

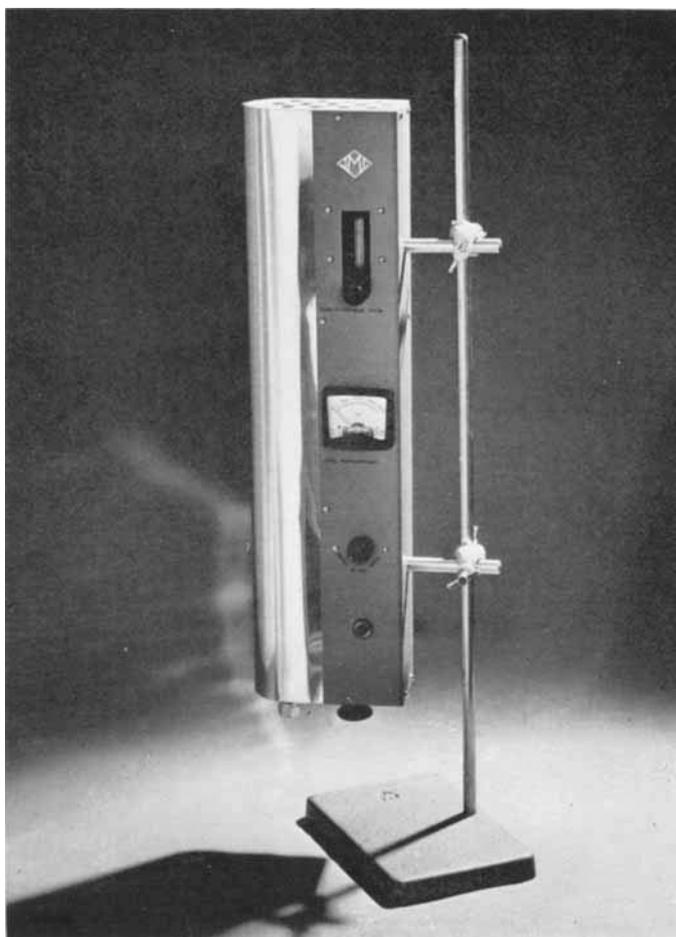
# A Laboratory Scale Hydrogen Purification Unit

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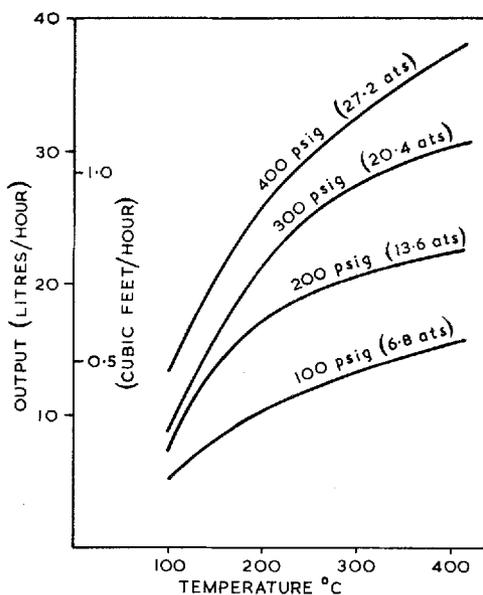
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There are today many uses for hydrogen in the laboratory, for example, for the heat treatment of metals and semiconductors, for catalytic hydrogenations and as a carrier gas in chromatography. In these fields, and numerous others, it is undoubtedly of great value to have available a grade of hydrogen with the highest possible degree of purity –

substantially purer, in fact, than is generally available with the best grades of commercial bottled hydrogen. By permitting only hydrogen to diffuse through it, a membrane of silver-palladium affords the best means of purifying this gas, and of separating it from all other diluting or contaminating gases. This principle has been used for some time for the



*A Type A.1 Diffusion Unit incorporating a silver-palladium alloy tube and able to provide an output of ultra-pure hydrogen exceeding 1 cu. ft/h (28 litres/h). The unit is supplied complete with retort stand and requires only connection to a mains power source and a hydrogen cylinder for instant operation*



The graph illustrates the range of outputs from the Type A.1 Diffusion Unit using different operating pressures and temperatures

large-scale purification of hydrogen (1, 2), and in fact provides the means of preparing hydrogen in a purer state than any other known technique.

### Compact and Inexpensive

In introducing the Type A.1 Diffusion Unit, Johnson Matthey make available for the first time a really compact and inexpensive unit specially designed for use in the laboratory. The unit is 22 inches (56 cm) high and for operation requires only to be connected to a 220/250-volt AC electric mains supply via a power regulator, and to a hydrogen cylinder. Supplied on a laboratory retort stand, the A.1 Diffusion Unit weighs 14.7 lb (6.7 kg) complete, and is easily portable.

When operating at maximum temperature (400°C) the power requirements are 0.6 kW. By regulating the power input from zero to maximum using a regulator such as the Variac Duratrak, the temperature of the single 12 inch (35 cm) long silver-palladium tube within the body may be continuously varied, thus varying the output from the unit if the feed gas pressure is kept constant.

Normal operation is at 350°C with a feed gas pressure of 300 p.s.i.g. (20.4 atm), and under these conditions the unit provides 1 cu. ft/h of ultra-pure hydrogen (28.3 litres/h). Increasing the pressure to 400 p.s.i.g. (27.2 atm) and the temperature to 400°C enables the unit to give 1.25 cu. ft/h (35.4 litres/h).

Connection to a hydrogen cylinder may be made with a pipe 0.25 inch (6.35 mm) outside diameter, using the steel coupling provided in the base of the unit. Rust-protected nipples at the rear of the unit enable plastic tubes to take off the ultra-pure hydrogen output and the very small hydrogen flow that is bled from the unit to provide movement of impure gas over the diffusion tube. The gas bled off may be burnt.

A two-tone aluminium alloy case gives the unit an attractive appearance and does not get warmer in operation than is tolerable to the hand. A pilot light indicates when the unit is "on" and the front panel displays a temperature indicator, bleed-valve and a flow meter for measuring the rate of output of ultra-pure hydrogen. Connection to the power lead is made by means of a Bulgin socket and plug in the base of the unit.

### Investigating Diffusion Characteristics

In addition to its use as a laboratory tool for providing ultra-pure hydrogen, the A.1 Diffusion Unit may serve as a means of investigating the diffusion characteristics of non-standard hydrogen-containing gases. Such investigations are very desirable when contemplating larger scale installations for separating hydrogen by the diffusion process. It may also be used as an inexpensive monitoring device to assist in maintaining proper operating conditions where large-scale diffusion units are already in operation.

### References

- 1 *Platinum Metals Rev.*, 1962, 6, 130
- 2 *Platinum Metals Rev.*, 1964, 8, 91