# SCIENTIFIC APPARATUS AND LABORATORY METHODS

## A MANOMETRIC VALVE OR RESPIRATOR

THIS valve permits of a fully automatic increase and decrease in pressure, over a variable fixed range, in reaction or culture vessels or rooms; and it obviates the discharge of, and consequent replacement of, waste liquid from the valve. Mercury is added to the separatory funnel so as to establish a liquid level B, higher than the point of intersection E in the inverted glass Y (FGH). At this time the mercury is continuous from level B, down through the U tube LKF, and in the legs of the Y (FE and EG). The introduction of gas under pressure at N then forces the mercury in the Y down through the two legs (FE and EG), into the capillary GM and into one arm (FK) of the U tube FKL. As the pressure in the line RN approaches a maximum, the mercury initially contained in EG approaches the upper limit A of the capillary tube. When the pressure in the line exceeds the pressure

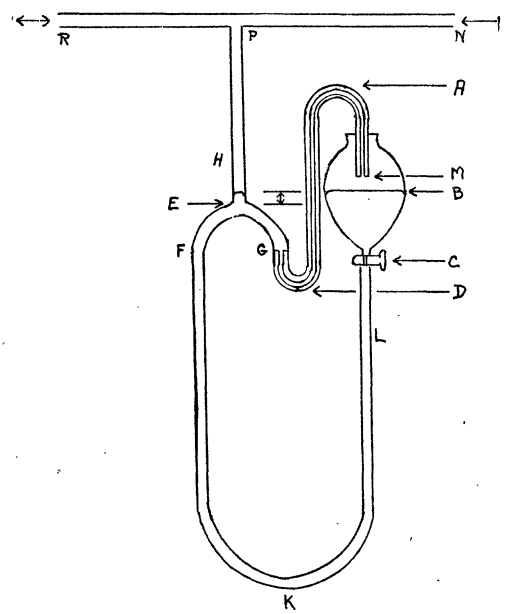


FIG. 1. A separatory funnel, a piece of capillary tubing, and an inverted glass Y are connected as illustrated.

represented by a column of mercury of vertical distance AD, all the mercury in the capillary spills over into the separatory funnel. The positive pressure in the line RN then drops as gas escapes through the now open capillary. The pressure of the mercury in the funnel then forces up the depressed mercury level in FK until the mercury once again spills over through FE into EG. The valve is thereby closed and the above cycle repeats.

The pressure range over which the valve operates is primarily a function of the vertical distance AD. Other variables, of which the rate of pressure increase and pressure decrease are a function, include: the rate of flow of gas into the line RN; the capacity of the chambers into which and out of which the gas flows through RP; the diameter of the capillary in the capillary tube; the capacity and angle of inclination of leg EG of the Y; the vertical distance EB which determines the hydrostatic pressure responsible for the return of the mercury from the funnel to the Y; and the setting of the stopcock C. These variables may be manipulated to suit one's purpose.

A valve of this type has been used to breathe cultures of microorganisms grown upon and within porous masses, that is, in the study of metabolizing masses which otherwise offer resistance to uniform aeration and temperature control. The rate of replacement of the gases in the reaction or culture vessels may be controlled by interposing a baffle between the line PR and the culture vessels, or by recirculating the gases expelled from the capillary at M, instead of permitting those gases to escape into the atmosphere. One of the obviously related uses for this respirator may be found in the study of respiratory quotients at gas-liquid-solid interfaces, in surface metabolism, as supplementary to the techniques in common use at the present time.

A. CANTOR

PUBLIC HEALTH AND PREVENTIVE MEDICINE LABORATORIES,
UNIVERSITY OF PENNSYLVANIA

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