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is put to use, R. S. Kramer reported for Rocketdyne, a division of North American Aviation, Inc., Canoga Park, Calif., which is producing the nozzle.

Detailed information on this nozzle is still classified, Mr. Kramer said at the American Rocket Society meeting in Washington, D. C. He said that the trend in rocket nozzles has been toward shorter design, going from the bell-shaped nozzles, now used in all missiles, to the spike type, to a combination of the two.

The reverse-flow type will use a new idea in rocket nozzles and will likely be adopted for missiles in the future, he said.

• Science News Letter, 78:404 December 17, 1960

Rocket Fuel at Half Price

► THE LIQUID rocket fuel, hydrazine, can now be produced for less than half the present price.

Aerojet-General Corporation, Azusa, Calif., reported at the American Rocket Society meeting in Washington, D. C., that a nuclear reactor can produce hydrazine from ammonia at about 25¢ per pound. This process is being developed for the U. S. Air Force Air Materiel Command.

Uranium-235, suspended in ammonia, is used for the hydrazine production reactor. Fission fragments of uranium break up ammonia molecules, some of which recombine to form stable hydrazine.

Circulation is continuous with the stream becoming subcritical as it leaves the reactor. A yield of one molecule of hydrazine per 100 electron volts will produce an economical plant.

Experiments have exceeded this yield. Ammonia, hydrazine and uranium are drawn out of the reactor stream. A cyclone separator removes the uranium-235 and feeds it back into the reactor. Hydrazine and ammonia are drawn off for additional processing, and then separated. Fission fragments are removed and the ammonia is fed back into the reactor. The hydrazine is further decontaminated and stored.

• Science News Letter, 78:404 December 17, 1960

Improve Rocket Thrust

► A NEW PRINCIPLE can improve rocket thrust to make it as effective as nuclear fuels would without actually using nuclear fuel.

Donald J. Simkin of Ordtech Corp., Walnut Creek, Calif., chairman of a closed meeting on hybrid rockets at the American Rocket Society in Washington, D. C., told SCIENCE SERVICE that this principle can be applied to any chemical or nuclear engines used in rockets for rocket thrust. Details of the principle, worked out by scientists at Astropower, Inc., Long Beach, Calif., a subsidiary of Douglas Aircraft Corporation, are still secret, he said.

The principle, called HIFOX, will lead to expansion of thermo-dynamic barriers, or improve existing performance limits of rocket engines, when applied.

Mr. Simkin explained that the HIFOX principle operates between nuclear specific impulse (pounds of thrust per pound of propellant per unit time) and the chemical specific impulse.

• Science News Letter, 78:404 December 17, 1960

MILITARY SCIENCE

Pictures of "Little Boy" Released After 15 Years

See Front Cover

► PICTURES of the "little boy" atomic bomb dropped on Hiroshima, Japan, in 1945, and the "fat man" type bomb, detonated over Nagasaki, Japan, have now been released by the Department of Defense.

The "little boy" type bomb, seen on the cover of this week's SCIENCE NEWS LETTER, is 26 inches in diameter and 120 inches long. The first nuclear weapon ever detonated, it weighed about 9,000 pounds and had a yield equivalent to 20,000 tons of high explosives. The "fat man" type bomb is 60 inches in diameter and 128 inches long.

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