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An Investigation on the Resonance Tube

Junjiro IWAMOTO*

A resonance tube consists of a hollow cylinder, one end of which is closed, while the other end is left open. When a jet stream of air injected by a nozzle is impinged axially against the open end, the closed end gets hotter than the stagnation temperature of the jet. The author conducted experiments with oscillatory jet easily obtainable by a convergent nozzle in case the pressure ratio of the jet exceeds the critical one. Relations between the thermal effect and the configuration of the jet was examined. It was found that the thermal effect depended on the axial distance between the nozzle exit and the tube inlet. The air temperature at the closed end was measured at the nozzle pressure ratio of 2.5, 3.4 and 5. At pressure ratio of 2.5, 3 and 4, the thermal effects were obtained when the convergent part of the jet stream was located at the entrance of the tube. It was also shown analytically that the above mentioned jet configuration yielded unstable flow pattern which rendered the thermal effects optimum. Thus, it is conceivable that the thermal effect is promoted irreversibly by the periodic compression and expansion of the working fluid. It seems, however, that the optimum configuration above mentioned deviates to some extent when the pressure ratio amounts to 5.

*岩 本 順 二 郎