VELOCITY DIAGRAMS: THEIR CONSTRUCTION AND THEIR USES, INTENDED FOR ALL WHO ARE INTERESTED IN MECHANICAL MOVEMENTS

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THEIR CONSTRUCTION AND THEIR USES.

INTENDED FOR ALL WHO ARE INTERESTED IN MECHANICAL MOVEMENTS.

BY

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PREFACE.

THIS treatise is in effect an abstract of a series of lectures forming a part of the course of instruction at the Stevens Institute of Technology. It explains the principles of the more common and convenient graphic processes of determining at any given instant the direction and velocity of the motion of a point, whether that motion be constant or variable.

It is intended not only for use in the classroom, but for the benefit of those who may wish to study the subject without the aid of an instructor.

C. W. MACCORD.

HOBOKEN, N. J., Oct. 12, 1901.

VELOCITY DIAGRAMS.

1. It is a familiar fact that in the operation of any piece of mechanism, the parts go through a series of motions in regular order, finally returning to their original positions; after which the same series of motions is repeated, and so on indefinitely. One complete series is called a **cycle**; in completing which it frequently happens that, supposing the first or driving piece to move uniformly in one direction, the motions of other parts will vary either in velocity or direction, and often in both. And in studying the action of any mechanical movement, or in comparing the actions of different ones, it is often desirable to have a clear understanding of the law of variation, in regard to the motion of a given piece or a given point.

Now, assuming that for a given motion of the driver, the motion of the point considered can be determined at any instant, or in other words in any phase of the action—then it is beyond question that a graphic representation is the best if not indeed the only means of conveying to the mind a distinct and comprehensive idea of the law according to which the motion varies in velocity and direction.

Such a representation, or "**velocity diagram**," is shown in Fig. 1. It consists merely of a curve whose abscissas, set

off from left to right upon the line *MN*, represent times, and the ordinates 11′, 22′, etc., represent the velocities of the moving point at the instants indicated by the points 1, 2, etc.; the positive ordinates, or those above the line, indicate motion in one direction, that in the opposite direction being indicated by the negative ordinates, below the line. And a single glance at this figure is sufficient to establish the claim above made,—it gives in an instant all the information that could be gathered from lengthy explanations and tables of figures.

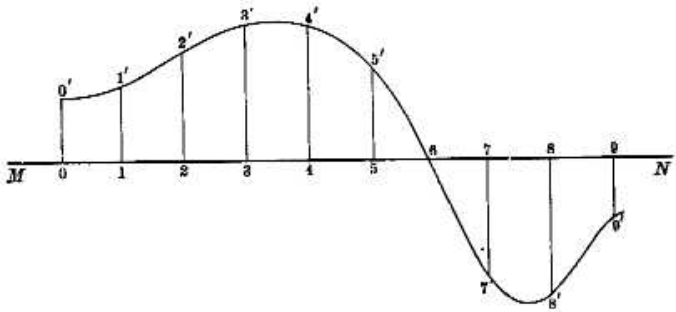

FIG. 1.

2. Now, given the velocity of the driver, how to determine the values of these ordinates? We have here to choose between two methods of procedure, the graphic and the analytic. There is no question that the members of a train of mechanism can be represented by symbols, the laws of their motions embodied in formulæ, and the desired values ascertained by algebraic computation. In the graphic method, the motion of a point at any instant is represented in magnitude and direction by a right line of definite length; and relations may be established between lines thus representing the motions of properly selected points, and other