

REGISTRATION OF THE RESPIRATORY MOVEMENTS IN MAN DURING PHYSICAL WORK BY MEANS OF A THERMOBATTERY

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The registration of respiration in man during physical exertion presents certain difficulties, for when pneumatic, powdered carbon or piezoelectric transmitters are used, mechanical distortion of the curve takes place.

There are reports in the literature of the registration of respiration in rabbits by means of a thermobattery, making use of the difference in the temperature of the inspired and expired air. In the registration of respiration by this method the thermobattery is fixed to the nose of the animal by means of a small rubber mask. This method introduces no external resistance to the act of respiration.

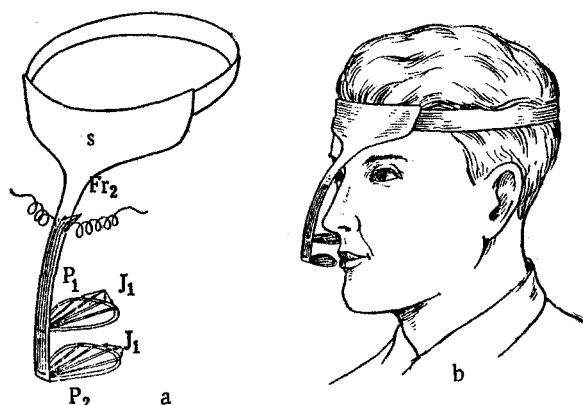


Fig. 1. Scheme (a) of the apparatus for registration of respiration in man by means of a thermobattery and (b) the method of attaching it.

In order to make use of this principle in the registration of the respiratory movements in man during physical effort, we introduced a few modifications into the construction and method of attachment of the battery as used in rabbits.

The method is as follows (Fig. 1). To the subject's forehead a T-shaped support S, made of half-millimeter aluminum sheet, is fixed by means of an elastic band. To the lower part of the support, plastic arms P_1 and P_2 are fixed against the mouth and nostril. On the plastic arms are arranged copper-constantan thermocouples, connected in series to form a battery, so that some junctions (working) J_1 are opposite the nostril and mouth, and the other junctions J_2 , corresponding to them, are collected together at a point a few centimeters above, where they are not exposed to the action of the expired air current.

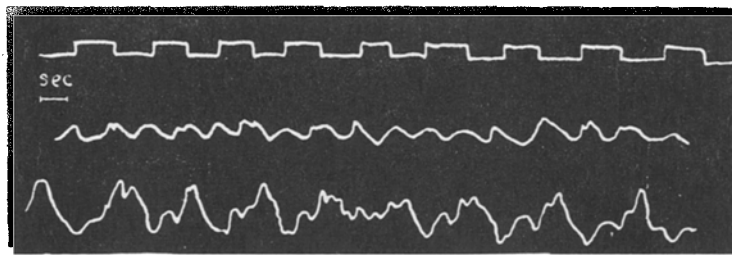


Fig. 2. Simultaneous registration of respiration by means of a thermobattery and a piezoelectric generator during physical exertion. Significance of the curves (from above down): rhythm of physical exertion, recording of respiration by means of the thermobattery, tracing of respiration by means of a piezoelectric generator.

Because of the differences in the temperature of the expired and environmental air, an electromotive force is generated in the thermobattery, which is transmitted via an amplifier to a recording system. For this purpose we used the 4-PFD-7 functional diagnostic apparatus of the experimental factory VNIIMI and O of the Ministry of Health of the USSR.

For comparison, in Fig. 2 are shown the recordings of respiration obtained by means of a thermobattery and piezoelectric generator in a human subject during physical exertion (raising and lowering a weight of 6 kg by flexing the lumbar spine).

As may be seen in Fig. 2, the working movements do not affect the true recording of respiration by means of the thermobattery; in the recording obtained by means of the piezoelectric generator, which is fixed to the abdomen, it is mainly the mechanical oscillations of the work rhythm that are shown.

SUMMARY

One of the junctions of the thermobattery is fixed against the nostrils and mouth of the subject under investigation. The process of respiration gives rise to an EMF in the thermobattery, which through an amplifier is transmitted to the registering instrument. Movements performed by the subject under investigation during work have no distorting effect on the respiration recording.