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L-TYPE THERMISTOR AS AN ANEMOMETER

In a recent publication the author (1957) has suggested the use of an L-type thermistor manufactured by the Standard Telephones and Cables Ltd as an anemometer, particularly for the short-period fluctuations of turbulent wind. The opinions expressed therein were to some extent based on theoretical considerations and also on the experience gained from the use of different kinds of thermistors for various purposes in this Department. With the recent development of Micrometeorology as a research study in this University, need has been felt for a suitable instrument for the study of low level atmospheric turbulence and this has afforded an opportunity for actually constructing an L-type thermistor anemometer in the manner mentioned earlier. The thermistor used was Stantel L-1311/120 (the readers are presumed to have a knowledge of the "Stantel" thermistor code) whose glass shell was carefully opened out by the electrically heated-wire technique. As in the case of electronic tubes, for the successful operation of a thermistor, particularly as an anemometer, it is desirable as well as useful to study its dynamical characteristics as, for instance, the electrical resistance variation with applied input power at different ambient temperatures. Not only do these curves give an idea of the current required for use in the external heating coil under different ambient conditions but also they enable us to account for the errors due to rapid temperature changes of the air stream in precision work. In the present work, however, the resistance variation of the thermistor was studied only at the room temperature for different power inputs in the external heater; the data are presented graphically in Fig. 1.

Next the heating current was arbitrarily fixed at 20 milliamperes and the wind calibration was obtained upto a speed of more than 2000 ft per min. This was accomplished by a 'Tornado' blower and an air-duct while the wind speeds were measured by an air-meter manufactured by the Hastings Instrument Co. Inc., Hampton (U.S.A.). A brief description of this meter and its use in turbulence work was previously given by Gill (1952). This meter is particularly suitable for this kind of calibration for it is an instrument operating on the heated thermopile principle and is an extremely sensitive anemometer for indication of instantaneous wind speeds upto more than 3000 ft per min. It has an open scale in the lower ranges permitting more accurate readings and thus the overall

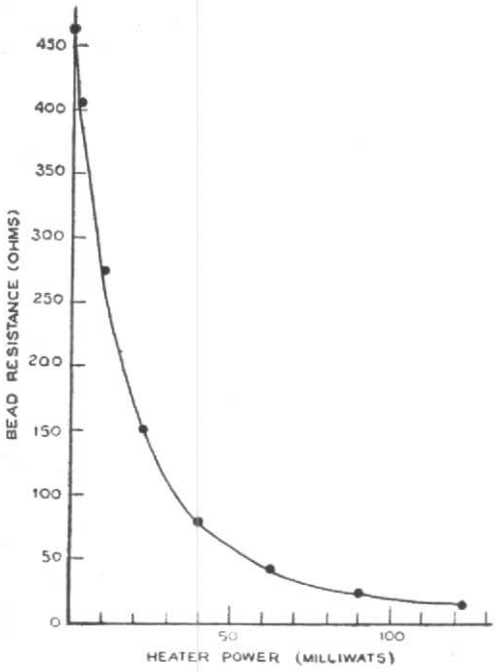

Fig. 1

(Heater resistance 100 ohms)

sensitivity of the instrument throughout its scale range is almost constant.

The wind calibration of the thermistor is shown in Fig. 2 which establishes the fairly regular and reliable behaviour of the heated thermistor towards changing winds.

An actual field performance of the anemometer is presented in Fig. 3 in which are also shown, for purpose of comparison, readings of the Hastings Airmeter. The close agreement between the two sets of readings is extremely interesting, strongly suggesting that a thermistor can be used as a reliable anemometer for turbulent wind studies. The range and at the same time the sensitivity of the instrument scale can be conveniently altered with the help of the graphs presented in Figs. 1 and 2. An additional advantage that the thermistor anemometer has got over the Hastings Airmeter (in its present form) is that the former is non-directional in its response while the latter has to be oriented

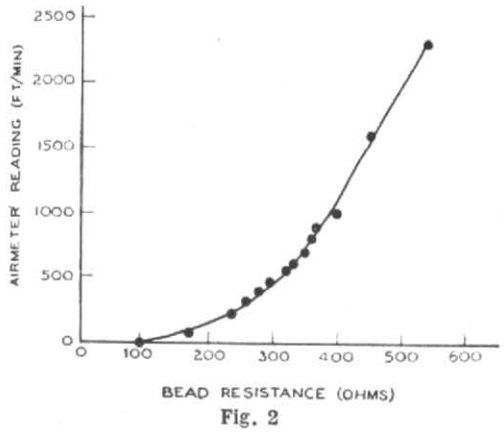

Fig. 2

(Heater current 20 milliamperes)

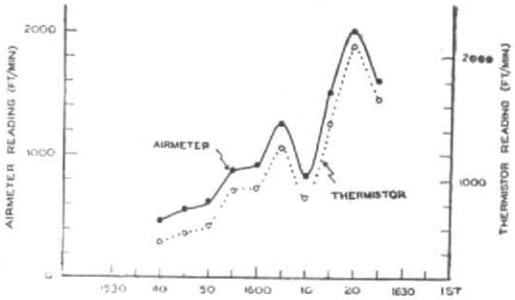

Fig. 3. Field test on 13 February 1957

into the wind either manually or by means of a vane arrangement.

Opinions are rather divergent on the stability of calibration of all anemometers based on the cooling power of wind but our experience has shown that this is not always serious; provided the heating current is not heavy, the thermistor is found to give very satisfactory service without frequent need for re-calibration.

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