

## A NOTE ON THE USE OF HOT WIRE ANEMOMETERS.\*

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## ABSTRACT.

The constant temperature hot wire anemometer must be used in the position of calibration when measuring very low air speeds. This was shown to be necessary on account of the difference in form of the calibration curves. The self-induced air currents vary with the position of suspension of the instrument.

An investigation on the effect of change in variables in the pretreatment and smoking of fish required the measurement of gas velocities varying between 1 and 500 cm./sec. The hot wire anemometer of the constant temperature type was the most suitable instrument for this work.

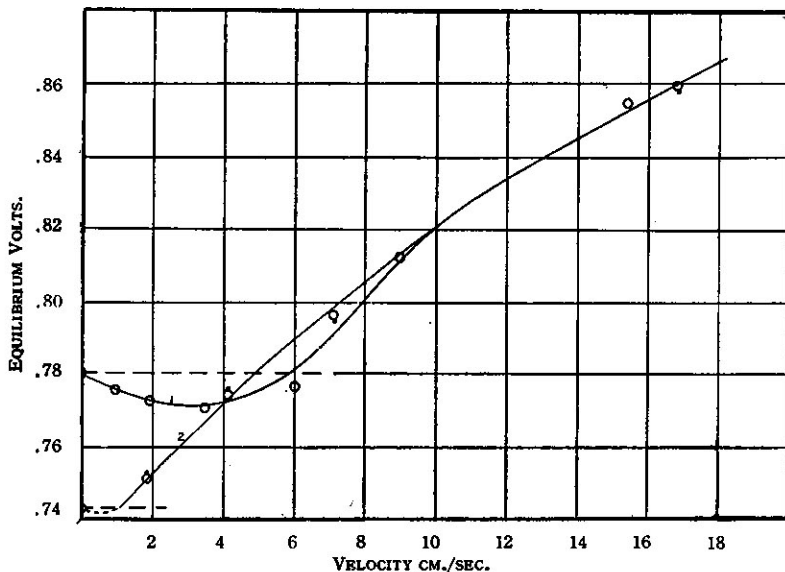
The calibration of several anemometers at very low velocities led to an observation that had not hitherto been considered.

E. Ower and F. C. Johansen<sup>1</sup> reported negative readings of the equilibrium current with a minimum, depending on the temperature of the wire, at about 3 cm./sec. Certain inexplicable discrepancies in zero readings of one anemometer used by the authors resulted in the postulate that the relation between these negative readings and the velocity of flow past the wire depended on the position of use of the anemometer, the wire being held normal to the air stream in all cases. This was shown to be the case.

One typical wire operated at a temperature of about 200°C. was examined in several positions. In the horizontal position (1, Fig. I.) negative readings commenced at a velocity of zero and continued to approximately 6 cm./sec. The same wire used in the vertical position (2, Fig. I) showed a lower zero, and negative readings too small for detection with the instruments available. If extrapolation of the curve in the manner shown be justified, negative readings commence at

<sup>1</sup> Ower, E. and Johansen, F. C., "*Pilot-static tube factors at low Reynold numbers.*" Aero. Research. Comm. Repts. and Memo. No. 1437, Aug. 1931. H. M. Stat. Office, London.

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zero and continue to approximately 1 cm./sec. In Fig. I the velocity of air flow normal to the wire is plotted as abscissae. The ordinates represent the voltage drop across a standard controlling resistance in the arm of the Wheatstone bridge circuit opposite to that containing the anemometer.

The following explanation is offered to account for the difference in the nature of the curves. King<sup>2</sup> has shown that hot wires induce air currents about themselves. That negative readings are a function of the relative speeds of these induced currents and the normal speed of the air has been suggested by Ower and Johansen to explain the negative readings obtained with their instruments. That position of the wire in which it is vertical, but still normal to the direction of air flow used subsequently for calibration, induces smaller air currents approximately parallel to the wire. Hence positive readings would be expected to occur at lower air speeds. The curves coincide at approximately 10 cm./sec. At this point the self-induced currents become negligible in comparison with the velocity of gas normal to the wire.

King, L. V. see Ower E. "Measurement of Air Flow." 2nd. ed. chap. X, Chapman and Hall, London 1933.