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FUEL RESEARCH INSTITUTE OF SOUTH AFRICA.

TECHNICAL MEMORANDUM NO. 10 OF 1962.

A SIMPLE AUTOMATIC TOEPLER PUMP.

BY:

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A SIMPLE AUTOMATIC TOEPLER PUMP.

The design of the Toepler pump has been simplified while its reliability was increased by replacing the conventional glass valves by a sintered glass filter and also by dispensing with sealed electrodes as set out below.

Figure 1 is a schematic sketch of the pump showing the position of the sintered-glass filter F. (Pyrex, No.4 Porosity Standard Disc) between the pump and the gas reservoir. This disc is covered with a 1 - 2 mm layer of mercury which effectively prevents gas from the gas reservoir returning to the pump.

The pumping action is obtained by the alternate movement of mercury from the pump reservoir R to T and back; this being achieved by either pumping air into or withdrawing it from the free space above the mercury in R.

Automatic action of the cycle is obtained by using a three-way solenoid valve which can be actuated either by a conventional system of sealed electrodes and an electronic relay system\* or by a time delay relay.

In the former case the upper of the three electrodes usually required is placed in a position (Marked A in Figure 1)  
which .../

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\* e.g. as described by Roberts W. and Madison John J.:  
Analyt. Chem. 29 (Oct. 1957) p.1555.

which is, relative to the filter, about 10 cm above the maximum pressure difference expected across the filter. Adjustable capacitance contacts, which are commercially available, should be useful in such a design.

The preferred system is, however, to operate the solenoid valve by a time delay switching device (various types are commercially available). As no sealed in electrodes are required in this case, the pump design is simplified and, furthermore, the pump can be used to handle explosive gas mixtures.

By adjusting the rate of air admission or its removal (Hoffman clamps on rubber tubing are satisfactory) the time required for the up and down strokes can be made to be almost equal. By then setting the time delay of the relay accordingly, the period of the pumping cycle can be reduced to a minimum (with the pumps presently in use, about 40 seconds).

These pumps have operated continuously and practically unattended for periods of up to 14 days. It was found that the sintered glass valve did not leak even with pressure differences of about 76 cm of mercury between the gas reservoir and the pump.

When this Toepler pump was used as a backing pump for a mercury diffusion pump, the pressure in a 500 ml vessel could be reduced from 70 cm Hg to  $10^{-3}$  mm Hg within 15 minutes.

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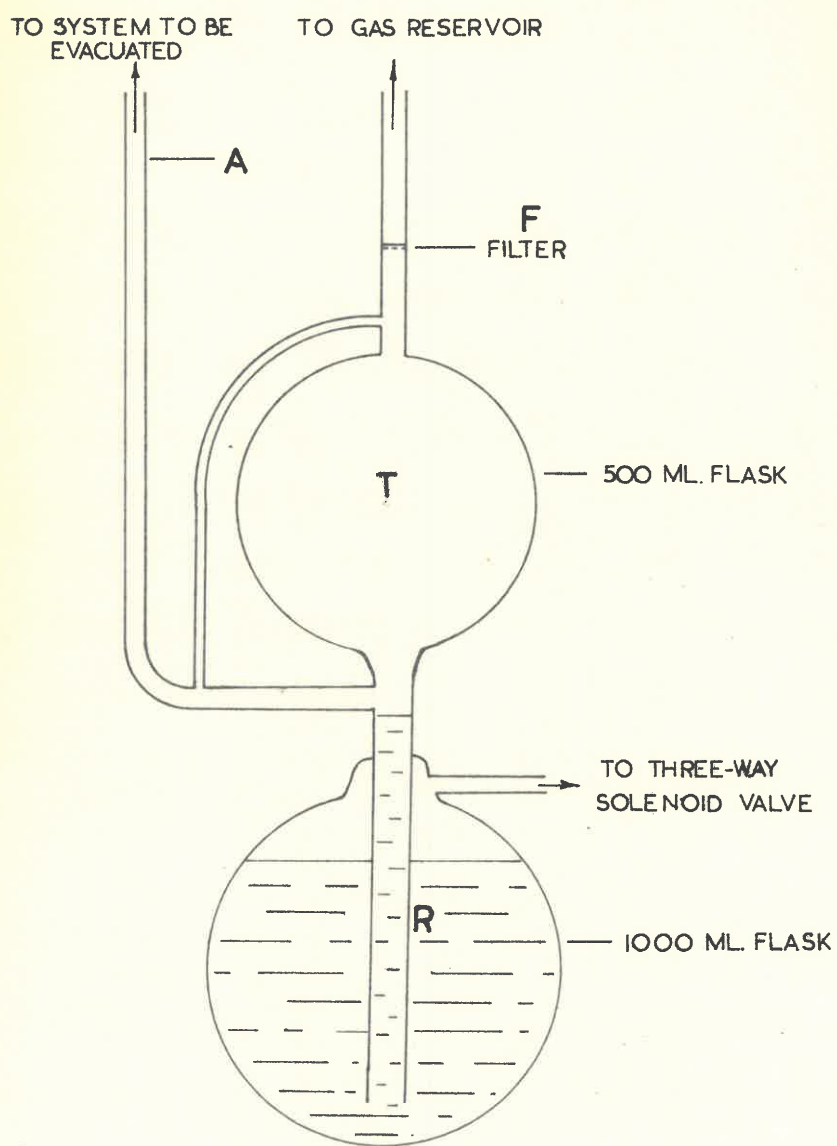


FIG. 1.

AUTOMATIC TOEPLER PUMP