

**PRACTICAL APPLICATION OF THE  
INDICATOR: WITH REFERENCE  
TO THE ADJUSTMENT OF VALVE  
GEAR ON ALL STYLES OF  
ENGINES**

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Practical Application of the Indicator: With Reference to the Adjustment of Valve Gear on All Styles of Engines by Lewis M. Ellison

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**LEWIS M. ELLISON**

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# PRACTICAL APPLICATION

OF THE

# INDICATOR

WITH REFERENCE TO THE ADJUSTMENT OF  
VALVE GEAR ON ALL STYLES OF ENGINES

Being a Practical Treatise for the Operating Engineer, Written in a Clear, Comprehensive and Concise Manner, Treating the Subject from an Entirely New Standpoint. The Valve Gear of the Corliss, Riding Cut-off and Single Valve Engine is Illustrated, with Complete Directions for Adjusting with the Indicator. Computations of the Diagrams Made under the Simplest and Most Complete Methods, in Plain Figures and Examples, Many of the Methods being the Author's Original.

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BY

LEWIS M. ELLISON

Consulting Engineer, and Editor The Stationary Engineer.

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CHICAGO

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LEWIS M. ELLISON,

1894.

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## DEDICATION.

This work is dedicated, with the highest regard, to my friend the working engineer, with the hope that it may in some manner benefit and assist him in his endeavors to rise to a higher standard of excellence in his calling.

THE AUTHOR.

January 1st, 1894.

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1894

## PREFACE.

While engaged in my work as consulting engineer, it has been my fortune to come in contact with a large number of working engineers; some more or less experienced in the use of the Indicator, others knowing practically nothing concerning it. It was gratifying, however, to note that whenever called upon to use my Indicators, I invariably found an interested spectator in the engineer, who, in most cases, expressed a desire to learn their use. In some cases, where desired I have given personal instructions, but in many cases the engineer could not afford such an expensive method of learning. To these, I recommended various works on the subject, but found the very general complaint that most of the works on the Indicator now published are not sufficiently definite for the beginner. These circumstances, together with the fact that I have personally felt the want of more practical information on the subject than is contained in existing books, have, to a great extent, induced me to prepare this volume; and it has been my aim to cover the ground as thoroughly as possible, and produce a work which will meet the requirements of the beginner as well as the experienced engineer. As so many of our engineers have not had the benefit of even a common school education, I have endeavored to use only such wording as would be readily understood by all, and avoid all intricate formulæ which tend to confuse



and mislead the reader. The importance of the Indicator is now so generally recognized that the time is rapidly approaching when no engineer will be considered competent unless he is proficient in the use of the Indicator; and if this effort on my part shall have made the subject plainer to some, or in any degree assisted those who desire to better their condition, I shall feel amply repaid for the time and labor expended in the preparation of this work.

LEWIS M. ELLISON.

CHICAGO, Jan. 1, 1894.

## INTRODUCTION.

The steam engine indicator is an attachment to the steam engine, which has been too long neglected. In fact, only a few years have elapsed since it was practically unknown to the average working engineer. However, questions were continually coming up which called for a frequent resort to its use, until now, in the hands of a skillful engineer, it is a very important factor in the running of the steam plant. The first indicator, I believe, was invented by James Watt and was a very crude affair, adapted for use only on engines of low pressure and running at slow speeds. It would be wholly unfit for use on the high pressure and high speed engines of the present day. Meantime, the changes in the styles of engines necessitated changes and improvements, and the makers of indicators have endeavored to keep pace with the times; and there is no doubt that the American indicators of to-day, for simplicity, accuracy and durability, far surpasses any like devices in the world; but we regret that the makers of reputable instruments have not already remedied all defects possible and that the day will soon pass when inferior instruments will be recognized by intelligent engineers. Whenever comparisons are made they are used simply as facts for the benefit of the readers and without any preference or prejudice on my part. The demonstrations are put in the simplest language so that all can fully

understand them without reference to the higher mathematics, and some of them have never before appeared in print and will no doubt prove interesting.