces, 317
 Pressures, principles of equality of, 305
 ——— and density, velocities of efflux, 353
 ———, centre of, 311
 ——— of water in vessels, 309
 ———, hydraulic, 355
 ———, lateral, 310
 ——— on the bottom, 308
 Principle of equality of pressures, 305
 ——— of the *vis viva*, 62
 ——— of virtual velocities, 85, 124
 Prismatic vessels, 415
 Prisms and cylinders, 232
 Profile in river, 438
 Projectiles, 479
 Properties of Galidinus, 107
 Pulley, the, 140
 Pyramidal-shaped vessels, wedge, &c., 420

R.

Radius of gyration or inertia, 230
 Rectangle and parallelopiped, 231
 Rectangular beams, 193
 ——— lateral orifices, 368
 Rectilinear motion, 225
 Reduction of the moment of flexure, 194
 ——— of inert masses, 208
 ——— of the moment of inertia, 229
 Regulators of efflux, 454
 Relative strength, 183, 199
 Rennie's experiments, 151
 Rest and motion, 25
 Resistance and impulse against surfaces,
 475
 ——— to compression, 183
 ——— to torsion, 183
 ———, impulse and, to bodies, 476
 ———, co-efficient of, 384
 ——— of friction, 391
 ——— and rigidity, 145
 ——— of water, 466
 ———, theory of impulse, &c., 474
 Resolution of velocities, 41
 ——— of forces, 66
 Restoring power of floating docks, 331
 Resultant, 64
 Rheometer, 465
 Rigid bodies, statics of, 76
 Rigidity of chains, 178
 ——— and friction, 145
 ——— of cords, 179
 Rod, the moment of inertia of, 230

Rolling motion, 263
 ——— friction, 168
 ——— and dragging friction, 169
 Rotary bodies, 295
 Running water, 438
 Rupture, plane of, 209
 ——— by compression, 214
 ——— under compression, 216

S.

Sail wheel, hydrometric, 461
 Section, transverse, different velocities in
 the, 438
 Segments, 236
 Short tubes, 382
 Simple constant force, 58
 Slope of water, 438
 Space, forces in, 69, 84
 Specific gravity, 55, 333
 Sphere and cone, 333
 Spherical and obelisk-shaped vessels, 422
 Spring force, 57
 State of aggregation, 56
 Stability, 116, 328
 ———, formulæ of, 118
 ———, dynamical, 120
 ——— of floating docks, 331
 Statical moment, 78
 Statics of solid bodies, 58
 ——— of rigid bodies, 75
 ——— of fluid, 58, 309
 ——— of aëriiform bodies, 58
 Strata of air, 345
 Stream, action of an unlimited, 473
 Streams, impact and isolated, 467
 ———, impulse of a limited, 470
 Strength and elasticity, 183
 ——— modulus of working load and, 184
 ——— the moduli of elasticity and table,
 187.
 ——— relative, 199
 ——— modulus of relative, 201
 Strongest form of body, 185
 ——— beams, 203
 ——— form, beams of the, 210
 Support of kinds, 109

T.

Table of co-efficients of the friction of re-
 pose, 151
 ——— comparative, of English, French and
 German measures and weights, 15
 ——— of motion, 152
 ——— of co-efficients of axle friction from
 Morin, 156
 ——— I., the moduli of elasticity and strength,
 187
 ——— II., the modulus of strength for the
 flexure of bodies, 201
 ——— of the modulus of resistance to crush-
 ing, 215

- Table of co-efficients of efflux through rectangular orifices, 370
 — of co-efficients of efflux for wiers, 372, 373
 — of the co-efficients of resistance for trap valves, 410
 — of the co-efficients of friction, 394
 — of the co-efficients of the resistance of curvature in tubes, 398
 — of the co-efficients of resistance for the passage of water through a cock in a rectangular tube, 406
 — in a cylindrical tube, 406
 — through throttle-valves in rectangular and cylindrical tubes, 407
 — showing the relations of the motion to the time in the free descent of bodies, 31
 — of corrections of the co-efficients of efflux for circular and rectangular orifices, 378
 — for the Poncelet wiers, 381
 — for wiers over the entire side, or without any lateral contraction, 381
 — of correction for imperfect contraction by efflux through short cylindrical tubes, 388
 — of the co-efficients of efflux, 390
 Tachometer, 461
 Tension of gases, 338
 Theory of the inclined plane, 122
 — of impulse and resistance, 474
 — wedge, 125
 Thickness of axles, the, 213
 — of pipes, 320
 Time of oscillation, 266
 Toggle joint, note on, 129
 Torsion, 219
 Traction, 51
 Transference of the point of application, 76
 Transmission of mechanical effect, 73
 Transverse section, different velocities in the, 438
 — the best form of, 441
 Tredgold, 213
 Triangular lateral orifice, 359
 Tricardo, 129
 Trigonometric expression, 41
 Tubes, angular, 396
 — conical, 389
 — curved, 397
 — cylindrical, 383
 — flow through, 436
 — long, 394
 — oblique additional, 386
 — of Pitot, 464
 — short, 382
 — table of co-efficients of the resistance of curvature in, 398
 Twist, breaking, 223
 U.
 Uniform motion, 26, 445
 Uniformly accelerated motion, 28, 428
 — variable motion, 27
 Unit of weight, 52
 V.
 Valves, 408
 — table of the co-efficients of resistance of traps, 410
 Variable motions in particular, 33
 — motion, mean velocity of a, 35, 448
 Velocities, co-efficient of, 364
 — combination of, 42
 — composition and resolution of, 41
 — in the transverse section different, 438
 — mean, 440
 — parallelogram of the, 38
 — parallelepipedon of, 41
 — principle of virtual, 85, 124
 — of efflux and influx, 351, 352
 — of efflux, pressure and density, 353
 — virtual, 85
 Vertical and horizontal pressure, 319
 Vessels, compound, 411
 — in motion, discharging, 362
 — irregular, 424
 — of communication, 416
 — Prismatic, 415
 — spherical and obelisk-shaped, 422
 — wedge and pyramidal-shaped, 428
 Virtual velocities, 85
 Vis viva, 62
 ♦ W.
 Water-inch, 456
 — flow of, through wiers, 372, 373
 — in motion, efflux of, 379
 — permanent motion of, 439
 — running, 438
 — slope of, 438
 Wedge and pyramidal-shaped vessels, 420
 — the, 154
 — theory of the, 125
 Wheel, and axle, the, 238
 — hydrometric sail, 461
 — and axle, the, 142
 — carriages, note on, 174
 Widening, abrupt, 401
 Wiers, 372
 — table of the co-efficients of efflux, for 372, 373
 — table of corrections for the Poncelet, 381
 — over the entire side, table of corrections for, 381

E R R A T A .

- Page 30, line 5 from bottom, *for* 32,22 *read* 32,2.
- “ 31 “ 6 *for* 15,625 *read* 16,1, and *for* 250 *read* 257,6.
- “ “ “ 8 *for* 0,016 *read* 0,0155.
- “ “ “ 10 from bottom, *for* 241 *read* 241½.
- “ 32 “ 9 from bottom, *for* 0,480 *read* 0,465, *for* 0,320 *read* 0,310, and *for* 0,160 *read* 0,155.
- “ “ “ 11 from bottom, *for* 0,032 *read* 0,031, and *for* 0,480 *read* 0,465.
- “ 38 “ 9 *for* 15½ feet *read* 15½ feet Prussian measure.
- “ “ “ 23 from top, *for* $c_1 t_1, c_2 t_1$ *read* $c, t, c_2 t$.
- “ 55 “ 5 *for* $\frac{205}{502}$ *read* $\frac{205}{485,8}$, *for* 0,4083 *read* 0,4219, also *for* 0,4083 *read* 0,4219, and *for* 705,54 *read* 729,04.
- “ 73 “ 4 from top, *for* Fig. 40 *read* Fig. 41, and in line 5, *for* Fig. 41 *read* Fig. 40.
- “ 75 “ 3 *for* $(h-h_1) M$ *read* $(h-h_1) G$.
- “ “ “ 6 *for* mass *read* weight.
- “ 100 “ 17 from bottom, *for* $x_3 y_2 z_1$ *read* $x_2 y_3 z_1$.
- “ 153 “ 9 from bottom, *for* GOK *read* GOQ.
- “ 163 “ 14 from bottom, *for* $\overline{+} Q \cos. \beta$ *read* $\overline{+}_{07} Q \cos. \beta$.
- “ 184 “ 10 from bottom, *for* 1 *read* l , and *for* λE *read* $\frac{\lambda}{l} E$.
- “ 189 “ 17 from top, *for* $z_1 \cdot F_1 S z_1$ *read* $z_1 \cdot F S z_1$.
- “ 257 “ 13 from top, *for* $\cos. a$ *read* $\cotg. a$.
- “ 264 “ 2 from top, *for* G *read* g .
- “ 331 “ 6 from top, *for* shoared *read* shored.
- “ 394 “ 15 from bottom, *for* $\overline{1\frac{1}{4} | 1 | 2}$ *read* $\overline{1\frac{1}{4} | 1\frac{1}{2} | 2}$.
- “ 414 “ from bottom, *for* 01,274 *read* 0,1274.
- “ 422 “ 15 from bottom, *for* $h = r t, 0 =$ *read* $h = r, t =$.
- “ 426 “ 12 from bottom, *for* 63,29 *read* 63,89.

