VIBRATORY MOTION AND SOUND

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AND

SOUND

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PREFACE.

THE PRESENT TREATISE is intended to open up the subject of Vibratory Motion to students who have mastered the elements of dynamics.

The key to the whole subject is Simple Harmonic motion, to which accordingly a large amount of space has been devoted. Its definition and leading properties are discussed in Chapter I.

Chapter III. discusses the composition of two Simple Harmonic motions of the same period, and contains some novelties in the shape of simple geometric proofs of propositions usually established by trigonometry (see especially §§ 24–28). Chapter II. has cleared the way by some explanations regarding the general subject of composition of motions.

These first three chapters lead straight to the geometry of Simple Harmonic waves, which is accordingly discussed in Chapter IV. The proofs of some of the most important properties of waves are given in duplicate,

first by general reasoning, and then by differentiating the equation of a wave. This Chapter is based on Chapter I., and in like manner Chapter V., which treats of the composition of two systems of Simple Harmonic waves of equal wave-length, is based on Chapter III. Stationary undulation is shown (by proof in duplicate, as above) to be the resultant of two opposite systems of waves, and the production of beats by waves in the same direction is also explained.

Chapter VI. discusses the general subject of the composition of two Simple Harmonic motions, and gives the mathematics of Lissajous' curves, with accounts of some methods of tracing them.

Chapter VII. breaks the monotony of a continuous thread of mathematical deduction by describing some very interesting mechanical illustrations of Simple Harmonic motion, including Sir William Thomson's tide-predicter and Donkin's harmonograph. A novel method of combining two motions by a jointed parallelogram, which has been described in Chapter II., is here applied to the composition of two opposite circular motions.

Chapters VIII. and IX. discuss in a popular way the propagation and reflection of sonorous undulations.

Chapters X. and XI. contain accurate investigations (some of them novel) of the rapidity of stationary vibrations of strings and columns of air, the velocity of

propagation of sound along a column of air, and the energy of sonorous undulations.

The last two Chapters, XII. and XIII., may be regarded as a musical appendix, the former being devoted to simple and compound tones, and the latter to musical intervals.

Though the work is mainly addressed to students at a particular stage of advancement, it is hoped that the line of treatment adopted will render it attractive to the general mathematical reader.

J. D. EVERETT.

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