Data Continued

CORE

Boundary dimensions of active core:—34″ x 28″ x 24″ high.
Lattice:—5 rows viz. 4, 6, 6, 6, 4
6″ pitch
Contained in Reactor Aluminium Tank 6′ 7″ dia. x 10′ $10\frac{3}{8}$″ deep
Aluminium 99.8% purity

MODERATOR & COOLANT

Heavy water Total investment 10 tonnes
Flow rate at 10 MW 860 lbs./sec.
Velocity through fuel 12 ft. per sec.

REFLECTOR

Graphite Segmental blocks, lead bound
Radial thickness 12″

FLUX

Maximum thermal neutron flux in fuel @ 10 MW $1{\cdot}7 \times 10^{14}$ $n.cm^{-2}.\ sec^{-1}$.

CONTROL

Coarse Control Arms 7 in number
Signal Arm: 4′ 8″ long
Normal maximum area of cadmium in core 13,300 cm^2
Reactivity worth:—26.8%

Fine Control Rod 1 in number
Maximum area of cadmium in core 205 cms^2
Reactivity worth:—0.5%

Safety Rods 2 in number
Maximum area in core 1600 cm^2 (2 rods)
Reactivity worth:—1.4% (0.7 each)

SHIELDING

Top
$\frac{3}{4}$″ stainless steel: 2 mm cadmium: 4″ water cooled lead: $\frac{3}{4}$″ mild steel: 3′ 9″ iron shot concrete: $1\frac{1}{2}$″ stainless steel

Annular
$\frac{1}{2}$″ mild steel: 2 mm cadmium: 4″ water cooled lead: $\frac{3}{4}$″ mild steel: 3′ 3″ iron shot concrete

Sides
$\frac{1}{4}$″ Boral: 1″ mild steel: 4″ water cooled lead: 1″ mild steel: 5′ 6″ Barytes concrete (min.): 1″ mild steel

Bottom
$\frac{1}{4}$″ Boral: 2″ mild steel: 4″ water cooled lead:—1″ mild steel: 4′ Barytes concrete

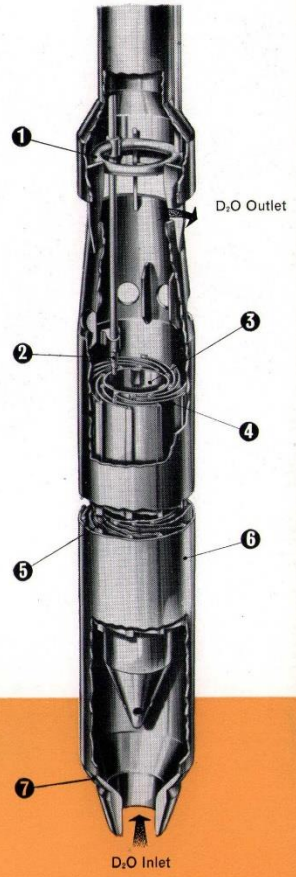
OVERALL SIZE

20′ square x 34′ 6″ high with 3 floor levels

CONTAINMENT BUILDING

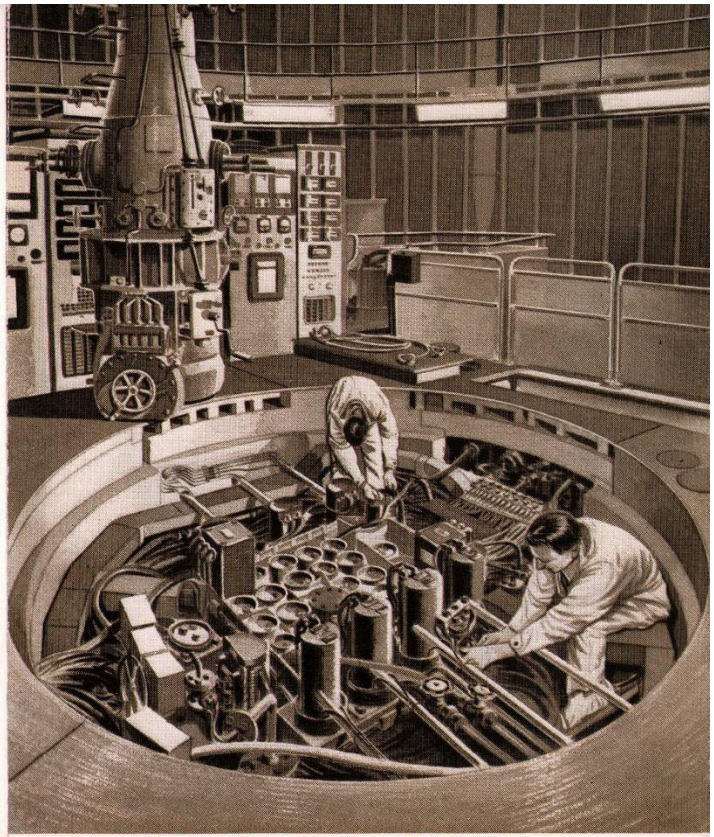
Steel building, cylindrical, 70′ diameter x 75′ high x $\frac{1}{2}\frac{3}{2}$″ thick
Normally kept at $\frac{1}{4}$″ water gauge below atmospheric pressure.
Built to withstand 7.5 p.s.i. internal pressure

1. Emergency cooling Spray Nozzle
2. Thermocouple Tube
3. Central Hole which will accommodate a 2″ experimental thimble
4. Fuel Plate
5. Inner aluminium tube
6. Outer aluminium tube
7. Spherical seat



Fuel Element Mk III

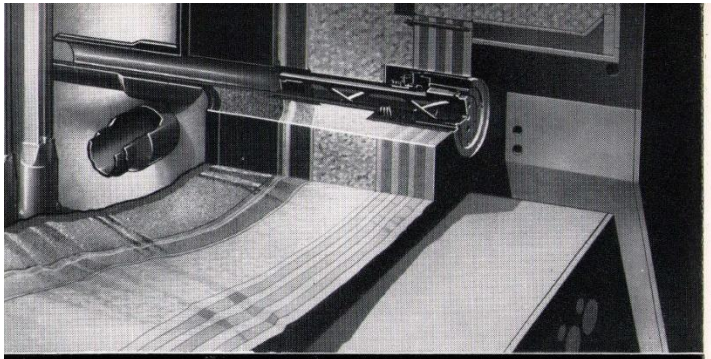
I.S LEAFLET No. 29138!



Pluto

HEAVY WATER REACTOR

ATOMIC ENERGY RESEARCH ESTABLISHMENT. HARWELL



TYPICAL HORIZONTAL FACILITY

Purpose

To test fuels, coolants and materials, and prototype systems for possible future reactors.

To produce high specific activity isotopes for medical and industrial uses.

To further research in nuclear and solid state physics, chemistry and metallurgy.

Data

OPERATION

First Critical Oct 25th 1957 First to full power March 1959
(Normally operates at 10MW)

FUEL

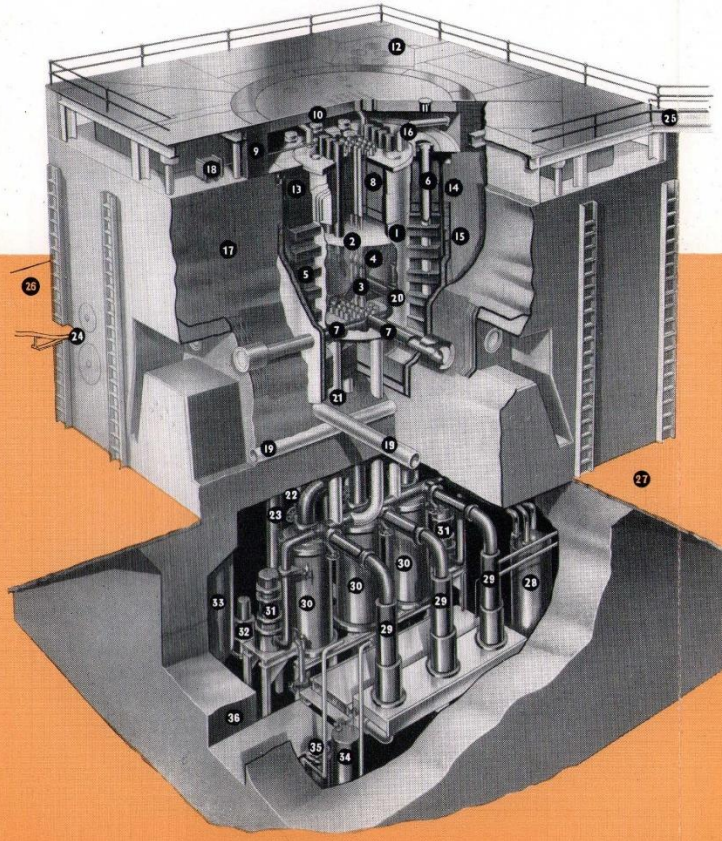
Enriched Uranium—Aluminium Alloy
In the form of plates of 99.5% purity Aluminium—Uranium Alloy— aluminium sandwich, with closed ends, approx., 24" long x 2⅞" wide x .058" thick.

Geometry. Two types are in use.

Mk. II Box Type
2⅞" x 2⅞" cross section 10 parallel plates with spacers.
Plates have curvature of 5½" radius

Mk. III Annular Type (with central irradiation facility)
4" o/d 2" i/d
10 plates curved radially between the two tubes
Curvature 1½" radius

Total Investment—26 elements giving 2.99 Kg.
Typical loading 14 Mk. II elements, 12 Mk. III elements.



PLUTO HEAVY WATER REACTOR

Key

1 Reactor Aluminium Tank
2 Heavy Water Level
3 Fuel Element
4 Coarse Control Arm
5 Graphite Reflector
6 Experimental Hole in Graphite 4 in. Dia.
7 Experimental Holes in Heavy Water 7 in. Dia.
8 Aluminium Tank Top Shield
9 Cast Iron Brick Wall
10 Reactor Top Plate
11 Cast Iron Shield Plug
12 Storage Holes
13 Annular Top Shield
14 Reactor Steel Tank
15 Lead Shield (Water Cooled)
16 Helium Balance Pipe
17 Main Biological Shield
18 Fine Control Rod Driving Motor
19 Experimental Loop Return Hole
20 Heavy Water Outlet
21 Heavy Water Inlet Pipe
22 Light Water Cooling Inlet Pipe
23 Light Water Cooling Outlet Pipe
24 Ion Chamber Holes
25 Bridge
26 Movable Floor
27 Operating Floor 15 ft. 6 in. Level
28 Heavy Water Partial Dump Tank
29 Heavy Water Circulating Pump
30 Heavy Water Heat Exchanger
31 Emergency Shut-Down Pump
32 Liquid Level Pump
33 Heavy Water Storage Vessel
34 Heavy Water Drain Tank
35 Ion Exchanger
36 Door in Face 3