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The Effect of the Material Composing the Sides of Deep Slits on the Intrinsic Intensity of Light Transmitted through the Slits

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THE EFFECT OF THE MATERIAL COMPOSING THE
SIDES OF DEEP SLITS ON THE INTRINSIC IN-
TENSITY OF LIGHT TRANSMITTED THROUGH
THE SLITS

CLARENCE R. SMITH

It is shown that differences in intensity of the light transmitted by a narrow, deep slit are produced by changing the material of the sides though other conditions are kept constant. With a pair of optically plane surfaces of each of the metals, steel, nickel, gold, silver and copper, a slit was prepared which could be varied in width while the depth remained constant. For each of these metals a curve was prepared showing the variation of transmitted light intensity with change in width of slit. Comparison of the curves for the various metals shows a fairly close agreement for small and for large openings of the slit while considerable differences occur in an intermediate region.

MEASUREMENT OF THE ACOUSTIC IMPEDANCE OF
A BRANCH LINE

G. W. STEWART

Acoustic measurement is in its infancy and that of acoustic impedance is peculiarly difficult. A theory of a new method of the measurement of acoustic impedance is presented herewith. How useful it may become must be determined through experience.

Assume an acoustic transmission line with a branch, the latter being of any shape whatever and both line and branch containing a fluid medium. Let the following nomenclature be used:

- ρ is the density of the fluid,
- a is the velocity of sound,
- s is the area of the transmission conduit,
- Z is the acoustic point impedance of the branch.

Two definitions of Z will be used. In the first instance assume Z to be the complex ratio between the pressure at the junction of the branch and the rate of volume displacement of the fluid into it. Let it be represented by $Z_1 + iZ_2$ where Z_1 and Z_2 are real. Then if the apparatus is arranged so that the branch has no influences on the source of sound, the ratio of the transmitted to incident energy can be shown to be

$$(1) \quad \frac{\left[Z_1 \left(Z_1 + \frac{\rho a}{2s} \right) + Z_2^2 \right]^2 + \left(\frac{\rho a}{2s} Z_2 \right)^2}{\left[\left(Z_1 + \frac{\rho a}{2s} \right)^2 + Z_2^2 \right]^2}$$