CLXXIII.—*An Improved Hydrogen Sulphide Generator.*

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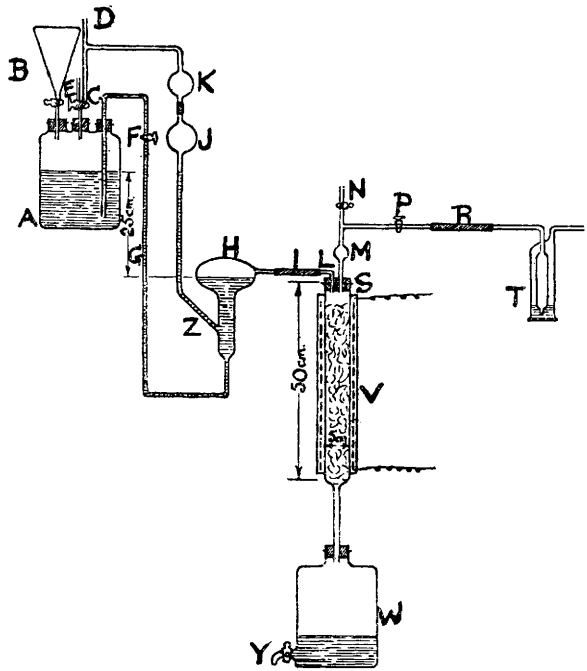
An automatic hydrogen sulphide generator for laboratory installation has been described by Steele and Denham (J., 1920, **117**, 527). Since then the present authors have redesigned certain portions of the apparatus and the modified generator has given such highly satisfactory results during constant use for the last two years that a description of it is considered justified. A laboratory fitted with one of these generators would have a potential and practically unlimited supply of hydrogen sulphide always at hand at the negligible cost of the electric current needed to keep the generator heated.

The following is a description of the apparatus. A is the acid-holder of about 6 litres capacity; B a tap-funnel for use in filling A; C a two-way tap so that A can be connected either to the tube D which leads to an outside flue, or to E; F is a large-bore tap situated at a higher level than the acid in A; H is a reservoir of 600—700 c.c. capacity for retaining hydrogen sulphide generated, but not withdrawn from the apparatus; J is a bulb of about 150 c.c. capacity, situated a few cm. above the highest level of acid in A; K is a 100 c.c. bulb; L is a piece of capillary tubing of 2 mm. bore and of about 8 cm. total length, used to prevent a too rapid flow of acid into V, connected to the reservoir H by a piece of pressure

tubing I (wired on); M is a small 10 c.c. bulb, N and P are taps, R is thick-walled rubber tubing, inserted for flexibility so that the rubber stopper S can be easily removed; T is a wash-bottle containing water, through which the hydrogen sulphide is supplied to the distributing taps and mains; V is a tube of fused silica, the upper portion of which is about 50 cm. long and 5 cm. internal diameter whilst the lower part is of 2 cm. internal diameter, fitted by a tight rubber stopper into the reservoir, W, of 6 litres capacity, which receives the spent acid; Y is a tap through which the spent

FIG. 1.



acid is withdrawn, connected to a waste drain. The tube V is heated electrically to a temperature of approximately 80°. The winding (total resistance 100 ohms) is made over a thin piece of asbestos paper with nichrome wire of 1 ohm per foot resistance, and is well covered with many thicknesses of asbestos paper. In the authors' generator, this winding is connected through an ammeter and adjustable resistance to a storage battery in such a way that it can be connected either with the full battery of 110 volts or a portion of it giving 60 volts. A current of just over 1 amp. is sufficient to heat the tube V up to the working tem-

perature in from 10 to 15 minutes, whilst a current of 0·6 amp. will maintain this temperature.

Mode of Operation.—The tube V is packed with lumps of iron sulphide. The acid-holder is filled by means of the funnel B with commercial hydrochloric acid diluted with an equal volume of water, and the funnel tap turned off. The taps F and N are turned on and the tap C is turned so as to connect the acid-holder to E, through which air is blown until the siphon, G, fills. Tap N is then turned off and tap E turned so as to connect the acid-holder with the tube D. The reservoir H fills to the side-tube level with acid which then runs over into V and, provided the tube V has been sufficiently heated, hydrogen sulphide is generated as soon as a few drops run over, and drives the acid back into H, where the gas is stored until drawn off through the tap P and wash-bottle T. The acid is completely neutralised long before it has percolated through the heated column of sulphide. The side-tube Z and bulbs J and K are provided as an escape for hydrogen sulphide should an excessive amount be generated owing to some abnormal cause. This prevents hydrogen sulphide from getting into the siphon and putting the generator out of action. When the generator is not in operation and the tube V not heated, tap F is kept turned off.

General Remarks.—The capacity of this generator is practically the same as that of the one formerly described, whilst almost theoretical yields of hydrogen sulphide are always available at a steady and convenient pressure. It has the following advantages over the older form: (1) It is completely automatic in operation. From this point of view electrical heating is a great advantage over steam heating, whilst the use of silica instead of glass for the tube V overcomes the trouble formerly experienced of cracking, due to alternate heating and cooling. (2) There is no leakage of acid, as it never comes into contact with the rubber stoppers or connexions (except at I during a portion of the cycle of operations). (3) Provided the tube D is carried to a suitable flue, there is no smell of hydrogen sulphide.

The hydrogen sulphide is distributed throughout this building in composition (lead) gas-pipes of $\frac{1}{4}$ in. internal diameter without any serious loss of pressure. After 3 years the attack on these pipes appears scarcely to have penetrated beyond the inner surface, although in the experience of one of the authors in the sub-tropical climate of Brisbane these pipes were seriously attacked, but this could probably be overcome by the use of drawn copper tube.

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