

CONTENTS

CHAPTER	PAGE
I. Introduction. Composition and Resolution of Forces acting at one point	1
Equilibrium of a Particle on a smooth curve	16
II. Parallel Forces. Moments. Couples	20
III. Equilibrium of a rigid Body acted on by forces in one plane	38
Astatic equilibrium	50
IV. Friction	54
Equilibrium of a Particle on a rough curve	60
V. Work. Virtual Work	76
Proof of the Principle of Virtual Work for a coplanar system	87
VI. Graphic Solutions	96
VII. Shearing Stresses. Bending Moments	119
Graphic Construction for Bending Moments	130
VIII. Centre of gravity	134
Centre of gravity of an Arc	144
Centre of gravity of a Plane Area	146
Centre of gravity of a Solid and Surface of Revolution	153
Centre of gravity of any Volume	157
Centre of gravity of a Spherical Triangle	161
Theorems of Pappus	162
IX. Stable and unstable equilibrium	165
X. Forces in three Dimensions	182
General Conditions of equilibrium	184
Proof of the Principle of Virtual Work for any system of forces	196
The Work Function	200
Stable and unstable equilibrium	203
XI. Forces in three Dimensions (continued)	206
Poinso't's Central Axis	206
Resultant Wrench of two given Wrenches	216
The Cylindroid	220
Reciprocal Screws	225
Nul lines and Planes	226

CHAPTER	PAGE
XII. Machines	231
The Levers	233
Pulleys	235
The Wheel and Axle	239
The Common Balance	244
Steelyards	247
The Screw	248
The Wedge	252
Efficiency of a Machine	254
Law of a Machine	256
XIII. Equilibrium of Strings and Chains	260
The Common Catenary	260
The Parabola of Suspension Bridges	270
General Conditions of equilibrium of a string	273
Catenary of Uniform Strength	274
Strings on smooth Surfaces and Curves	276
Strings on rough Curves	282
Strings under Central Forces	287
Extensible Strings	291
XIV. Attractions and Potential	304
Attraction of a thin Rod	304
Circular Plate	308
Change in the Attraction on crossing a thin attracting surface	309
Thin Spherical Shells and Solid Sphere	315
Value of gravity on a tableland	319
Value of the Constant of Gravitation	319
The Potential	324
Potential of a thin Rod	328
Thin Spherical Shells and Solid Sphere	332
XV. Attractions and Potential (continued)	346
Surface Integral of Normal Attraction	346
Equations of Laplace and Poisson	349
Equipotential Surfaces	353
Lines and Tubes of Force	355
Work done by a Self-attracting System	358
Distributions for a given Potential	363
Equivalent Layers	365
XVI. Equilibrium of slightly elastic Beams	369
Clapeyron's Equation of the three moments	375
General equations of equilibrium of a bent Rod	380
Work done in bending a Rod	384
Bending of Long Columns	386
Centrifugal Whirling of Shafts	388
Column bending under its own weight	390