

**CAMS,
ELEMENTARY
AND ADVANCED**

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Cams, elementary and advanced by Franklin DeRonde Furman

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FRANKLIN DERONDE FURMAN

**CAMS,
ELEMENTARY
AND ADVANCED**

CAMS

ELEMENTARY AND ADVANCED

BY

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Franklin D. Furman

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PREFACE TO THE ENLARGED EDITION

THE first five sections of this book were published about three years ago under the title of "Elementary Cams." The chief features of this earlier book were that it pointed out a classification, an arrangement, and a general method of solution of the well-known cams in such manner as has been generally developed in other specialized branches in technical engineering work; and also it gave a series of cam factors for base curves in common use, which enabled designers to compute proper cam sizes for specific running conditions, offering numerous examples in the use of these factors in the several kinds of cam problems. The factors, with the exception of the one for the 30° pressure angle for the Crank Curve were new, so far as the author is aware. The "Elementary Cams" will continue to be sold as a separate volume.

A further development of the subject is given in the present work which is under the title of "Cams." The chief original features of this advanced work include the development or use, or both, of the logarithmic, cube, circular, tangential and involute base curves, the establishing of cam factors for such of these curves as have general factors, and the demonstration that the logarithmic base curve gives the smallest possible cam for given data.

The new material now introduced into the book includes, further, comparisons of the characteristic results obtained from *all* base curves, in which the relative size of each cam, and the relative velocity and acceleration produced by each, is shown graphically in one combined group of illustrations, thus enabling the designer to glance over the entire field of theoretical cam design and quickly select the type that is best adapted for the work in hand. From these diagrams one may observe, for example, which form of cam is best adapted for gravity, spring or positive return, which is best for slow or fast velocities at various points in the stroke, and which ones are apt to develop "hard spots" in running. The involute curve is found to have its chief and characteristic theoretical advantage when it is used with an offset follower. The nature of the contact between cylindrical, conical and hyperboloidal roller pins, when used in connection with grooved cylindrical cams, has been investigated and pointed out. The subject of pure rolling contact between various forms of oscillating cam arm surfaces, and of the nature and amount of sliding action

of such surfaces has been developed so that the effects of wear due to rubbing may be confidently considered when such types of cams are under design.

While the whole purpose of this work has been to present the subject matter in graphical form and in the simplest possible manner so as to make it available to the greatest number, much mathematical investigation has been necessary and in this I have been greatly aided by my colleague Professor L. A. Hazeltine, M. E., head of the department of Electrical Engineering at Stevens, to whom I express my deep appreciation. The details of these investigations are not necessary here and are not set down, but their results are. These results are given in various formulas that are used in the solution of a number of the problems. These final formulas avoid the use of calculus and are mostly in such form as to be readily used by designers generally.

In closing, the author desires to introduce a personal thought that has grown up, and which is inseparable, with this book. Some years ago, before any special study was given by the writer to the subject of cams, it appeared that the whole subject of mechanism was so thoroughly covered by various text books and technical papers that the time in engineering development had arrived when there was but little for an instructor to look forward to in the way of production of extended original work on any given topic. To say the least such a thought was not at all encouraging, and so it is a pleasure now to the author, and it is hoped that it will be an inspiration particularly to the younger readers, to record that the study of this subject of cams has brought forth a great wealth of new and practical material which had not previously been brought to light and set down in the literature of the subject. Now that this work is done, the vastness of the "unknown," even in this present era of great accomplishments, is realized as it never was before, and it only remains to suggest that not only this topic of cams but many other topics in the science of engineering may offer opportunities for much further development and perfection on the part of those who have the desire for such work and the time to pursue it.

F. DeR. FURMAN.

HOBOKEN, N. J., April, 1920.

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