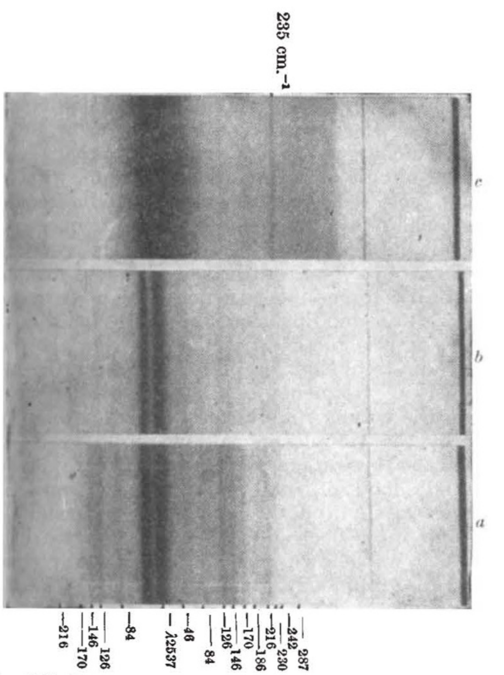

(*a*) and (*b*) Raman spectra of potassium bromide taken with the Hilger medium and large quartz spectrographs respectively and enlarged to the same extent. (*c*) Raman spectrum of rocksalt taken with the Hilger large quartz spectrograph

spectrum of the latter is reproduced in Fig. *c* for comparison.

A crystal with rocksalt structure has nine eigenfrequencies. These may be evaluated[2] to a first approximation with the aid of two assumed force-constants only. The theoretically computed frequencies for potassium bromide and those evaluated from our spectra are shown for comparison in the accompanying table. It will be seen that the agreement is good.

Force constants: $P = 2{\cdot}22 \times 10^4$ dynes/cm.; $T = -0{\cdot}034 \times 10^4$ dynes/cm.

	ν_1	ν_2	ν_3	ν_4	ν_5	ν_6	ν_7	ν_8	ν_9
Calculated frequencies	121	117	112	104	95	73	67	40	28 cm.$^{-1}$
Observed frequencies	121	116	114	108	93	73	63	42	23

ν_3 in the table is the frequency of the oscillation of the bromine and potassium ions against each other, and it is in good agreement with the infra-red absorption maximum at 113 cm.$^{-1}$ recorded by Barnes[3]. As is to be expected in view of the high refractivity of the bromine ions, the two most intense lines in the Raman spectrum are the octaves of ν_6 and ν_7, that is, of the oscillations (alternately in opposite phases) of the bromine layers in the octahedral planes of the crystal in directions respectively normal and tangential to these planes, the intervening potassium layers remaining at rest.

We are indebted to Dr. A. C. Menzies for enabling us to secure some satisfactory specimens of synthetic potassium bromide for our experiments.

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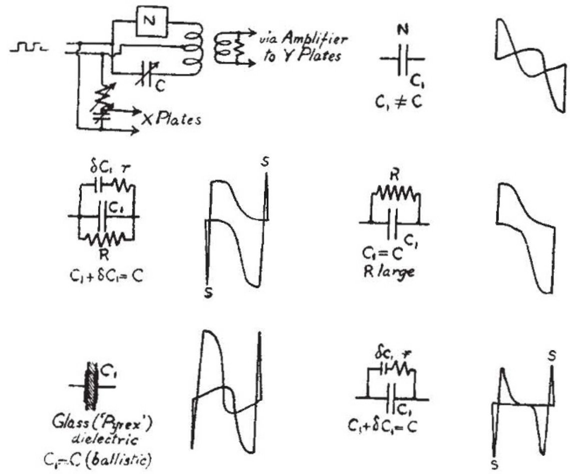
Differential Transformer Bridge Operated by Square Waves

The use of inductively coupled ratio arms in a bridge energized by square waves has been studied in these Laboratories, with particular reference to the analysis of condenser-resistance combinations. It has been found, in general agreement with Yates's statement[1], that the output forms shown by a cathode ray oscillograph, as balance is approached, afford a means of discriminating between parallel and series combinations of capacitance and resistance.



Basic bridge circuit, including *N*, the network under consideration. Typical oscillograms for different networks are shown

The diagrams show the form of the output obtained when certain networks are compared with a variable condenser C. A supply circuit is employed which gives abrupt reversals of potential at a repetition-rate controlled by an audio-frequency oscillator. It will be seen that the association of a series resistance, r, with part of the capacitance, δC_1, gives rise to sharp spikes, s, on the oscillogram; also that similar spikes are present when a glass dielectric condenser is substituted for the four-component network. These spikes are removed when the comparison condenser is reduced by an amount δC_1.

When a potential V is suddenly applied, for the condition $C_1 + \delta C_1 = C$, the current in the two branches divides symmetrically and very rapidly supplies both condensers with charge VC_1. The flow of the remaining charge, $V\delta C_1$, is restricted in one branch by the resistance r, and momentarily an out-of-balance condition exists in which, in effect, the potential across r during the process of charging δC_1 appears at the output, producing the observed spike. Other instances are simpler: with unbalanced pure capacitances, the final flow is restricted by the self-inductance of one branch of the transformer; with a large parallel resistance (L/R small) a small, steady additional current flows in one branch and so opens out the cyclogram.

It has been found possible to ascertain separately the four components of an artificial network of the type shown, and of these components δC_1 is most easily determined. It is hoped that this will be of value in the study of dielectric materials.

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