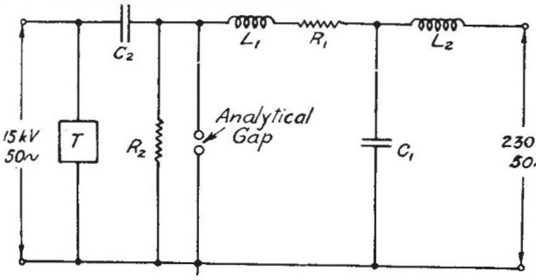
rupter has, since that time, engaged the attention of a number of workers, and the consensus of opinion is that the interrupter gap should be irradiated from a source of ultra-violet light. This method has been recommended by Simpson[2], Fowler and Wolfe[3] and others. The use of 'Trigatrons' and an electronic synchronizing circuit (patent applied for) obviates the necessity of providing an external source of ultra-violet radiation and also eliminates the difficulties caused by the hunting of synchronous motors. The characteristics of the discharge in the 'Trigatron' gap itself are extremely stable.

The first type of circuit, the high-voltage spark source, consists of a conventional condensed spark circuit using a 4 kVA. transformer operating at 10 kV. R.M.S. charging a condenser of capacitance 0·01–0·04 μF. The discharge through the analytical gap is controlled by the trigger circuit mentioned above.



The circuit of the controlled A.C. arc is shown in the diagram. The discharge is triggered by means of a high-voltage impulse generated by the trigger circuit T in conjunction with C_2 and R_2. The energy for the main discharge is provided by the condenser C_1, and the discharge characteristics are governed by L_1 and R_1. The condenser C_1 is charged from the 230 V. supply and the circuit L_2C_1 is tuned to a frequency of 50 or 100 c./s., thus allowing the voltage on C_1 considerably to exceed that of the supply.

Our investigations have led us to devote our attention to the development of the controlled arc circuit, which appears to allow the attainment of higher accuracies than have been possible with the high-voltage source. A detailed account of the circuit will be published at a later date.

We wish to express our gratitude to Dr. J. D. Craggs and Dr. J. M. Meek for their valuable assistance in the early stages of this work.

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Raman Effect in Rock-Salt

Born and Bradburn[1] have deduced the nature of the Raman spectrum of rock-salt to be expected on the basis of the Born lattice dynamics. They claim to have explained satisfactorily the observed features of the rock-salt spectrum reported by Fermi and Rasetti[2]. I believe that their theoretical results cannot be reconciled with the observed facts[3].

The main contention of Born and Bradburn is that in the observed spectrum the so-called Raman lines are only "small peaks on a strong background", a feature which is characteristic of the spectrum deduced from the Born dynamics. This description, which is mainly based on the microphotometer record reproduced by Fermi and Rasetti, is not justified. It is a familiar experience in microphotometry that even in the case of ordinary atomic spectra consisting of closely spaced sharp lines, microphotometric records of heavily exposed spectrograms exhibit the lines only as small kinks on a strong background. In order to gauge correctly the nature of the spectrum in such cases, it is necessary to take weakly or moderately exposed spectrograms and examine them by microphotometer. The photograph taken by Fermi and Rasetti and reproduced by Born and Bradburn itself bears testimony to the above statement. The intense Raman line with a frequency shift of 235 cm.$^{-1}$ appears only as a small peak on the Stokes side, whereas it is more prominently visible on the anti-Stokes side of the microphotometer record. It is also seen clearly as a line on the anti-Stokes side of the spectrogram and is so sharp that it may easily be mistaken for a mercury line.

The recorded Raman spectrum exhibits two prominent lines with frequency shifts 235 and 184 cm.$^{-1}$ which are recorded also in infra-red absorption roughly at the corresponding positions. These lines are a characteristic feature of the rock-salt spectrum. They are, however, completely absent from the spectrum deduced on the Born lattice dynamics.

Fermi and Rasetti remark in their paper that the Raman spectrum of rock-salt terminates abruptly at 360 cm.$^{-1}$. The observations made at Bangalore also definitely confirm this result, and show that the microphotometer record beyond this point arises from a continuum associated with the mercury lines at 2561·2 and 2563·9 A. The extension of the spectrum up to 500 cm.$^{-1}$ indicated by the Born lattice dynamics thus does not find experimental support.

The Born theoretical spectrum exhibits a couple of strong peaks in the region of low-frequency shifts. Investigations carried out at this Institute definitely show that there are no corresponding bands in the Raman spectrum. The band in this region appearing in the photograph taken by Fermi and Rasetti would appear to be a spurious one of instrumental origin.

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Asymmetrical Broadening with Multiple-Beam Interference Fringes

FOR the application of multiple-beam Fizeau's fringes[1] of equal thickness to the study of surface topography, it is necessary to know whether a displacement in the fringe pattern represents an increase or decrease in the interferometer gap. Previously this has been determined either by displacement of the reflecting surface[1], or if this is impossible, by examination with Tolansky's fringes of equal chromatic order[2].

This note describes a third method inherent in the Fizeau fringes and depending on their behaviour when the incident parallel beam is displaced from the normal by moving the pin-hole of the collimator off the axis. First, as may be seen from the basic formula $n\lambda = 2\mu t \cos \theta$, all fringes are displaced in the direction of t increasing, the displacement being proportional to the order of interference. Secondly, the fringes become broader, the peak intensity decreasing.

Thus if the source diameter is increased, each point forms its own set of fringes, and broadening towards the side of greater gap results. For high orders the first factor restricts θ to very small values, the second factor thus becoming negligible. The fringes then have a square-topped distribution characteristic of gaps of the order of a millimetre, even with very small pin-holes. For low orders, broadening is only observed with large sources, and because of the second factor the intensity of the wing decreases away from the normal position. In all cases the edge of the fringe towards the smaller t remains sharp and is located in the same place as for the fringes obtained with strict point-source collimation conditions. It may be noted that the broadening due to a slit source is independent of its radial inclination.

The photographs show multiple-beam monochromatic Fizeau fringes obtained with a point source (Fig. 1) and an extended source (Fig. 2), the fringes being formed in a thin air gap between silvered mica and a silvered optical flat[3]. With a point source, parallel beam and normal incidence, the fringes are very sharp. Removal of the pin-hole produces the asymmetrical fringes which can be used to interpret the contour directions absolutely in terms of 'hills' and 'valleys', for the wing of a fringe is always on the side of the greater air gap. The crystal surface illustrated represents a 'col' with 'hills' to the north-east and south-west and 'valleys' to the north and south-east.

In some cases measurements can be made on the sharp edges of the broadened fringes with nearly the same precision as on the collimated sharp fringes. The gain in intensity is so great (up to a 100 times) that the loss of accuracy may possibly be tolerated, particularly if high magnifications are needed. Variations of intensity within the wing of the broadened fringe can also clearly delineate details of surface relief.

Broadening similar to the above has also been observed on Tolansky's fringes of equal chromatic order, the wing in this case always appearing on the blue side of the fringe. Since with this type of interference there is never any doubt about which are hills and valleys, the application of such an asymmetrical broadening has not the same value as in the case of Fizeau fringes. The phenomenon in both fringe types, however, must always be present to some extent with pin-holes of practical size, diffracted and scattered light adding to the effect. For these reasons multiple-beam fringes of the Fizeau or Tolansky type often exhibit a slight wing on one side instead of being perfectly sharp, if critical illumination conditions are not obeyed.

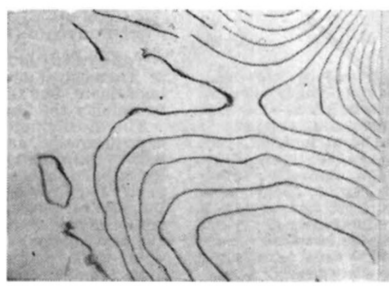

FIG. 1.

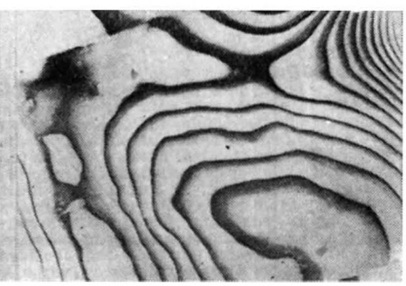

FIG. 2.

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