

**A TREATISE ON ACOUSTICS IN  
CONNECTION WITH VENTILATION:  
AND AN ACCOUNT OF THE  
MODERN AND ANCIENT METHODS  
OF HEATING AND VENTILATION**

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A Treatise on Acoustics in Connection with Ventilation: And an Account of the Modern and Ancient Methods of Heating and Ventilation by Alexander Saelzler

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**ALEXANDER SAELTZER**

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# TREATISE ON ACOUSTICS

IN CONNECTION WITH

VENTILATION;

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## AN ACCOUNT

OF THE

Modern and Ancient Methods of Heating and Ventilation.

By **ALEXANDER SAELTZER,**  
ARCHITECT.

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## PREFACE.

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It appears to me necessary to make a few remarks in advance, as I am anxious the book which I herewith lay before the public, should at least receive a friendly acknowledgment of the many days' and even months' time of my strictest observation. The title of this book embraces much that is of great importance, especially on the subject of acoustics, as the problem introduced in it which I have endeavored to explain and to vindicate, will prove.

It is the first attempt, in its peculiar nature, ever presented to the public ; at least I believe that all the former experience upon the subject of acoustics, referring to public buildings, may be placed in a secondary light, without fear of being considered arrogant. There must be a good cause why this proposed theory has not been advanced by any other higher professional pen previously. And surely the cause is clear, as science in this particular branch is too young, and it is only in this nineteenth century that the nature of sound has been partially discovered. A large field is still

open ; many obstructions will have to be cleared away, and many individuals will have to assist, with manifold labor, to concentrate, and confine progressively, the harmonious dictates of nature. I have been often placed in a very unpleasant position, in the construction of public buildings, where acoustics have formed a most important part, and in which the want of knowledge on sound has caused a feeling of actual discouragement to proceed, and I have no doubt many architects have found themselves in the same predicament. This new theory will obviate this uncertainty, as well as confine and regulate sound in its proper course and action, and in being found correct will justify me for the expression of my inmost conviction.

A. SAELTZER,

*Architect.*

NEW YORK,  
49 Wall street.



## ACOUSTICS.

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ANY practical fact relating to science can never be traced, except through the thorough knowledge of nature, and our progress in this sphere will always be either checked or advanced accordingly.

This new and important discovery will undoubtedly prove these assertions, and will produce a plain and striking example, which, I hope, will assist all future arrangements and do away with all the existing evils in public halls or buildings, at least as much so as possible, and the changes will be precisely in proportion to the application of the new remedy to the existing mismanagement of form, proportion, and construction heterogene to nature.

Sound receives its vitality or its life through the air, and, without air sound loses it and becomes extinct.

Before I proceed to explain the new discovery, I will first introduce a number of facts showing the relative attributes of sound in connection with air, from the best authorities, not alone as being interesting, but as a necessity, for the remedy which I propose for buildings of all classes where sound has proved a failure.

“The intensity of sound depends on the density of the air in which sound is generated, and not on that of the air in which it is heard. A feeble sound

“ becomes instantly louder as soon as the air becomes  
“ more dense. So you will always find on great eleva-  
“ tions in the atmosphere the sound sensibly diminished  
“ in loudness. If two cannon are equally charged and  
“ one fired at the top of a high mountain and the other  
“ in a valley, the one fired below in the heavy air may  
“ be heard above, while the one fired in the higher air  
“ will not be heard below; owing to its origin, the  
“ sound generated in the denser air is louder than that  
“ generated in the rarer. Peals of thunder are unable  
“ to penetrate the air to a distance commensurate with  
“ their intensity, on account of the non-homogeneous  
“ character of the atmosphere which accompanies  
“ them; from the same cause battles have raged and  
“ have been lost within a short distance of the reserves  
“ of the defeated army while they were waiting for the  
“ sound of artillery to call them to the scene of action.”

Science teaches us, that whenever a shock or pressure of any sort is suddenly applied to any material of any nature, whether metal, wood, gas, water, air, etc., it is immediately affected in all its parts, from the point of contact to the whole extent of the material, in displacing and replacing the particles of a determinate volume; and the velocity of the movement of the particles of the mass created by the concussion of shocks or pressure depends solely upon the nature of any material, upon its elasticity and density; sound likewise causes motions with every particle of the air, and as far as the motion reaches, so that each particle with regard to that which lies immediately beyond it, is in

a progress of rarification during return. "All parts which go forward do in their progressive motion strike each obstacle they meet in their way; they are for that reason called pulses, and the sensations which are excited in the mind by the strokes of these pulses on the drum of the ear are called sounds, considered in their physical causes are nothing else than the pulses of the air." "In order therefore to explain the nature of sound I will add the chief properties of these pulses. The first is, that they are propagated from the trembling body all around in a spherical manner. For the pulses go and return according to certain directions from the parts of the body by whose vibrations they are generated; yet for as much as every impression which is made on a fluid is propagated every way throughout the fluid, whatever be the direction wherein it is made in like manner the pulses must spread and dilate so as to form themselves into concentric spherical surfaces, or rather shells, whose common centre is the place of the sounding body. And hence appears the reason why one and the same sound may be heard by several persons, though differently situated with respect to the sounding body."

"A second property of the pulses is that they grow less and less dense as they recede from the sounding body, and in the same proportion with the squares of their distances from the body. For whatever be the force wherewith the sounding body acts on the first spherical shell of air, with the very same force does that shell act upon the second, and that again upon