

Outpile Connections

Data

These rigs can be designed for operation at any temperature in the range 150 to 900°C. The major differences, one rig to another, being width of the annular gap between drum and thimble and the choice of materials for construction.

Each rig will irradiate 27 $\frac{1}{4}$ in. diameter $\times$ 3 in. long specimens.

The specimen drum is approximately 1 $\frac{1}{2}$ in. O.D. and 1 $\frac{3}{8}$ in. I.D. By reducing the bore of the drum, larger diameter specimens can be created up to a limit of $\frac{3}{8}$ in. diameter.

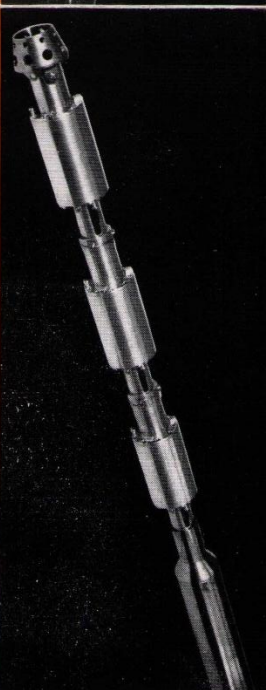
All thermocouples are $\frac{1}{16}$ in. diameter chromel alumel.

The heaters are capable of delivering 1 kW., but the demand on them will depend on the position of the rig in the reactor core.

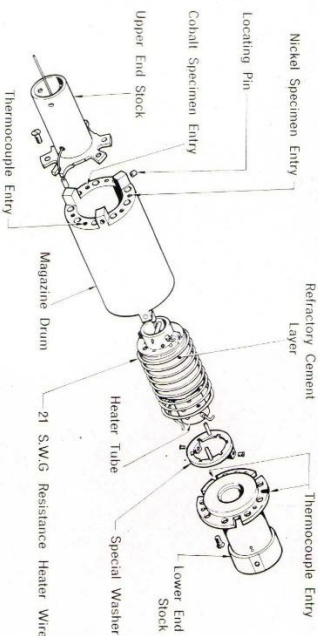
The heater leads are "manganic", which is nickel wire with 2% manganese added. The rig atmosphere is helium maintained at approximately 20 p.s.i.g.

When Built

Design commenced in March, 1958, and the first rig was ready for installation in reactor by mid-June, 1958. The first fuel element facility became available in September, 1958, and when the rig was installed it was found to operate satisfactorily at its designed temperature. The Contractor for design and manufacture of these rigs was Vickers Armstrongs (South Marston) Limited, Swindon.



Specimen Carriers



Exploded view of magazine drum and heater

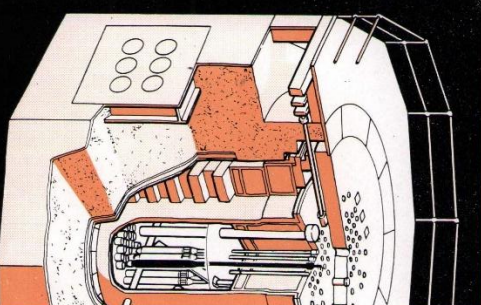
Details of Experiments

Irradiation of graphite specimens for the Wigner Energy Programme.

Irradiation of stainless steel specimens for the A.G.R. Fuel Canning Programme.

Irradiation of graphite specimens to measure dimensional stability.

Irradiation of mild steel (square) specimens for the Naval Reactor Programme.



Graphite Irradiation Rigs

Rigs for use in Hollow Fuel Elements

Atomic Energy Research Establishment, Harwell

These rigs were built for a research programme investigating the storage of energy in graphite moderators. They have been used for irradiating graphite specimens at various temperatures in the range 150°C-900°C. Low temperature rigs, i.e. 150°C-350°C made extensive use of light alloy in their construction. For the high temperature range the light alloy was replaced by graphite and stainless steel.

General Description

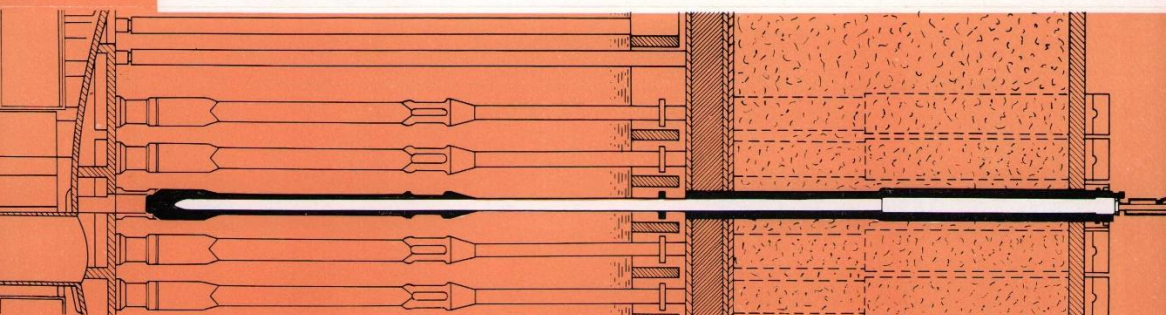
A rig comprises three specimen carrying magazines suspended one below the other from a shield plug which fits closely in the thimble of a hollow fuel element.

Considering the components which form the magazine, there is a thick walled cylindrical drum with nine holes drilled axially in the wall. The end caps are screwed to the drum and the heater which fits closely inside the drum is trapped between the end caps and held by them precisely concentric with the drum. The heater consists of a layer of refractory cement baked around a stainless steel sleeve. A Nichrome wire is wound on the surface of the cement and two stainless steel end rings are sunk into the ends of the cement layer. These act as terminals both for the winding and for the electrical supply leads.

The magazines are loosely attached to each other to permit a degree of mechanical freedom when the rig is installed in its thimble. There are three locating pins fitted in housings at each end of the magazine drum, when the rig reaches its operating temperature these pins make contact with the inside of the thimble, thereby establishing an accurate annulus between the magazine drum and the thimble bore. To design a rig for a specific operating temperature it is only necessary to compute the width of the annulus such that the rig temperature on nuclear heating is approximately 20°C below the required value, the rig then being brought to temperature by the input of electrical heat.

There are three thermocouples in each magazine drum for instrumentation and control, and they, with the heater cables, pass up the centre of the rig to terminal blocks located at the top of the shield plug.

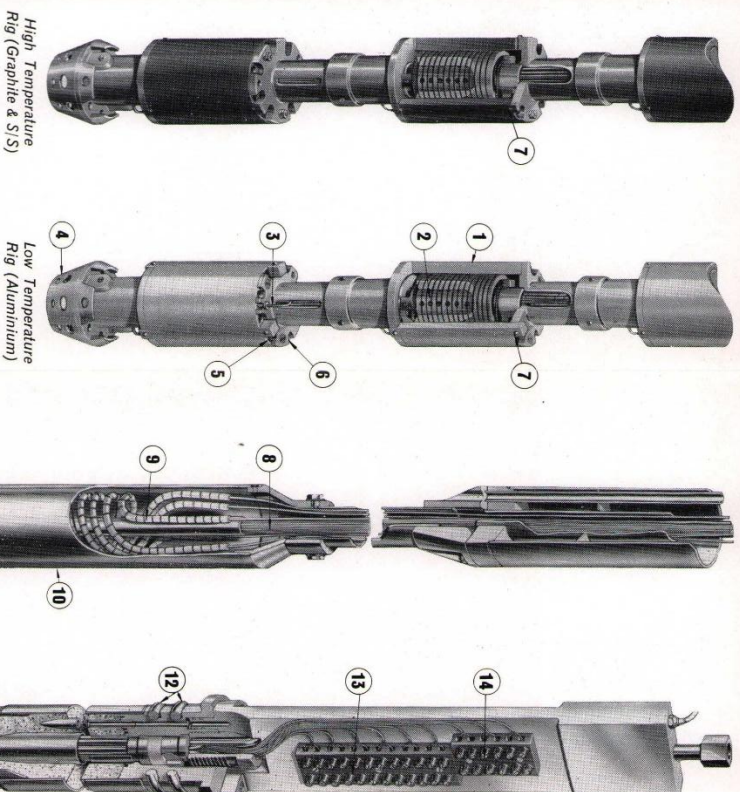
Rig installed in
mark III F.E. in Reactor



A

B

C



1. SPECIMEN MAGAZINE
2. HEATER
3. THERMOCOUPLE
4. GUIDE CONE
5. SPECIMEN POCKET
6. MONITOR POCKET
7. LOCATING SPIGOT
8. THERMOCOUPLES
9. HEATER LEADS, THERMAL EXPANSION COIL
10. EXPANSION COIL CHAMBER
11. RESIN/IRON SHOT SHIELDING
12. "O" RING SEALS
13. THERMOCOUPLE TERMINAL STRIP
14. HEATER TERMINAL STRIP

A

B

C

Rig ready for
installation
in Reactor

