NOTE ON THE CHARACTERISTICS OF THE NEW SINGING TUBE[1]

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The temperature difference that is necessary to cause the new singing tube to emit a tone, when the portion B (Fig. 1) is kept at room temperature while the tip A is heated, was observed to be about 400° Centigrade. If, however, B is cooled to the temperature of liquid air the temperature difference necessary is greatly reduced, being about 200° Centigrade. The pitch is also considerably lowered.

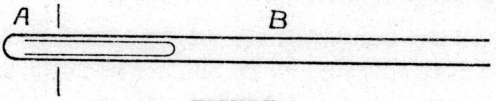

FIGURE 1.

It was deemed desirable to make quantitative measurements of these temperature differences and also of the corresponding pitch of the tone emitted. To this end B was held successively at different temperatures, ranging from that of liquid air to values considerably above room temperature, while A was heated electrically in each case to a temperature where a tone was emitted continuously. The two portions A and B were each housed within a separate copper tube of about 1 cm. wall thickness and heavily insulated with asbestos. The temperatures were accurately measured by means of thermo-junctions—three being attached to A and three to B. The temperature control of each section was good and could be held fairly constant at will.

TABLE I.

Obser-nation No.	A Average Temp. in degrees C	B Average Temp. in degrees C	Total temp. difference in degrees C	Temp. of B in absolute measure	Vibra-tions per second
1	1	−181	182	92	213
2	204	− 88	292	185	300
3	355	− 16	371	257	378
4	448	+ 26	422	299	425
5	524	+ 57	464	330	450

The results from the only run thus far made are contained in Table 1. In observation No. 1 the part B was placed within a glass jacket heavily wrapped with asbes-

1. Phys. Rev., N. S., Vol. XV, p. 336.

tos and cooled directly to -180°C by means of liquid air. The temperature of A was allowed to fall until the tone emitted was just maintained. This by repeated trials was found to be at 1°C. Thus the temperature difference when B was cooled to -181°C, for this particular tube, was found to be 182°C. In observations 2 and 3 the part B was placed in a special copper tube designed by the author[1] some years back for the determination of intermediate temperatures. Observation 4 was for B at room temperature (note that it was now necessary to heat A to 448°C), while in No. 5 the part B was warmed up to 57°C, and the tip heated electrically to 527°C before the tube responded.

The absolute temperatures of the part B are given in the second last column, while the corresponding vibrations per second are listed in the last column. These data are represented graphically in Fig. 2, in which the total temperature differences as ordinates are plotted against absolute temperatures. The relation is strictly linear except possibly for the last reading at 330° absolute temperature. By extending the straight line to the left we are able to determine the temperature difference that should maintain

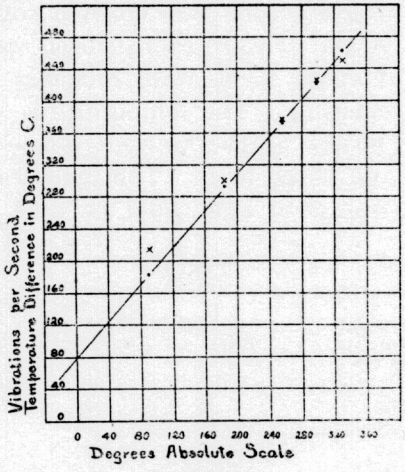

FIGURE 2.

the tone when B is cooled to absolute zero. For this particular tube the graph shows this temperature difference to be about 80°C.

1. Phys. Rev., Vol. XV, p. 125.

The same figure also shows the corresponding vibration frequencies (indicated by crosses) plotted to the same scale against absolute temperatures. This relation also seems to be linear except for the point taken at 91° absolute. The pitch was determined by means of a tone variator.

Lastly the vibration frequencies and temperature differences in degrees centigrade, as shown by the graphs, are nearly equal numerically. This, however, should be considered as a coincidence.

Observations with tubes of different pitches and extending over wider temperature ranges are under way.

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