

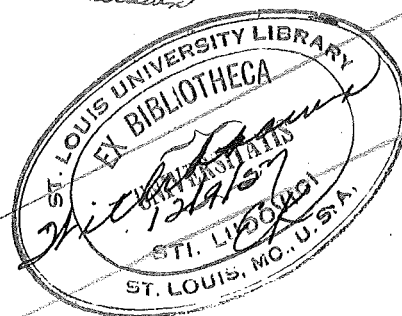
AN EXTENSION OF THE METHOD OF
NUMERICAL INTEGRATION OF SEISMOGRAMS
TO INCLUDE A THIRD INTEGRATION

by

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CHAPTER I

INTRODUCTION

This dissertation is devoted to the problem of integration of seismic records. Originally a research program was planned involving integration of seismic records with the following objectives:

- 1) To devise a valid method of integration of the records obtained with our apparatus whereby the true motion of the ground during the passage of a seismic wave can be found.
- 2) To study the nature of the ground motion in the immediate vicinity of the source of the seismic waves.
- 3) To discern the mechanism of generation of longitudinal and transverse waves and their method of separation into distinct phase groupings.

For this purpose a series of recordings were made of quarry blasts and heavy sledge blows on solid rock. These latter tests were made in order to get very close to the source of the motion.

The program outlined above was found to be

too inclusive for the present because of the difficulty of the problems posed by the integration process. The records obtained were galvanometrically recorded seismograms. The seismographs themselves are specially designed electromagnetic instruments whose outputs are fed into galvanometers of the type used in commercial seismic prospecting. Since the records were made by galvanometers that are not at all in resonance with the seismometers or with the ground motion the determination of the true ground motion involves a third integration of the seismic trace. In the original outline for the investigation it was assumed that the third integral would be a mere third summation by the procedure of Neumann ¹ for the double integration process. This assumption was soon found to be false and it became apparent that the double integration process would have to be extended to include a new process for the third

1) Neumann, Frank, "An Appraisal of Numerical Integration Methods as Applied to Strong-Motion Data," Bull. Seis. Soc. Am., 33:21-61, 1943.

integration before the work could proceed.

The subject of this dissertation is therefore the theoretical and practical consideration of the process of triple integration as applied to a seismograph trace record.