CONTENTS

CHAPTER I

EXPERIMENTS IN DYNAMICS

Experiment 1. An example of conservation of angular momentum.
§ 1. Angular momentum of a particle about an axis.  2. Angular momentum of a system about an axis.  3. Method.  4. Experimental details.  5. Practical example.  [Pages 1 to 7]

Experiment 2. Kater’s pendulum.

Experiment 3. Moment of inertia of a body about a non-principal axis.

Experiment 4. Recording gyroscope.

CHAPTER II

THE STROBOSCOPE

Experiment 5. Determination of frequency of alternating current.

CHAPTER III

EXPERIMENTS IN ELASTICITY

§ 32. Transverse vibrations of a thin rod.  33. Mathematical theory of vibrations of rod.  34. Roots of \( \cosh \, m \cos \, m = -1 \).  [Pages 52 to 58]

Experiment 6. Determination of Young’s modulus by vibrations of a rod.
§ 35. Introduction.  36. Calibration by tuning forks.  37. Determination of Young’s modulus.  38. Ratio of \( m_1 \) to \( m_0 \).  39. Practical example.  [Pages 58 to 63]
CONTENTS

Experiment 7. Determination of frequency of alternating current by vibrations of a rod.

§ 40. Introduction. 41. Method. 42. Determination of frequency of current. 43. Practical example. 44. Experiment with several nodes. 45. Practical example . . . . . . [Pages 63 to 69]

Experiment 8. A bifilar method of measuring the rigidity of wires.

§ 46. Introduction. 47. Bifilar couple. 48. Apparatus. 49. Theory of method. 50. Experimental details. 51. Conversion table. 52. Practical example . . . . . . . . . . [Pages 69 to 79]

CHAPTER IV

OPTICAL METHODS OF DETERMINING ELASTIC CONSTANTS

§ 53. Introduction. 54. Thermal effects due to strain. 55. Mechanical work spent in stretching. 56. Application to bending of bar. 57. Mechanical work spent in shearing. 58. Geometry of helicoid. 59. Application to torsion of blade . . . . . . . . . . [Pages 80 to 88]


Experiment 10. Determination of elastic constants of glass by focal line method.

§ 68. Introduction. 69. Focal lines due to reflexion at curved surface. 70. Optical method of measuring curvatures of reflecting surface. 71. Determination of Young's modulus and Poisson's ratio. 72. Determination of rigidity. 73. Practical example . . . . . . [Pages 101 to 113]


§ 74. Introduction. 75. Method. 76. Optical adjustments. 77. Experimental details. 78. Mechanical theory. 79. Theory and practice of optical measurements. 80. Practical example . . . . . . [Pages 113 to 127]

CHAPTER V

MATHEMATICAL DISCUSSIONS OF PROBLEMS IN SURFACE TENSION

CONTENTS

XI
curvature of surface and normal force per unit area due to surface tension. 89. Principal curvatures of surface of revolution. 90. Form of meniscus in capillary tube. [Pages 128 to 142]

THEORY OF CATENOID FILM

§ 91. Catenoid film. 92. Maximum length of catenoid. 93. Surface of catenoid. 94. Solution of equation \( \cosh n = n \). [Pages 143 to 148]

THEORY OF CYLINDRICAL FILM

§ 95. Unduloid film. 95A. Cylindrical film with constant internal pressure. 96. Theory of stability of cylindrical film. [Pages 148 to 153]

THEORY OF SESSILE DROP

§ 97. Sessile drops. 98. Introduction to theory. 99. Large finite drop. 100. Curvature at vertex. 101. Circle of contact. 102. Form of drop where \( z \) is comparable with \( c \). 103. Determination of surface tension. 104. Determination of angle of contact. [Pages 153 to 163]

CHAPTER VI

EXPERIMENTS ON SURFACE TENSION

§ 105. Soap solution. 105A. Cleaning of glass surfaces. [Pages 164 to 165]

Experiment 12. Measurement of surface tension of liquid by capillary tube.


§ 110. Method. 111. Practical example. [Pages 171 to 174]


§ 112. Introduction. 113. Method. 114. Practical example. [Pages 174 to 177]

Experiment 15. Measurement of surface tension of soap solution by thread method.

§ 115. Method. 116. Practical example. [Pages 177 to 180]


§ 117. Method. 118. The bubble holder. 119. Note on design of apparatus. 120. Practical example. [Pages 180 to 185]

Experiment 17. Measurement of surface tension of soap film by buoyancy method.

§ 121. Method. 122. Practical details. 123. Practical example. [Pages 185 to 188]
CONTENTS

Experiment 18. Study of catenoid film.
§ 124. Introduction. 125. Apparatus. 126. Method. 127. Practical example . . . . . . . . . . . . [Pages 188 to 190]

Experiment 19. Study of cylindrical film.

Experiment 20. Measurement of surface tension of mercury by Quincke’s sessile drop method.
§ 131. Introduction. 132. Method. 133. Optical discussion. 134. Practical example . . . . . . . . . . [Pages 196 to 202]

Experiment 21. Surface tension of interface between two liquids.

CHAPTER VII

EXPERIMENTS ON VISCOSITY

§ 144. Introduction. 145. Stresses in a viscous fluid due to shearing. 146. Heat produced by shearing. 147. Turbulent motion. 148. Distribution of velocity in a tube deduced from minimum heat production. 148a. Flow through tube of elliptic section. 149. Angular velocity of liquid between a fixed and a rotating cylinder found by minimum heat method . . . . . . . . . . . . [Pages 216 to 225]

Experiment 22. Determination of viscosity of a liquid.

Experiment 23. Determination of viscosity of air.

Experiment 24. Determination of viscosity of very viscous liquid by viscometer.
CONTENTS

CHAPTER VIII
MATHEMATICAL DISCUSSIONS OF PROBLEMS
IN CONDUCTION OF HEAT


CHAPTER IX
EXPERIMENTS IN HEAT


Experiment 25. Correction for the emergent column of a thermometer.
§ 180. Introduction.  181. Method.  182. Practical example  [Pages 269 to 273]

Experiment 26. Determination of thermal conductivity of copper.

Experiment 27. Determination of thermal conductivity of rubber.
§ 187. Introduction.  188. Theory of method.  189. Practical example  [Pages 280 to 284]

Experiment 28. Distribution of temperature along a bar heated at one end.

Experiment 29. Determination of mechanical equivalent of heat.

CHAPTER X
MATHEMATICAL DISCUSSIONS OF
PROBLEMS IN SOUND

§ 203. Introduction.  204. Calculation of velocity of plane waves of sound  [Pages 306 to 310]

Spherical Waves and Radiation of Energy

CONTENTS

CHAPTER X

§ 213. Correction of volume due to potential energy of air in neck of resonator.
§ 216. “Conductivity” of opening of resonator.
§ 220. Opening of any form. 221. Resonator with thin-plate opening.
§ 222. Correction for thickness of plate. 223. Decay by radiation of vibrations in a resonator.
§ 224. Application to Helmholtz resonator.
§ 225. Radiation from resonator with tubular neck.
§ 226. Effect of viscosity.
§ 227. Distribution of velocity in circular opening in thin plate.
§ 228. Dissipation of energy in resonator with tubular neck.
§ 229. Comparison of Helmholtz with tube-neck resonator.
§ 230. Selectivity of a resonator.

[Pages 319 to 344]

CHAPTER XI

§ 231. Resonance with a bottle.
§ 232. Practical example.

[Pages 345 to 349]

CHAPTER XII

§ 233. Introduction.
§ 234. Method.
§ 235. Practical example.

[Pages 350 to 351]

CHAPTER XIII

§ 236. Method.
§ 237. Practical example.

[Pages 352 to 355]

CHAPTER XIV

§ 238. Introduction.
§ 239. Estimation of F and H.
§ 240. Correction for open ends.
§ 241. Experimental details.
§ 242. Practical example.

[Pages 356 to 359]

Note I. Awbery’s method for combination of observations.

[Pages 360 to 362]

Note II. Exact equation for spherical waves.

[Pages 362 to 363]