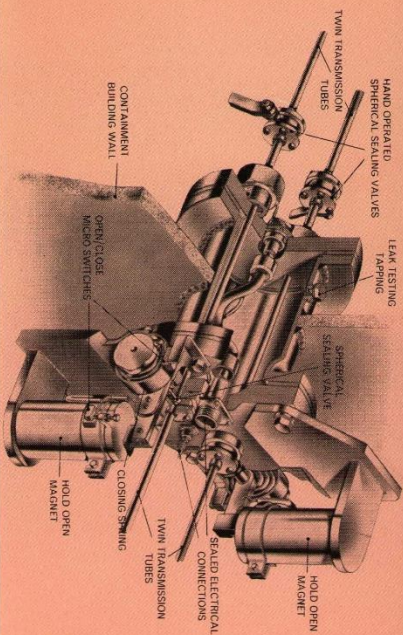




IMPORTANT DATES IN THE PROGRAMME

Detail design was commenced in July 1961 and all items were delivered to site by the end of February 1962. Erection started during February 1962 and was complete by the end of March 1962. The in-pile element was loaded in May 1962 after problems associated with the seals at the point of containment building penetration were solved. The equipment was handed over to the experimentalist for inclusion in his apparatus at the end of May 1962.

GENERAL DESCRIPTION

The specification required that natural metal samples of about 0.030 gms to be irradiated in DIDO for periods up to 40 minutes, and then loaded into the experimentalist's apparatus about 150 ft away within 5 seconds of being removed from the neutron flux.

The equipment provided consists of:

1. A Send/Receive Station; 2. A Control Panel; 3. Transmission Tubes; 4. An in-pile element.

The method used is to blow the sample in by means of very pure compressed nitrogen.

As the delivery time is so short, and the carrier and sample active, automatic unloading is employed. The send/receive station is mounted directly on the experimentalist's apparatus and when the carrier returns from the in-pile element with the active sample, a plunger impinges on the centre spindle of the carrier, pushing it through the surrounding sleeve, allowing the sample to fall into the analysing machine.

The instrumentation is of simple design, consisting of:

- (a) A thermocouple attached to the tip of the in-pile element coupled to a high temperature warning.
- (b) An indication of the carrier's position in the in-pile element.
- (c) An indication of the carrier's position when in the region of the containment building shell, the latter two indications being effected by change-over lights monitored by pressure tapplings, which are, in turn influenced by the open or closed state of the building seal valves.

DATA

Experimental facility	..	..	..	4H4 hole in DIDO
Thermal flux in region of sample	..	..	..	1.5×10^{14} at 15 MW (estimated)
Atmosphere:	inside transmission tubes:	..	..	very pure nitrogen
	inside reactor thimble:	..	..	carbon dioxide
Cooling of tip of in-pile end	..	..	..	By conduction to the reactor thimble and thence to the heavy water
Sample temperature	..	..	..	200 C (estimated)
Sample heating	..	..	..	Nuclear only
Reactivity absorbed	..	..	..	Negligible
Sample size and material	..	..	..	2 mm. dia. ~ 0.030 gms of various natural metals

EXPERIMENTAL PROGRAMME

This is essentially a "self service" facility, and as such its use is not committed to any single experimental programme. Although a useful service to the experimentalist is already provided by the equipment, development of the system has by no means reached its limit. Proposed extensions to the plant include a change-over station and a more flexible design of load/unload station.

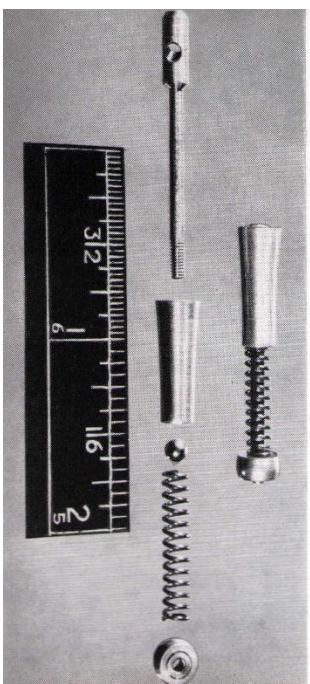
Containment Building Penetration (above)

A six inch diameter tube flanged at the ends passes through a hole in the containment building, and is welded into place. Short lengths of transmission tubing with flanges welded to them pass through this tube. One flange of each transmission tube together with the stainless steel sealing valve is bolted to the flange of the above 6 in dia. tube, the mating faces being sealed with "O" rings. The other end of the transmission tubes pass through a stuffing box type of gland sealed with a mastic compound.

The whole of the sealing valve is made in stainless steel with the ball of the valve turning on PTFE seats, in the manner of a plug cock. Electrical power supplies are taken through the wall of the containment building through the same 6 in dia. tube by means of sealed plugs and sockets bolted to the flanges.

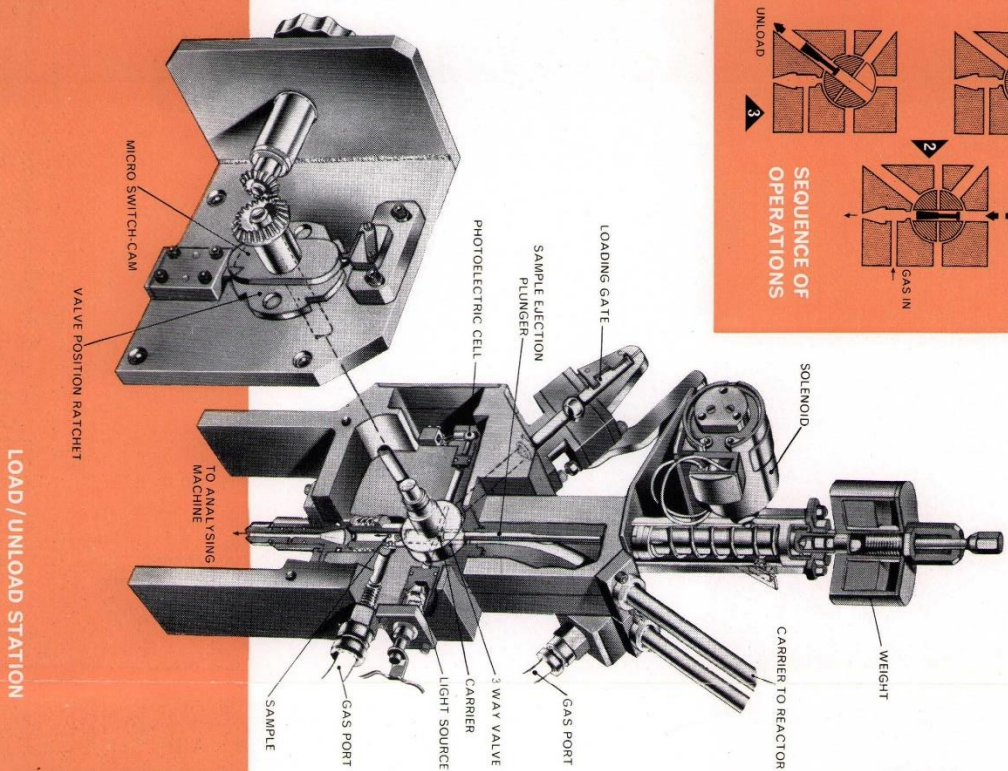
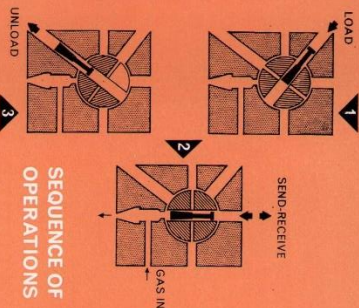
Carrier (below)

This consists of four parts and is used as an assembled item. The steel spring is compressed by the sleeve to expose the angled hole in the centre portion. The sample is placed in this angled hole by hand and the sleeve allowed to slide over the hole to retain the sample. The carrier returns to the load/unload station with the small head-like nut uppermost and rests on the sleeve. The ejector ram then falls, and the plunger forces the angled hole in the centre position out of the sleeve and the sample falls out into the analysing machine.

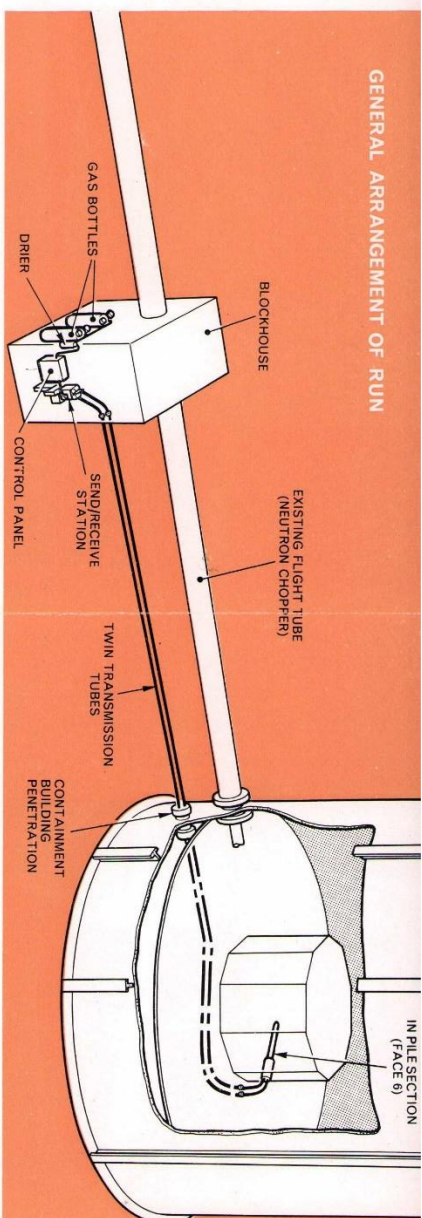


Dido fast rabbit

—used for providing small quantities (~0.030 gms) of high specific activity isotopes with short half-lives for nuclear physics molecular beam experiments.



LOAD/UNLOAD STATION



GENERAL ARRANGEMENT OF RUN

The Load/Unload Station

This unit, consisting of a three-way valve and a sample ejection mechanism, is mounted directly on to the Cambridge University Molecular Beam Machine.

The three-way valve rotates in a horizontal plane and has three positions:—

(1) Load Carrier into the station, (2) Send/Receive the carrier to/from the reactor, (3) Unload Carrier from the Station.

The spindle of this valve is approximately $\frac{1}{4}$ in dia, and has two intersecting holes of $\frac{1}{4}$ in and $\frac{1}{8}$ in diameter diametrically through it. The send/receive position a beam of light passes through the smaller hole to impinge on a photocell.

The operation of carrier ejection is initiated from the interruption of a beam of light normally incident across the carrier position. This is interrupted when the carrier arrives ready for ejection. Actual ejection is effected by a mechanism consisting of a spring loaded plunger

normally held cocked by a catch. This catch is released by the solenoid when the carrier arrives back at the load/unload station, obscuring the light beam impinging on the photocell. The plunger compresses the spring on the carrier and the sample falls into the molecular beam machine.

In-Pile Section

This consists of a shield plug with two aluminium tubes passing through it, joined together to form a return bend at their inner end. Also at the inner end is an expanding linkage operated from the out of pile end of the plug, used to press the tip of the aluminium tubes on to the reactor thimble so that the heat generated in these tubes, carrier and sample is dissipated through the thimble to the heavy water. A pressure tapping tube is welded to each flight tube near the join to indicate, by a rise in pressure, when the carrier has arrived at the in-pile end. A thermocouple is located in a pocket on each flight tube near the tip.



IN-PILE SECTION