XXI.—*An Automatic Thermo-regulator, for use in the preparation of Nitrous Oxide and other Gases.*

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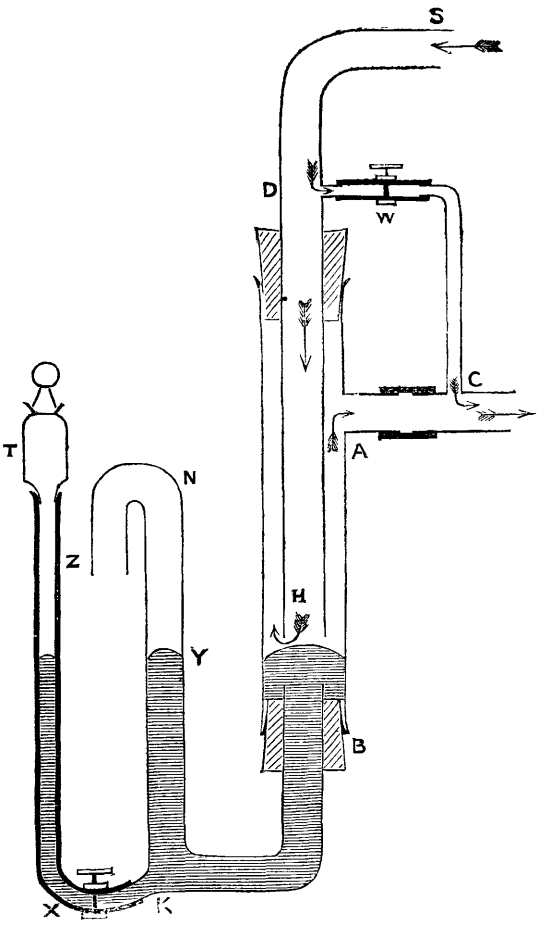
The accompanying diagram represents in section a modification of the usual air-bath thermo-regulator. It was devised to control the source of heat in the preparation of large quantities of nitrous oxide gas for anæsthetical purposes. It has been in constant use for some time in the laboratory of a distinguished dentist, and has performed its duty perfectly. Its simplicity and efficiency will probably recommend its adoption in laboratories where large quantities of any gas are prepared, whose rate of evolution is dependent upon the amount of heat furnished by a gas-stove or burner.



The broad jacket, AB, has a side tube fused in at A, and is

closed at top and bottom by perforated corks. The upper cork bears a long tube SH, cut square and slightly rounded in the flame at its lower end, which descends nearly to the bottom of the jacket; it has a small tube fused on at D. To ensure the efficient action of the apparatus, the axis of the tube DH must be made to coincide with that of the jacket AB. The lower cork is traversed by a bent tube, NKB, one of whose ends only just passes through the cork; it has a small piece joined on at K, on which fits an india-rubber tube carrying at its upper extremity a small reservoir T, which is suspended by a wire loop to a peg, and can be raised or lowered at will. The side tube at A is joined by india-rubber with a T-piece, C, one branch of which is united by an india-rubber tube, bearing a screw-clamp, with the small side-piece at D, the other branch communicating by gas-tubing with the burner.

When the apparatus is required for use, mercury is poured in at T until it rises sufficiently high in the cylinder to close the lower end of the tube HD; the supply-tube from the gas-pipes is then fitted on at S, the gas passes through SDWC in the direction indicated by the arrows, and is lighted as it issues from the burner; the clamp at W is then tightened until the amount of gas passing to the burner is just sufficient to prevent the flame from being extinguished: the reservoir T is lowered, the clamp at X opened, and the mercury-level in the jacket allowed to fall considerably below the end of the tube SH, so as to give a full supply of gas to the burner through SH. As soon as the gas is being generated in the apparatus at a proper rate, the tube BKN is connected at Z by india-rubber with one of the wash-bottles of the generating-apparatus, whence the gas pressure acts upon the mercury-level at Y; the reservoir T being raised, the clamp at X is carefully opened, and the mercury-level in AB allowed to rise until the gas flame just begins to diminish in size; the clamp is then closed. When the pressure of the generated gas increases, it will depress the level at Y, raising the mercury in AB and diminishing the supply of coal gas, and *vice versâ*; the supply of coal gas to the burner varying inversely as the pressure in the generating apparatus. It was found unnecessary to use a conical float on the mercury, or a slit at H, as the convex surface of the mercury rendered the arrest and renewal of the gas-current sufficiently gradual. The apparatus is drawn pretty nearly to scale; the diameter of the tubes SDH and AC should be about the same as that of the ordinary india-rubber gas-tubing, so as not to impede the free flow of gas to the burner; the diameter of the little side passage DWC may be much less, its object being merely to supply sufficient gas to prevent the total extinction of the flame by a sudden rise of pressure in the generating apparatus; the relative diameters of NYK and AB, must depend upon the rise of mercury-level required in AB. The apparatus was attached to a flat board and suspended upon the wall of the laboratory.