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 Eine Analyse des Intonationsvorganges bei Orgeln

Vore

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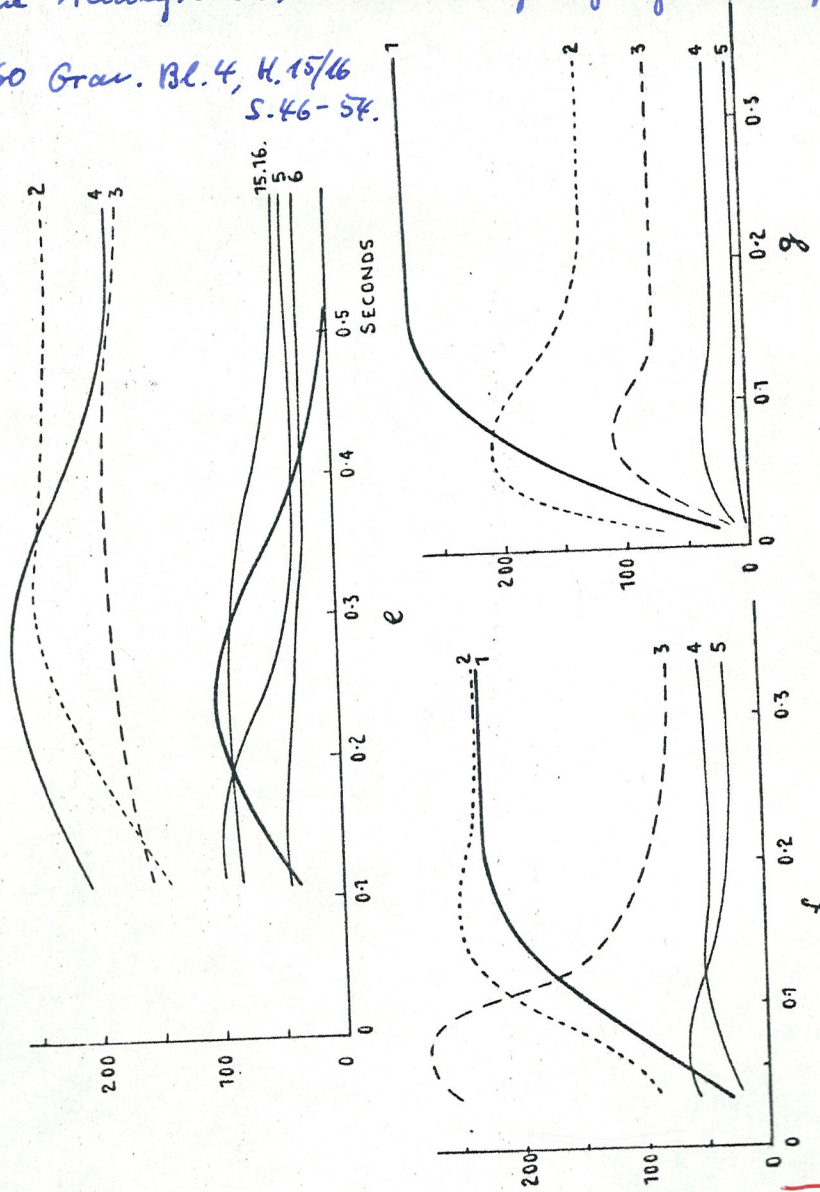


Fig. 4 Fortsetzung e, f, g — Offene Prinzipal-Pfeife  
 Fig. 4 Cont. e, f, g. — "open diapason".

## A Spectral Analysis of the Voicing Process

by

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### Summary

Tape records have been made of the sounds of two organ pipes, one wood and one metal, of diapason type during the process of voicing. A Fourier analysis of the records, made on an electronic computer, shows the effect on the harmonic components of the various adjustments made by the voicer. The analysis is given for both the transient and steady states.

### Introduction

The process by which the flue organ pipe speaks its note is well known. It is believed that the air issuing from a slit in the mouthpiece and striking the upper lip (cf. Fig. 2) produces an edge-tone whose pitch in the absence of the pipe, would rise continually in proportion to the wind velocity, i. e. to the square root of the pressure in the wind chest. The natural frequencies of the column of air, however, are confined to the fundamental and its harmonics which it sounds in turn at rising pressure as the edge tone comes nearly into resonance. These possible modes of vibration are shown in relation to the edge tone on Fig. 1 for an open diapason type of 280 c/s. fundamental.

The pipe actually pulls the edge tone out of its natural pitch into that of the Column. Only when the two partners of the coupled system are badly out of synchronism does the pipe rise or fall a little in pitch and then become silent.

The figure shows another type of edge tone, produced at low pressures, which can come into synchronism with the tones of the column at low pressures. These 'underblown tones' are apparent as 'transients' when the wind is first let into the pipe.

The edge tones can be heard in a suitable apparatus without any pipe, either in air (Richardson) or under water (Gross). After the pipe and its mouthpiece have been roughly fashioned, a skilled craftsman makes adjustments of the mouthpiece, the subject of which is generally to strengthen the fundamental and some of the lower harmonics and remove the higher ones which are responsible for the roughness and sibilance of the original tone. Previous experiments on the voicing of flue pipes have been made by Kuhn and Mercer.

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