less well illustrated, but not precluded, in adrenalectomized pigs. In the latter animals clear serum was nearly always expressible from the nipples during the observation period. If cortical hormone or tissue was present this fluid quickly became milk. Sufficient fluid for milk flow was probably present.

In guinea pigs lactating normally after parturition, production of "artificial adrenal insufficiency"[5] by intraperitoneal injection and subsequent withdrawal of isotonic glucose solution for 2 successive days, either entirely or almost, stopped lactation (4 cases). Lactation was quickly reinstated by salt solutions given orally.

*Conclusion.* Experiments of several types indicate that adrenal cortical hormone is necessary for milk production, and that the disturbance of cortical function produced by hypophysectomy, or adrenalectomy prevents the initiation of lactation in the guinea pig.

## 9146

## Horizontal Respiratory Graphs by Automatic Feed of Oxygen into a Basal Metabolism Apparatus.

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When respiratory tracings are taken of a subject breathing air, oxygen must be added to maintain the oxygen concentration at the desired level. A previous method employed a calibrated air pump by which the experimenter forced into the gas circuit sufficient oxygen to maintain the graph approximately horizontal. The oxygen concentration in the circuit was subject to considerable variation depending on the frequency with which the oxygen consumed by the patient was replenished. Furthermore, the graphs were difficult to calculate accurately, since the oxygen admitted was reflected intermittently on the tidal air curve. The "concertina apparatus" was used by Haldane[1] for gases of fixed concentrations but the expiratory phase on the graph was traced as a result of the refilling of the concertina from a gas source other than the lungs. Poulton[2] em-

[5] Gilman, Alfred, *Am. J. Physiol.*, 1934, **108**, 662.

[1] Haldane, J. S., "Respiration," new edition, University Press, London, 1935, p. 208.

[2] Poulton, E. P., *Guys Hospital Gazette*, 1935, **49**, 346.

ployed an apparatus in which the volume of air in the circuit remained constant, oxygen replacing the $CO_2$ absorbed by the soda lime.

By means of the levelling device described below, a horizontal graph of the tidal air is obtained with minimal fluctuations of the oxygen content, $\pm 0.5\%$, and without artificial disturbance of the patient's pulmonary ventilation.

The levelling bulb (1), half filled with water, is fastened to the spirometer bell with the base of the bulb resting on top of the bell. The levelling device is adjusted to a height that permits slight immer-

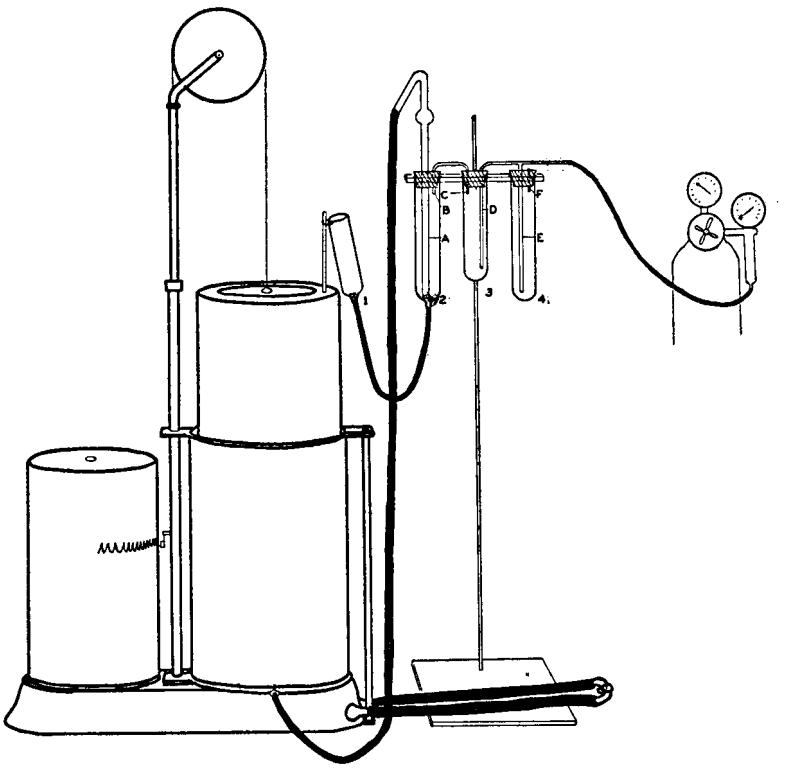



FIG. 1

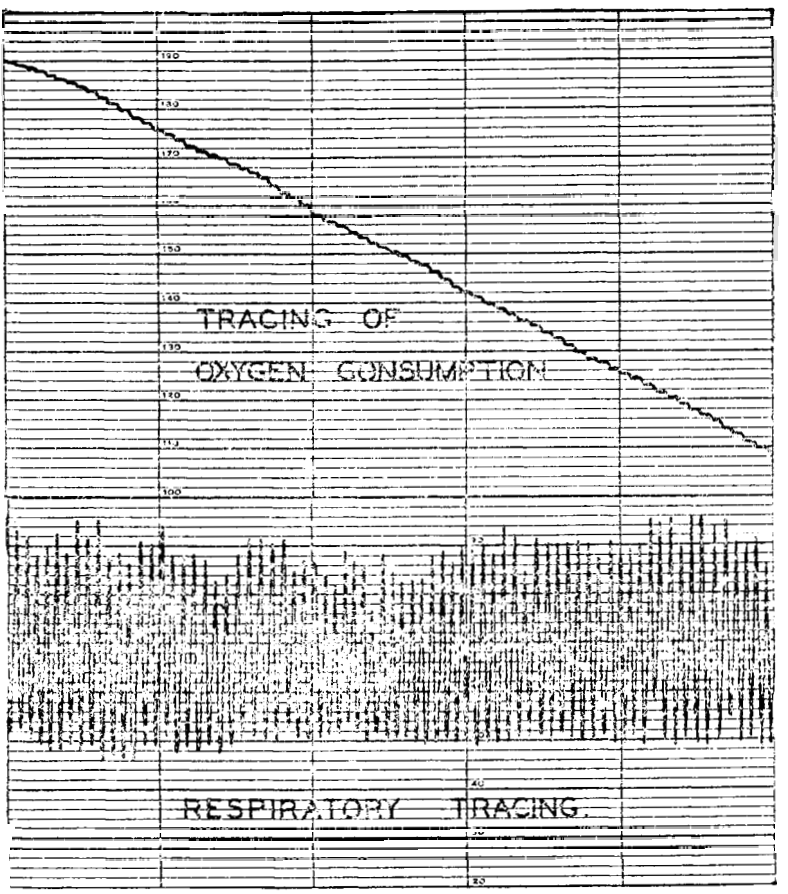
*Description of apparatus for text figure 1.*

(1) Levelling bulb joined by thin-walled rubber tube to (2) water valve which contains tube A. This tube, which is inserted to within 2 mm. of the bottom of the water valve, has a bulb (2.5 cm. I.D.) blown in its length 25 cm. from the bottom to prevent water from being carried into the spirometer circuit. The water valve is connected by delivery tube B-C (5 mm. I.D.) to the (3) water trap which contains tube D (5 mm. I.D. x 14 cm. to bend.) which is inserted to within 2.5 cm. of the bottom of the trap and connected to one horizontal arm of the T tube E. The vertical arm of tube E is inserted to within 2.5 cm. of the bottom of the (4) constant pressure trap. An oxygen escape tube F is run through the stopper of the pressure trap to permit escape of excess oxygen. The oxygen supply at 3 liters per minute enters the remaining arm of the T tube E.

sion of tube A when the spirometer bell is half filled. The subject's lungs and the apparatus are first washed out with the gas mixture to be breathed; the bell is then filled half way, the recording kymograph drum set off and an oxygen flow of 3 to 4 liters per minute started through the levelling device.

As oxygen in the basal metabolism apparatus is consumed, the spirometer bell falls until the water level in the water valve (2) sinks beneath the lower end of tube A. Oxygen will immediately enter the gas circuit through tube A and raise the bell until the bottom of the tube is again immersed in water. Thus a sufficient flow of oxygen will be admitted to balance the oxygen consumption and keep both the bell level and the oxygen concentration constant.

The water trap (3) should contain enough water to immerse




GRAPH 1

tube D to a depth of 1 cm. Its function is to prevent any gas from the basal metabolism apparatus from escaping through the levelling device.

The constant pressure trap (4) should contain enough water to immerse tube E to a depth of 5 cm. This trap insures a constant supply of oxygen at 5 cm. pressure to the water valve (2). Excess supply of oxygen to tube E leaves the bottom of the tube.

If a record of oxygen consumption is required, as in determining oxygen deficits, a spirometer filled with oxygen, weighted to deliver gas at 5 cm. pressure and containing a volume recording device may be connected to the levelling device in place of the constant pressure trap (4). A simultaneous graphic record of respiration and oxygen consumption (Graph I) will thus be obtained.

*Summary.* The levelling device described makes it possible to record horizontal respiratory graphs by means of a continuous inflow of oxygen, automatically regulated to correspond to the patient's oxygen consumption. Any gas mixture desired may be kept constant during the test period since the oxygen concentration in the basal metabolism circuit remains within $\pm 0.5\%$ of the original concentration. With the use of an auxiliary recording spirometer, it is possible to record oxygen consumption and respiratory tracings simultaneously. Oxygen deficit may be accurately recorded.

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## The Blood Picture in the Alarm Reaction.

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It has recently been shown that if the general condition of an animal is seriously injured by acute, non-specific damaging influences, such as exposure to cold, surgical injuries or intoxication with sublethal doses of various drugs, a characteristic symptom complex appears which has been called the "alarm reaction". It is probably the expression of the defence of the organism against damage as such. The anatomical changes seen in this syndrome have been described in previous reports.[1, 2] The principal ones are thymus, spleen and lymph gland atrophy; marked tendency towards

[1] Selye, H., *Nature*, 1936, **138**, 32.

[2] Selye, H., *Br. J. Exp. Path.*, 1936, **17**, 234.