a considerably higher rate has been observed on clean platinum and nickel than on clean glass, it is clearly too early to say whether this effect is due to the different type of interatomic forces or to more macroscopic features of the surfaces. A more detailed description of the work will be published in the near future.

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The D—D Reaction as a Standard Neutron Source

THE first of the two possible D—D reactions

$$\begin{aligned} D_1^2 + D_1^2 &\rightarrow He^3 + n \\ &\rightarrow H^3 + H^1 \end{aligned}$$

has long been used as a source of mono-energetic neutrons. To use it as a standard source of neutrons requires either the counting of all the neutrons, using, for example, a water-tank method, or the counting of the helium-3 particles, which is difficult because of their very short range. But if, with given conditions, the ratio of the number of helium-3 particles to the number of hydrogen-3 or hydrogen-1 particles from the second reaction is once found, then the neutron flux may afterwards be determined merely by counting the number of hydrogen particles, which is much easier owing to their greater range.

Experiments were performed to find this ratio using a copper block as a target. The block was bombarded with a deuteron beam accelerated from a radio-frequency ion source using a voltage-multiplying circuit. With a 100-μ amp. beam, a counting-rate of 1,000 per minute was observed in a solid angle of $4\pi \times 10^{-4}$ radians from the deuterium driven into the target.

The counting of the helium-3 particles was made possible by the use of the thin silica windows of thickness equivalent to 0·2 mgm./cm.^{2} of air, described by Thonemann[1]. The charged particles emitted at 90° to the beam passed through this window into the first of two proportional counters. At a pressure of 11 cm. of mercury (10 : 1 argon – alcohol mixture) the helium-3, hydrogen-3 and hydrogen-1 nuclei gave pulses of relative magnitude 12 : 4 : 1 respectively. By using a pulse-amplitude selector, the helium-3 and hydrogen-3 peaks could be completely separated, and the incomplete separation of the hydrogen-3 and hydrogen-1 peaks would not introduce errors exceeding 1 per cent.

The second counter was isolated from the first by means of an aluminium window (thickness 4 mgm./cm.^{2}) sufficiently thick to stop the helium-3 and hydrogen-3 nuclei. The protons counted in this were used to monitor the beam, and the equality (within the statistical error) of the proton and triton counts in the two chambers when two side-on counters were used served as a check on the accuracy of the experiment. This equality is demonstrated by the following figures :

Energy in keV.	80	110	140	160
Ratio H^3/H^1	1·01 ± 0·04	0·95 ± 0·06	1·01 ± 0·03	1·02 ± 0·03

Three different sets of experiments using different counters, and in one case an aluminium instead of a copper target, gave consistent results.

The ratios of the number of helium-3 particles to the number of hydrogen-3 particles at different incident beam energies were found to be :

Energy in keV.	70	80	90	100	110	120
He^3/H^3	0·86	0·89	0·906	0·92	0·926	0·96
Standard statistical error	±0·02	0·03	0·01	0·01	0·01	0·03

Energy in keV.	140	160
He^3/H^3	1·00	1·02
Standard statistical error	±0·01	0·03

As the distribution of deuterium in the target is not known, absolute cross-sections cannot be obtained using this type of target. Preliminary runs with a gas target at 120–160 kV. do not show any significant deviation from the above results.

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Mechanism of Ignition by Local Sources of Heat

THE conditions under which combustible materials may be ignited by contact with hot bodies have been the subject of intensive investigations, mainly with the object of determining the minimum temperature of the body necessary for ignition. Experiments have recently been reported by Jones[1] in which the energy necessary to ignite certain deflagrating solids by means of a hot wire embedded in them was measured, the wire being heated by means of an electric current maintained for a limited time. The experiments showed that a definite amount of energy must be supplied to the wire for ignition to result, this quantity decreasing as the rate of supply increases, but still remaining finite even when the rate of supply is infinite, corresponding to the instantaneous generation of heat in the wire.

The use of wires of different materials indicated that under conditions where it was supplied instantaneously, the energy necessary for ignition consisted of two parts, one part being transferred to the solid and the other part remaining in the wire. Over the range of diameters considered, 1×10^{-3} cm. to 5×10^{-3} cm., the energy transferred to the solid was constant, but that remaining in the wire was proportional to the thermal capacity and equivalent, therefore, to a constant temperature of wire at ignition. The critical energy transferred to the solid, and the temperature of the wire at ignition, are dependent on the nature of the solid but independent of diameter over the above range.

The mechanism of the ignition process suggested by these experiments is that if a certain quantity of heat is generated in the wire instantaneously, thereby raising its temperature to some high value, ignition will occur when a definite quantity of this heat has been transferred to the surrounding medium, provided