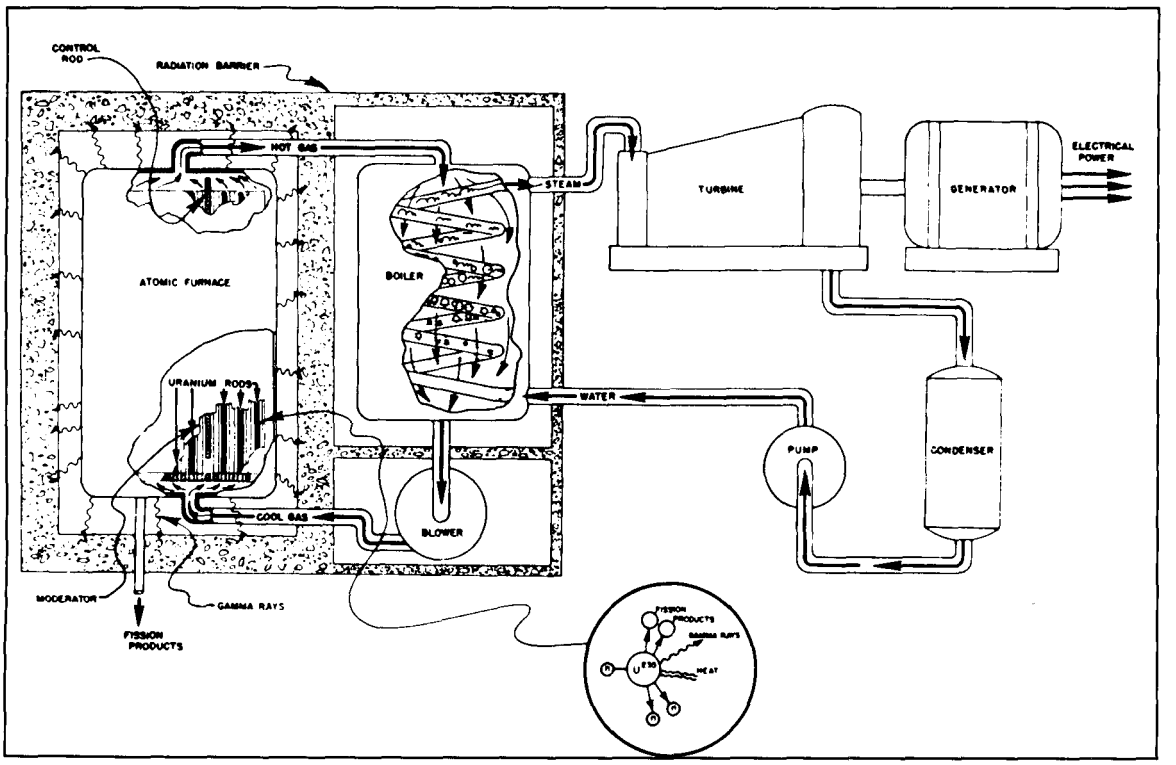

This 1946 sketch was the first released by the Laboratory to explain to the public the proposed use of a nuclear reactor to generate electricity.

flowed past the fuel plates. Concern arose that intense heat might warp the plates, bringing them in contact and restricting coolant flow. After pondering this potential problem, Wigner directed that the plates be warped, or curved, to improve their structural resistance to stress. Because warped plates could only bow in one direction, they would not constrict water flow.

Adjacent to the Materials Testing Reactor, Leverett's team planned to construct a plant to reprocess spent nuclear fuel, using the precipitation process developed during the war. In reprocessing, nuclear fuel is extracted from the spent fuel and separated from the accumulated fission products for reuse in reactors. Chemists John Swartout and Frank Steahly recommended that the "25 solvent-extraction process" replace the more expensive precipitation process. Their recommendation was accepted. Solvent extraction—separating one material from others dissolved in one liquid by transferring it into another liquid that cannot mix with the first—eventually became the standard method worldwide for reprocessing spent nuclear fuel.

Monsanto's principal concern was the Daniels Pile, named for Farrington Daniels who, at the Chicago Metallurgical Laboratory in 1944, had designed a reactor with a bed of enriched uranium pebbles moderated by beryllium oxide and cooled by helium gas. Some called it the pebble-bed reactor. In May 1946, the Manhattan Engineer District directed Monsanto to proceed with the design, leading to the construction of an experimental Daniels Pile to demonstrate electric power generation.

To accomplish this task, Monsanto brought Daniels from the University of Wisconsin as a consultant. The company also recruited engineers from industry and brought them to Clinton Laboratories, where they formed a Power Pile Division headed by Rogers McCullough. This division identified materials suitable for high-temperature reactors and developed pressure vessels and pumps, piping, and seals for high-pressure coolants; it also studied heat exchanger designs.

Because its staff was recruited largely from outside Clinton Laboratories, the Power Pile Division was never fully integrated into the organization. The project, moreover, encountered numerous design problems. Critics of the Daniels Pile contended that it would never become a practical power-generating reactor and that building a demonstration project wasted time and resources. After all, Logan Emlet and operators of the Graphite Reactor had demonstrated power production with a toy steam engine and generator that used heat from the air-cooled reactor. Why, critics said, should we pursue a more complicated and expensive power-production strategy?

"Solvent extraction eventually became the standard method worldwide for reprocessing spent nuclear fuel."