

the magnetic potential M , of a point⁴ with polar co-ordinates r, θ with reference to a charged sphere such as the one in the earth's interior, is given by

$$M = \frac{Qwa^2 \cos \theta}{5cr^2}$$

where a is the radius of the sphere (the core), and c is the velocity of light. But $M = Hr$ in which H is the average value of the computed earth's magnetic field. Hence

$$Q = \frac{6cHr^3}{wa^2 \cos \theta}$$

and substituting appropriate values for a point near the core's pole, we have $Q = 2.5 \times 10^{14}$, and not 4.5×10^5 coulombs as is commonly assumed.

Again Petrucci⁵ has shown that the earth's charge is a variable quantity, and that it changes directly as the atmospheric potential gradient. But since the latter may vary from one to four times its basic value in the course of a day, we may conclude that the earth's charge also varies from one to four times the above value. It is important to note that there will be a strong electrostatic field at the surface of the earth's internal core of Q divided by the square of the core's radius, namely, 6×10^8 volts per cm. which must undergo a similar periodic variation in magnitude.

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NEW ULTRA-VIOLET BANDS OF MERCURY IODIDE

THE ultra-violet bands ascribed to the mercury iodide molecule by various investigators were recorded in a previous paper¹ dealing with the analysis of two of these band-systems. Further investigations using transformer and high-frequency oscillator discharges through mercury iodide vapour reveal the existence of three new systems which have not been reported previously. They lie in the regions λ 2550-2500, λ 2435-2385 and λ 2345-2300, and may be designated as F_1 , F_2 , F_3 -systems respectively. F_1 comprises of about twenty red degraded bands some of which have intense and sharp edges towards the violet. F_2 consists of a succession of closely spaced bands degraded to the red with the interval between successive bands diminishing towards the region of longer wave-lengths. F_3 has the resemblance of the brief system of mercury bromide analysed previously² and consists of about fifteen diffuse and mostly headless bands. The analysis of these systems and their correlation with the

other known bands of the HgI molecule will be dealt with in detail elsewhere.

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OSCILLOGRAMS OF VALVE CHARACTERISTICS

IN the course of a study of the dynamic transfer characteristics of radio valves, by means of the cathode-ray oscillograph, a few interesting features were observed, which are described herein. In this method the signal input (50 C.P.S. and 1,000 C.P.S. sine wave in our case) is applied to the control grid and to the X-plates of the oscillograph, while the anode output is applied to the Y-plates.

It is in general recognised that the dynamic ($e_g = ip$) characteristics become looped or closed curves, if the load impedance has a



FIG. 1



FIG. 2



FIG. 3



FIG. 4



FIG. 5



FIG. 6

reactive component, when phase changes are introduced between the X and Y components of the variables. But our studies reveal that even if pure resistance are used in the anode and grid circuits, closed dynamic curves can be obtained, if the grid resistance is higher than certain maximum values. Under these conditions when the grid charge leaks away but slowly, the response of the plate voltage can be delayed, developing a sort of hysteresis effect as shown in Figs. 1, 2 for the 6 C 5 R.C.A. detector, amplifier and 3, 4, for the 6 K 7 super control amplifier pentode. Curves 1 and 3 are taken with correct grid resistors, while with 2 and 4, the grid was imperfectly earthed and may be described almost floating.

Again the negative slope of the screen grid valve characteristics when the screen voltage is higher than the plate voltage, has the effect of reversing the closed curves, as illustrated in Figs. 5 and 6, which were taken with the tetrode 46.

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COLORIMETRIC ESTIMATION OF IRON WITH RESACETOPHENONE— OXIME

SNELL¹ describes sixteen reagents for the colorimetric estimation of iron and of these a dozen are organic compounds. Since then several other organic reagents have been added to the list. Recently Howe and Mellon² investigated the iron-salicylaldoxime colour reaction spectrophotometrically and found that pH was a critical factor and, with solutions buffered with ammonium acetate, the colour obeys Beer's Law over a wide concentration range of iron.

Astin and Riley³ drew attention to the expensiveness of salicylaldoxime as a reagent and in their investigations on the determination of copper, to cut down the cost, they adopted a procedure involving the production of the oxime *in situ* so that isolation became unnecessary. It must, however, be pointed out that salicylaldehyde itself is an expensive item. Further, Howe and Mellon (*loc. cit.*) found that dilute aqueous alcoholic solutions of this oxime (0.1 per cent.) were not quite stable. This adds to the cost of the reagent.

The present authors found that resacetophenone-oxime also gives a similar purple colour with ferric iron and the sensitivity was comparable with that of salicylaldoxime. Resacetophenone is neither costly nor difficult to prepare being obtained in very good yield from resorcinol, glacial acetic acid and anhydrous zinc chloride. This compound has also been introduced as a reagent for the detection of iron by Cooper.⁴ The oxime (colourless crystals, m.p. 198-200° d.) is obtained easily by the usual method and is cheaper than salicylaldoxime. Resacetophenone-oxime is readily soluble in alcohol and is not precipitated by

large dilution with water. Aqueous alcoholic solutions (0.5 per cent.) are quite stable for long periods. Control of pH is necessary with this reagent also. Buffering with ammonium acetate was found to give satisfactory results. Experiments carried out with Klett's colorimeter and artificial illumination showed that the limits for the balancing method, with a final dilution of 25 ml. after developing colour, was 2.0 to 0.1 mg. of iron. Because of the powerful illumination, at the still lower concentrations of iron, the colour shades were too light for satisfactory matching.

The colour characteristics and the applicability of Beer's law could not be studied spectro-photometrically at present. This investigation will be taken up and the results published later on.

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THE NUTRITIVE VALUE OF MILK AND CURDS

THE status of milk as the only food for infants carries with it the implication that it contains all the essential nutrients. Even for children, adolescents and adults, milk is almost an essential article of diet. An enormous amount of work has been done in Western countries to ensure the production and distribution of milk under hygienic conditions. Pasteurization is the process of choice for rendering the milk free of micro-organisms and at the same time retaining most of its nutritive value.¹ In India the conditions, however, do not permit strict control of the distribution of milk and as an alternative measure of safety every housewife boils the milk before it is used. This process causes destruction of some of the essential nutrients, such as vitamin A, C and carotene.² Unlike the Western countries the curds prepared by fermenting milk, forms an important constituent of most Indian dietaries. Yet the nutritive value of curds has formed the subject of few investigations. The studies in the bacteriology of milk have been undertaken to find out mainly the ways and means to prevent the growth of pathogenic organisms such as *Mycobacterium tuberculosis* and the organisms belonging to the enteric group.

According to Supplee,³ the whey from the rennet curds is a rich source of vitamin B complex. It also contains, provitamins D and K in addition to minerals and hormones. Curds, therefore, would be a better source of nutritive material than whey on account of its additional protein and fat content. During the pro-