NEW PATENTS by ALFONS PUISHES

In this Section of NUCLEAR APPLICATIONS we briefly describe some recently issued patents which we think are particularly interesting. The patents themselves, which contain all the detailed descriptions of the inventions, may be obtained from the Commissioner of Patents, Washington, D. C. for 25c each. They also may be read in patent libraries in major cities.

CONTINUOUS PURIFICATION of the nuclear fuel made possible by continuous removal of fission products from a homogeneous thermal-power reactor. This is applicable to UO_2 or ThO_2 fuel suspended in H_2O or D_2O and is made possible by utilizing fuel particles averaging 1 μm in size (0.8 μm - 15 μm), insuring stable suspension and causing a very high percentage of fission products to leave the fuel particles and enter the carrier liquid. Continuous bypass purification of the carrier liquid is then effected by conventional means. 3 159 548, J. J. Went, Stichting voor Fundamenteel Onderzoek der Materie, Netherlands.

A BENZINE-MODERATED AND -COOLED power reactor made practical and economical by operating reactor at supercritical pressure and employing novel full stream removal of the objectionable degradation products formed in the reactor. Thermodynamic advantages of the inexpensive benzine working fluid at practical temperatures and pressures are realized without encountering earlier disadvantages. Turbine efficiencies of over 40% are indicated. 3 162 580, J. F. Block, W. J. Sweeney, F. T. Barr, Esso Research and Engineering Co.

COMPACT MOBILE NUCLEAR BOILING-WATER POWER PLANT providing 10 MW/ft^3 and 2 000 MWd/ft^3. This is made possible through use of epithermal neutrons produced by fuel elements of zirconium hydride and enriched uranium and by a borated zirconium hydride shield and a rotatable nickel reflector. 3 164 525, J. R. Wetch, H. M. Dieckamp, M. V. Davis, North American Aviation, Inc.

MONITORING THE POWER LEVEL OF A NUCLEAR REACTOR without the use of instruments which must penetrate the reactor vessel and core, as is the case with thermopiles and ion chambers, or without the need of shutting down the reactor, as is the case with foils.

Method and apparatus utilizes a long small-bore tube or collimator positioned externally to the reactor vessel and axially aligned with a radiation source within the core at the location sought to be monitored. Bore of the collimator directs particles, usually fast neutrons, to a detector connected to an indicating instrument. Thick shell of collimator attenuates neutrons from other directions, making reading on instrument proportional to intensity of neutrons traveling directly into collimator and hence the power level of their source. 3 165 446, S. Untermeyer II, General Electric Company.

GRAPHITE-MODERATED GAS-COOLED REACTOR WITH REMOVABLE CORE. Special metal container surrounds core and is sealed to pressure vessel by a frangible seal weld. Specially positioned shielding protects personnel when loosening necessary bolts, breaking seal weld, refastening and rewelding, thus permitting safe replacement of entire core. 3 159 549, R. V. Moore, S. Hackney, UKAEA.

RESEARCH OR TEST REACTOR producing a high neutron flux without excessively hot channels within the core. A piston-activated mechanism produces relative reciprocating motion between core and reflector thereby shifting the active zone or location of chain reaction longitudinally to different parts of the core and avoiding overheating while producing high fluxes. 3 165 447, R. M. Stephenson.

RADIOACTIVITY SOURCE AND DETECTOR PROBE for measuring material properties utilizing a movable radium-beryllium source in combination with a plurality of counters located in parallel on either side of source. Counters are gas filled, and gas spaces are interconnected through a manifold thereby equalizing consumption of neutron absorbers and increasing life of counters and facilitating maintenance. 3 159 745, A. G. Schrodt, P. Shevick, Nuclear-Chicago Corp.

REACTOR SAFETY CONTAINMENT utilizing chemical absorbing means for relieving pressure, eliminating hazard of dispersal of radioactive materials without use of a huge pressure vessel. Materials which absorb moisture endothermically are located in a sealed container inside a relatively small containment vessel and are automatically exposed to the atmosphere inside the vessel upon the occurrence of an accident. They simultaneously absorb water vapor, decrease temperature, and liquefy gaseous products, thus preventing creation of excessive pressures. 3 158 546, R. Cordova, Kaiser Industries Corp.

A NEUTRON CONVERTER. Neutrons from any available source are first thermalized by passing through paraffin in which is positioned a suitable target, e.g. one of the lithium-deuterium type, which emits fast monoenergetic neutrons at an angle and projects them against the object to be irradiated. 3 157 790. R. L. Callaway, Lockheed Aircraft Corp.

SELF-SUSTAINING THERMONUCLEAR FUSION reaction produced in an apparatus which utilizes two oppositely positioned linear accelerators. Ionized plasma masses of deuterium and tritium are accelerated and caused to collide in a shielded space between the accelerator outlets producing alpha particles and neutrons. Useful energy is trapped in the shield and removed by a heat exchanger. The necessary "pinch effect" is produced by the magnetic field of the accelerators. 3 155 592, S. Hansen, G. F. Bonardi, Litton Systems, Inc.

BOILING HOMOGENOUS REACTOR with a boiling core section (inner zone) and one or more annular reflector sections (outer zone) situated between the core and the pressure vessel shell separated by a zirconium tank. Condensate returning from heat exchanges goes back to the core by way of the reflector. Pressure is equalized between zones by a common vapor space above the zirconium tank. Greater safety and better neutron economy are indicated. 3 166 480. O. Lindstrom, Allmanna Svenska Elekriska Aktiebolaget, Sweden.

RADIOACTIVE DEVICE for measuring physical changes in materials requiring no physical connection between the materials and the measuring instrument. Transducer utilizes any of several well-known radioactive source materials together with compatible target materials to emit secondary radiation. Source and target are disposed so as to vary their distance apart in response to physical changes in materials and hence vary the secondary radiation emitted. The latter may then be measured, at a distance, by use of standard detectors. Various adaptations permit the remote measurement of the effects of temperature, pressure and strain on materials. 3 164 722, A. T. Biehl, G. A. Linenberger, USAEC

DIRECT ELECTRICAL ENERGY FROM ELECTROCHEMICAL FUEL CELLS utilizing heat from nuclear reactor. Steam is circulated through nuclear reactor at very high temperatures over a platinum catalyst, partially dissociating into H_2 and O_2. Undissociated steam is employed for power generation in essentially conventional manner. Potential electrochemical energy of H_2 and O_2 is converted into direct current in a cell, and heat which is freed is utilized in the cycle. High over-all net efficiencies are claimed. 3 155 547, M. Siebker, L & C Steinmuller, G.m.b.H., Germany.

NUCLEAR REACTOR WITH MOVABLE CORE. Rugged fuel element, control rod, and core housing construction makes possible mounting of core on movable carriage and suspending in a swimming pool of oval configuration making possible movement of core from one end of tank to other. Variably shielded fast-neutron irradiation room is situated just outside one end of swimming-pool tank; slow-neutron room is at opposite end. A removable radiation shield is located across center of tank midway between rooms. Combination offers great flexibility in performing experiments and permits access to one irradiation room while other is in operation. 3 156 624, C. E. Clifford, H. R. Zeitlin, K. Antonsen, General Dynamics corp.