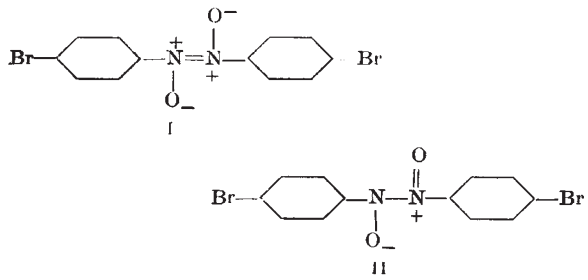

I

II

structure I would appear most nearly to represent the bond distribution, probably with some contribution from structures of the type of II (compare Hammick, Plant and others[1]).

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Lattice Parameters of Martensite and of Austenite

THE lattice parameters of martensite and austenite in steels (carbon content varying from 0·57 to 1·74 per cent) have been extensively studied; but considerable discrepancies exist in the values obtained by different investigators. The quenching temperatures used, however, differed, and quite often are not quoted. Some authors attribute the discrepancies in the lattice constants to the surface decarburization of the specimen[1]. It is significant that the diameters of the X-ray cameras used by the majority of previous experimenters were less than 9 cm.

In the present investigations, the lattice parameters were established for steels containing 1·25, 1·20, 0·90, 0·89, 0·75 and 0·45 per cent of carbon. A detailed account concerning the chemical analysis, the heat treatment, preparation of the specimens and the X-ray technique has been given in previous communications[2]. X-ray diffraction photographs were taken both with 9-cm. and 19-cm. Debye–Scherrer cameras, using cobalt radiation and an iron filter. The homogeneity of the specimens was examined in some cases by using different radiation. The results of the measurements of the lattice parameters are summarized in the accompanying table.

The figures obtained for the lattice spacing of austenite satisfy the Dannatt–Wrażej's straight-line equation[3], and the existence of retained austenite in quenched steel with 0·45 per cent carbon entirely confirms the recent findings of other investigators[4]. Further work concerning the influence of very low temperatures on the physical properties of the specimens is in progress.

Carbon (per cent)	Martensite			Austenite
	c Parameter (A.)	*a* Parameter (A.)	*c*/*a*	*a* parameter (A.)
1·25	3·008	2·842	1·058	3·6043
1·20	3·005	2·843	1·057	3·6020
0·90	2·963	2·847	1·041	3·5884
0·89	2·962	2·849	1·040	3·5879
0·75	2·939	2·850	1·031	3·5816
0·45	—	—	—	3·5680

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Absorption of Ultrasonics in Liquids from Thermal Considerations

THE thermal effect of high-frequency sound waves passing through a liquid has been studied by a number of authors, particularly by Richards[1] and Mastagli[2]. Their interest was, however, limited to the determination of rise of temperature in the liquid, and to relating that rise with chemical constitution. Further, their investigations were conducted only at the exact resonant frequency of the crystal. In our experiments, we have studied the heating effect produced in the liquid as the frequency of the driving voltage is continuously varied around the fundamental. We have thus another method of studying the resonance condition of the vibrating crystal through the production of heat.

The experiments were conducted with a quartz plate having the fundamental at 420 kc./sec. placed in the liquid contained in a double-walled calorimeter. The usual corrections for the pronounced dielectric heating of the liquid and for radiation loss were made. Seven organic liquids were studied and graphs were drawn for each liquid relating the thermal output with frequency around resonance. The results of our investigations at the fundamental frequency are given in the accompanying table, the heat output shown being that at peak resonance.

Liquid	Heat output in calories	$a/f^2 \times 10^{17}$ (calc.)*	Heat output taking that in carbon tetrachloride as unity	a/f^2 taking that of carbon tetrachloride as unity
Carbon tetrachloride	148·4	20·4	1·00	1·00
Nitrobenzene	109·2	13·4	0·80	0·74
Ethyl acetate	73·6	8·3	0·49	0·41
Toluene	68·0	8·0	0·46	0·39
Benzene	63·0	8·0	0·42	0·39
Xylene	46·0	7·1	0·31	0·34
Carbon disulphide	38·7	5·0	0·27	0·26

* By the Stokes–Kirchhoff formula.