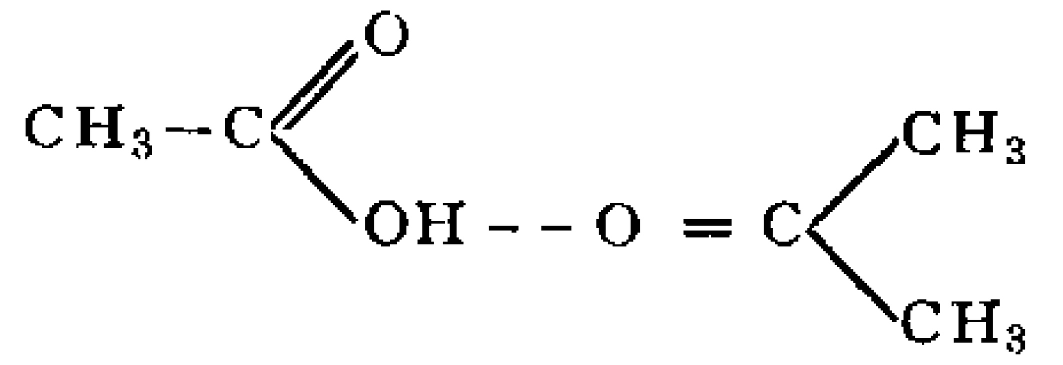
monomeric form but the O in its C = O has strong donor properties. In the mixture of the two liquids, the shifting of the acetic acid C = O line to higher frequencies and its C – C to shorter frequencies indicates the breaking up of the associated molecules, while the shifting of the acetone C = O line to lower frequencies and its C – C line to higher frequencies indicates an association of the acetone molecule with that of the acid forming probably a complex of the form



The line 1760 may probably be due to the unco-ordinated C = O set up in the complex so formed. The percentage of such complexes is largest in a 50 : 50 mixture and hence the increased intensity of this line at that proportion as compared to other concentrations.

On a comparison of these results with those in aqueous solutions of acetic acid, it is clear that both water and acetone have strong dissociating power on the acid molecules. But whereas, in water, its influence seems to be mainly to break up the molecules without an appreciable tendency to associate with the molecules so broken up, in acetone, there is a definite evidence for the association of the monomeric acid molecules liberated and the acetone molecules. The explanation of the differential behaviour of the two liquids lies probably in the fact that though both of them are polar, and have donor atoms, water is highly associated while the latter is not. In mixtures of associated liquids the influence seems to be a mutual dissociation of both.

The author's thanks are due to Dr. I. Ramakrishna Rāo for his helpful guidance.

P. Koteswaram.

Andhra University,
Waltair,
February 1, 1939.

[1] *Z. fur. Physik.*, 1938, **110**, 118.
[2] Unpublished work of the author.

Distribution of Temperature and Humidity in the Upper Air over Karachi

The kite flights made by J. H. Field in August and September 1905, were the first attempts to determine the temperature and humidity conditions in the upper air over Karachi. Although the flights were made on only 14 days and the highest flight reached 1,380 metres, valuable information was obtained[1] regarding the conditions in August and September, the chief feature discovered being, the existence of a well-marked inversion separating a lower layer of moist sea air from comparatively very dry air above.

Since June 1927, the R.A.F. at Karachi (Drigh Road) have taken observations of dry and wet bulb temperature and pressure at definite altimeter heights on aeroplane flights and provided meteorological information of great value. The data obtained after January 1929, have been published in the 'Upper Air Data' volumes of the India Meteorological Department. The published data of the seven years, 1929–35, have been recently analysed and discussed in *Indian Meteorological Department Scientific Notes*,[2] in which diagrams showing the average distribution of temperature and humidity during the year up to 3 Kms. (or about 10,000 feet) have been given. These diagrams were prepared from the mean values of data tabulated for every ½ Km. height and do not show quite clearly certain peculiarities of the temperature and humidity distribution below 6,000 feet. With a view to bring out more clearly these peculiarities and also to extend the diagrams to 5 Kms. (or about 16,000 feet) up to which height, the aeroplane meteorological flights extended after January 1936, new diagrams have been drawn (Figs. 1 and 2) based on the data for 1936 and 1937, utilising temperature and humidity values tabulated for every 0·25 Km. height.

The temperature diagram (Fig. 1) shows isotherms drawn at intervals of 4° F. and the humidity diagram (Fig. 2) shows lines of equal relative humidity drawn at intervals of 10 per cent. relative humidity. The average heights of base of inversion (dash and dot line) and of top of inversion (dash and two dots line) during April to September are also shown in the temperature diagram. An examination of

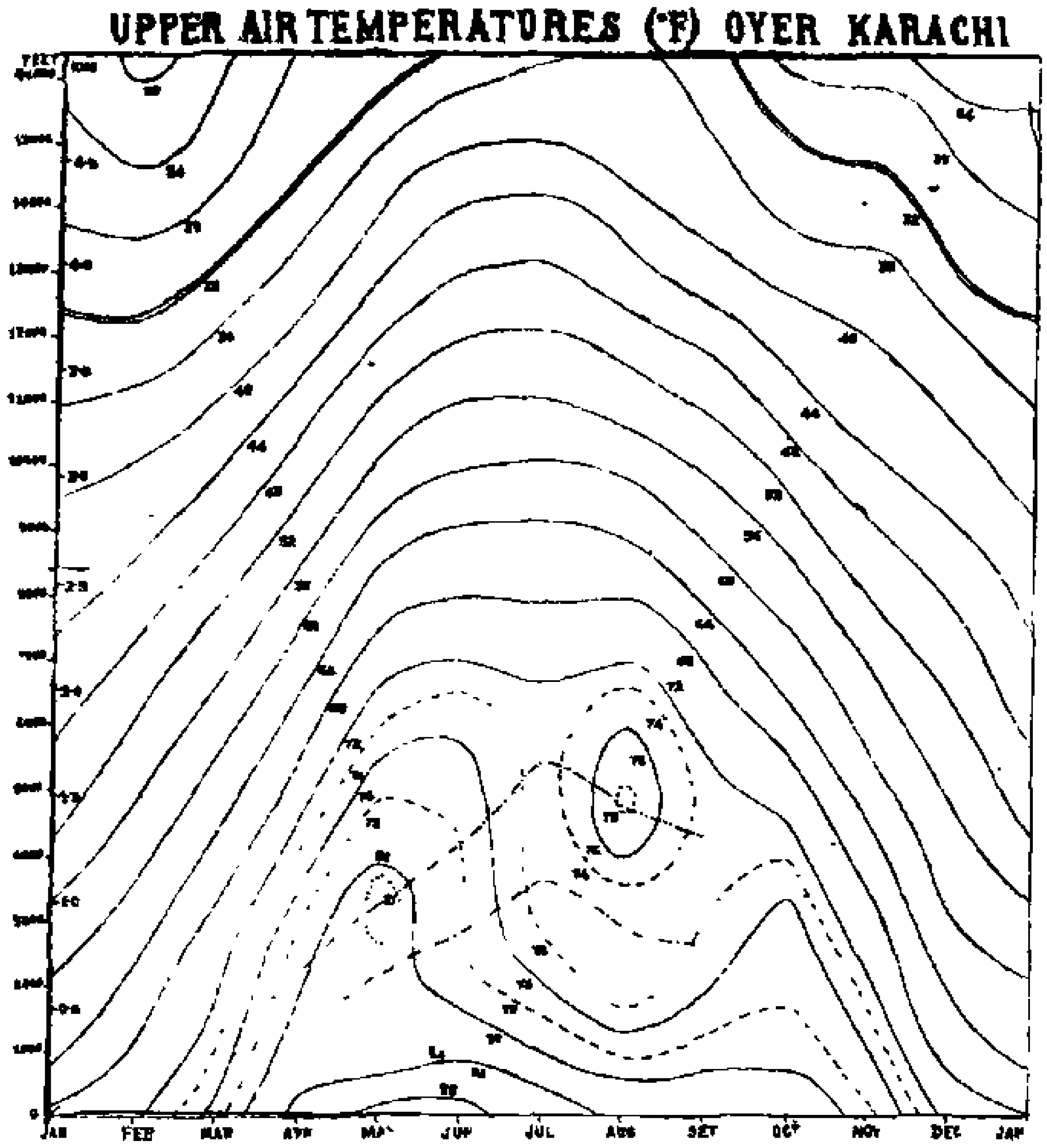


FIG. 1

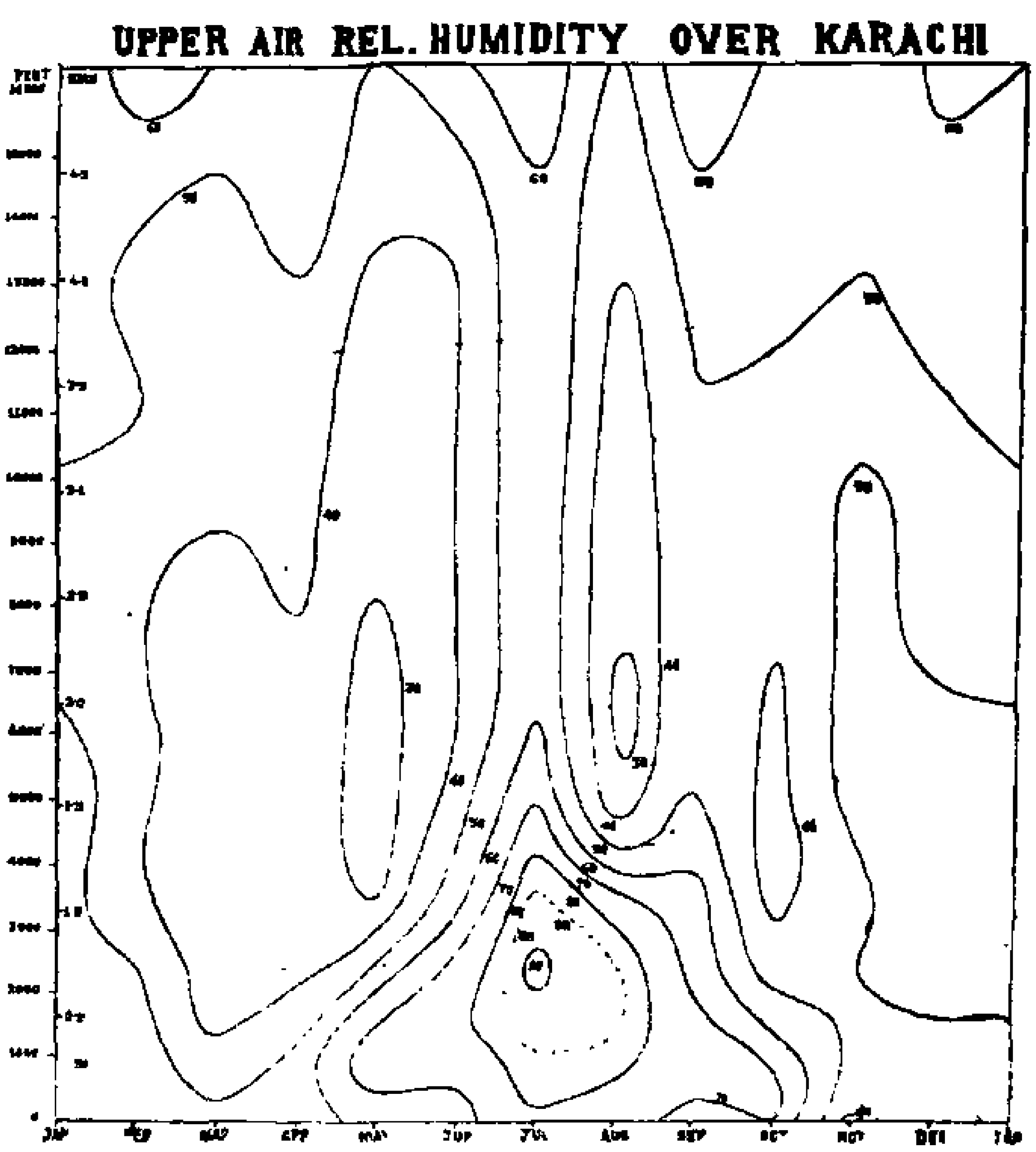


FIG. 2

the diagrams reveals some important features which are mentioned below.

(i) The 32° F. isotherm (double line) shows that the freezing temperature occurs at a height of 12,000 to 13,000 feet in the winter months—December to March—and at higher levels in the rest of the year. It occurs at heights of over 16,000 feet in June to September. The above information is of interest in connection with the question of ice-formation on aeroplanes. Ice-formation is known to occur in regions where the temperature is below the freezing point of water and the air saturated with water in the liquid state as in clouds or rain. At the heights at which freezing temperature (or lower temperature) occurs over Karachi the air is generally only about half saturated, so that in general, ice-formation does not appear to be a serious problem for consideration for flights over Karachi; at any rate not for ordinary flights which are confined to a height of 10,000 feet. Ice-formation on the wind screen was experienced at 13 to 14 thousand feet by planes flying over Karachi in thick alto-stratus cloud on 17th December 1937. The temperature at that height was 22 to 25° F.

(ii) The temperature distribution as shown by the general run and spacing of the isotherms indicates that between 1,000 and 3,000 feet in April and May, and between 2,000 and 5,000 feet in June to September, inversions, isothermal regions and regions of low lapse rate of temperature are common, specially during June to September. The results of individual aeroplane flights also show that inversions occur during May to September, being most frequent and well marked in July and August. The closed isotherms of 74°, 76° and 78° F. indicate that inversions are very common in August. A preliminary study of the inversions over Karachi has been reported.[3] A more detailed study is being made by the authors separately.

(iii) Considering the year as a whole, there is a subsidiary maximum of temperature in October up to a height of about 3,000 feet, the main maximum being in May–June. This is due to the complete disappearance of the low clouds which are nearly always present in the day time during June–September.

(iv) The relative humidity distribution is more or less symmetrical about July which is the most humid month. The highest relative humidity in the year occurs at a height of about 2,500 feet in July–August. This is approximately the height at which, during this period, a sheet of stratus cloud exists almost daily in the morning and evening hours near the base of an inversion marking the top of a moist layer of sea air. Above the stratus sheet or the base of inversion, there is a rapid decrease of relative humidity with height in the inversion region till the dry continental air above is reached. The closeness of the humidity isopleths between 2,000 and 5,000 feet in May to September indicates this rapid fall of relative humidity.

The lowest relative humidity in the year occurs between 4,000 and 8,000 feet in May and between 6,000 and 7,000 feet in August. In these regions, which are above the inversion, dry continental air prevails.

A detailed study of the structure of the atmosphere over Karachi taking the upper wind circulation also into consideration is in progress.

P. R. Krishna Rao.
K. L. Bhatia.
R. A. F. Meteorological Office,
Karachi Air Port,
January 28, 1939.

[1] *Mem. Ind. Met. Dep.*, **20**, Part I.
[2] *Ind. Met. Dept., Sci. Notes*, **7**, No. 78.
[3] *Ibid.*, 50.

Constitution of Iodic Acid

That iodic acid behaves differently from its analogues chloric and bromic acids has been known for a long time. J. Thomson,[1] Ostwald,[2] Walden,[3] Rosenheim and Liebknecht,[4] Groschuff[5], Dhar[6] and others have shown that iodic acid exists in solution in the polymerised condition, some suggesting also that the iodate ion is probably divalent. In a previous paper[7] evidences were adduced to show that a 6 N. solution of the acid contains mainly $(HIO_3)_3$ molecules while a dilute solution (below 0·1 N.) only the ions of the monobasic acid HIO_3, and that the iodate ion is monovalent.

The existence of the three salts, KIO_3, $KIO_3 \cdot HIO_3$ and $KIO_3 \cdot 2HIO_3$ suggests the existence of the three corresponding acids: HIO_3, $(HIO_3)_2$ and $(HIO_3)_3$.

Since a change in constitution is taking place apparently by dilution it must be of interest to find out at what concentrations, if any, such

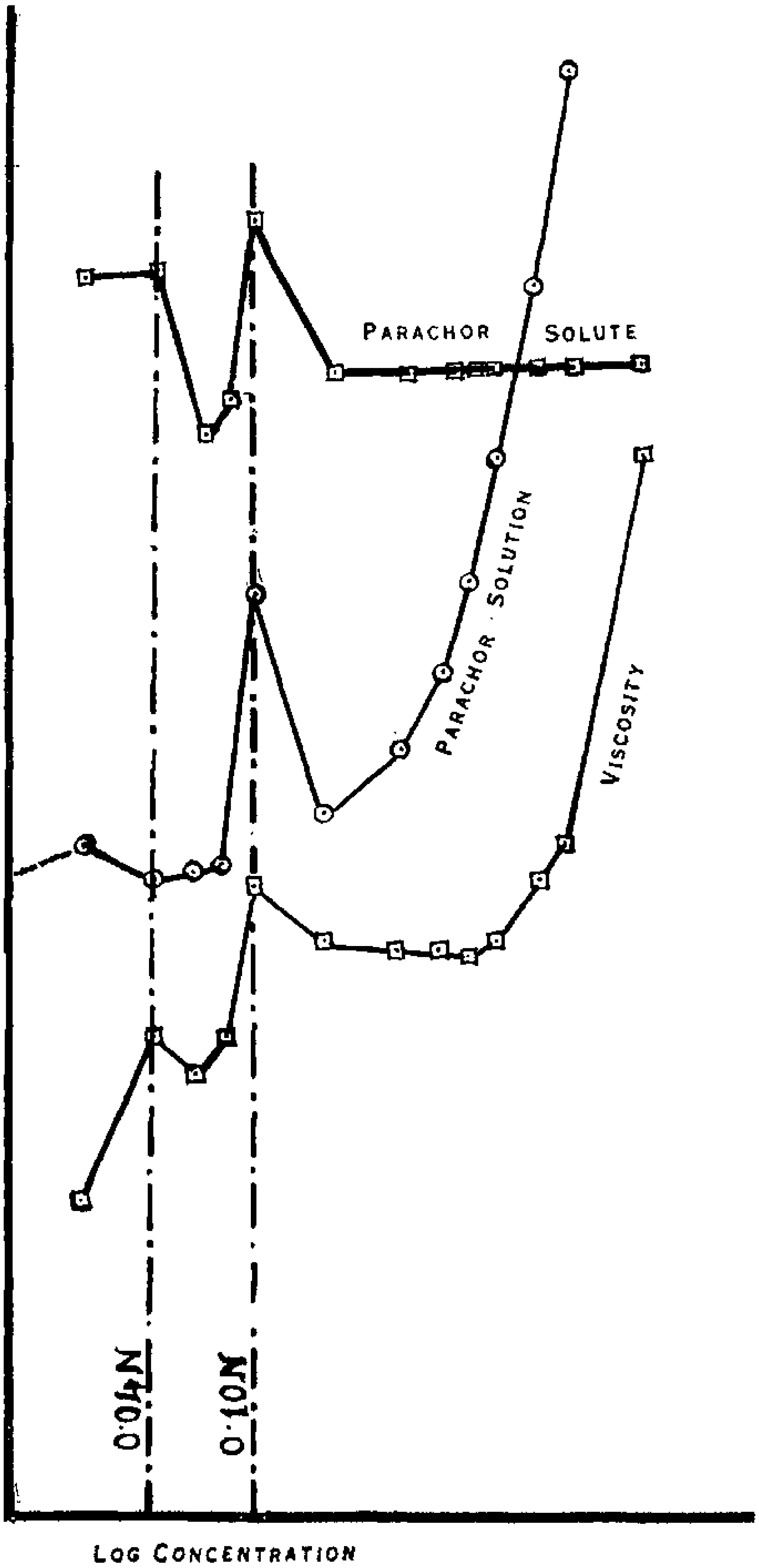


Fig. 1

changes are brought about. With this end in view a number of physical properties have been studied and graphs obtained connecting the property of the solute with the concentration. For this purpose the mixture law equation was employed:

$$P_{soln.} = (1 - x)P_{solvent} + (x)P_{solute},$$

where P denotes the property investigated, *viz.*, density, viscosity, surface tension, parachor,