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 50¢ each. They also may be read in patent libraries in major cities.

New accelerator concept. A device and method for accelerating any charged particles either in linear or curved paths by the use of direct-current accelerating potentials. Called the "DC-TRON," it employs a series of either straight or curved shielding tubes with gaps between ends and accelerating rings on opposite sides of each gap. Independent sources of direct-current potential across each set of rings provide a combined electrical field across the gaps, which produces successive acceleration of charged particles as they enter the field. Approach to relativistic velocities is indicated without the need for construction of gigantic machines, use of Klystrons, and other expensive and cumbersome devices. 3 218 562, J. T. Serduke.

Nuclear rocket engine. Gaseous fissile material, such as uranium hexafluoride, is introduced into a chamber through a nozzle concentric with a toroidal nozzle for hydrogen working fluid. General arrangement makes possible longer retention and more efficient utilization of critical mass of fissile material. Specific impulses of several times those of chemical rockets and three times those of conventional nuclear rockets are indicated. 3 202 582, F. E. Rom, NASA.

Nuclear thermionic converter. A novel cylindrical nuclear fuel element uses the cladding as the cathode of a converter. The anode is a concentric cylindrical shell surrounding the fuel element, with the space between filled with alkali metal or helium. Ionization from fission, augmented by high ambient temperature, permits flow of electrons between cathode and anode, and useful electric current is available through connections at ends of tube bundles. 3 201 619, C. H. Gleason, G. R. Feaster, Westinghouse Electric Corporation.

Thin-walled reactor vessel. A boiling-water reactor vessel is located in a steel-lined heavy prestressed concrete vault, with a gas space surrounding it. Steam pressure in the reactor and gas pressure in the gas space are equalized through an interconnecting line. Provision is made for preventing steam entering the gas space or gas entering the reactor. 3 205 145, P. H. E. Margen, Aktiebolaget Atomenergi (Sweden).

Smaller reactor containment vessel. The upper part of this cylindrical containment for a boiling-water reactor is separated from the reactor by a horizontal perforated-steel wall. The perforations are covered by a thin membrane, or a series of rupture discs; the containment vessel holds a large pool of water above the reactor. A pressure rise, caused by reactor or pipe failure, ruptures the membrane or discs, flooding the reactor area, thus condensing steam and preventing excessive pressure in containment. 3 207 671, H. Kornbichler, Licentia Patent-Verwaltungs G.m.b.H. (Germany).

Brazing aluminum to a ferrous metal. The method indicates the possibility of a strong joint between aluminum and steel pipe. Steps include degreasing, cleaning, dipping, applying brazing alloy, and heat treatment. 3 205 573, R. E. Seal, R. R. Shellman, Dominick Monaco.

Pressure-tube reactor with variable reflector control. Fueled pressure tubes are located in a heavy-water moderator tank. A reflector tank is positioned around the moderator tank. Variation of the level in the moderator tank provides control, and combination indicates improved operation. 3 211 623, S. N. Tower, Westinghouse Electric Corp. (See also **Variable moderator reactor.** 3 042 595, J. Cobb, C. M. Rice, W. L. Ross, K. W. Sauer, American Standard Corp.)

Removal of radioactive strontium and cesium from milk. Contaminated milk is treated with a cation-exchange resin substantially saturated with calcium, potassium, and sodium ions. Preferred resin is prepared by treating normal resin with chlorides of the metals and then washing free of chlorides. The calcium, potassium, and sodium ions in the resin should be in substantially the same proportions as in milk, i.e., 1:1.33:0.42 by weight. 3 207 607, B. B. Migicovsky, Canadian Patents & Development Limited (Canada). (See also 3 194 663, T. R. Higgins, Chemical Separations Corporation, NUCLEAR APPLICATIONS, December 1965.)

Safety feature for reactor circulating system. A series of non-return valves is positioned around the inside of a reactor shell in the flow path of circulating water, and above the core. In the event of external failure of the circulating system, reactor core will remain flooded by action of these valves. 3 205 146, S. Hackney, R. P. Williams, UKAEA.

Internal jet pump for increased circulation of water in pressurized-water reactor. An hydraulic nozzle type of jet pump is positioned directly below the reactor core. The main circulating loop pump feeds into the jet, which is further disposed to suck water down the outside of the core and up through tubes augmenting the circulation through the core provided by the main pump. Adaptation for vessel propulsion is indicated. 3 202 584, M. Bogaardt, W. G. Bonsel, M. Muysken, W. W. Mijs, A. Bahbout, Reactor Centrum Nederland (Netherlands).

Improved core structure for high-power high-temperature gas-cooled reactor. Better stability and hydrodynamic balance are indicated by a novel core arrangement. A two-part bottom reflector and a two-part top reflector provide for horizontal gas passages between each part. Gas is fed horizontally over the top and then down around the outside of the core, through the lower horizontal gas passage, up through the fuel tubes, and out through the upper horizontal gas passage. The outlet pipe from the reactor is concentrically located within the inlet pipe. 3 207 670, P. Fortescue, F. R. Bell, General Dynamics Corp.

Two different superheating methods in a boiling-water reactor. Kluge uses a once-through boiling and superheating tube immersed in the cooler moderator in which the fuel elements of enriched uranium dioxide are located, surrounded by a vapor space and a ceramic (Al_2O_3) thermal insulation. Setterwall uses separate steam-generating and steam-superheating tubes both containing fuel elements; the superheating tubes partly protrude above the core of the reactor and are connected to a saturated steam dome. 3 206 372, H. Kluge, E. Fischer, Licentia Patent-Verwaltungs, G.m.b.H. (Germany); 3 211 625, M. Setterwall, Almanna Svenska Elektriska Atiebolaget (Sweden).

Heavy-water manufacturing process. Deuterium is catalytically separated from hydrogen in a high-temperature contact zone, and heavy water is separated from water in a low-temperature contact zone. Reaction in both zones is greatly aided by fission reaction in the contact zones. The catalysts are of conventional type. The fission reaction may be maintained by supplying extra neutrons from an outside source to a subcritical mass mixed with the catalyst, by locating the contact zones in a special reactor, or by making them an integral part of a power reactor. 3 206 365, E. O. Guernsey, Socony Mobile Oil Company, Inc.