NUCLEAR PHYSICS

Superbombs Due for Tests?

Three or four superbombs will probably be tried. AEC research is now gleaning the basic information needed for the hydrogen bomb.

➤ THE big question about the superbomb —or superbombs—is how soon it can be built and tested.

Plans and research for superbombs have been in the AEC laboratory, if not actually on the drawing boards, for at least three years, possibly more.

There will probably be at least three or four superbombs tried. For there are several atomic reactions that have in them engaging amounts of mass that can be transformed into energy, if conditions such as millions of degrees temperatures and split-second reaction are fulfilled. For instance, there is the well-recognized combination of two atoms of deuterium, the D-D reaction, which is favored in the speculation because it happens at a lower temperature than most, a mere million degrees or so which an ordinary fission (uranium or plutonium) bomb could provide as a fuze.

Equally inviting in the tables of energies of disintegration of atoms (in any science library) are such reactions as that in which an ordinary atom of lithium is combined with an atom of deuterium (heavy hydrogen) to make one of the kinds of beryllium atoms and give off a neutron. This actually releases five times as much energy as the D-D reaction. Beryllium, another light metal, also could produce lots of energy if it combined with deuterium.

The scientists have many combinations to try. There is also a plentiful supply of these light chemical elements to use if the superbombs go into production—much more of them than uranium.

AEC Research

The Atomic Energy Commission through its researches on the nuclei (hearts) of light elements is getting the basic information needed for the hydrogen bomb. This is made clear in the seventh semi-annual AEC report to Congress.

The simplest of all interactions between atoms—two protons or hydrogen hearts smacking into each other—is occupying the time of two atom smashers at Berkeley, Calif. Scientists admit that they do not yet have a satisfactory mathematical description of the force between protons and that present theory must be modified.

Atoms of mass three, both of hydrogen and helium, are being produced at Argonne Laboratory, near Chicago, because they are so useful in investigations.

Interactions between protons, deuterons, tritons, helium 3 nuclei, and alpha particles are being studied. Deuterons, which are mass 2 hydrogen atomic hearts, reacting with each other provide the simplest energy-releasing reaction so far suggested as the basis of the so-called hydrogen bomb (See *SNL*, Feb. 4, p. 69). The fact that the report mentions them is considered interesting, although the so-called D-D reaction is not specifically mentioned.

Other innocuous-sounding experiments reported are aimed at understanding how atoms interact to form molecules. Hydrogen is being used because it makes the simplest of molecules. The three kinds of hydrogen, masses 1, 2 and 3, produce six different kinds of hydrogen molecules when they combine two and two. Scientists are catching the spectra (rainbows) of these various molecules to determine the motion of electrons within them. These motions are responsible for the inter-atomic forces which come into play to hold matter together or split it asunder.

Scientists can split an atom and manufacture matter heavier than any they had in the beginning. University of California accelerators have produced atomic "chips" consisting of three protons which have been glued immediately into another element, making it gain three mass units. This may find application in the manufacture of new kinds of elements of practical worth, just as plutonium is now manufactured out of non-fissionable uranium.

Science News Letter, February 11, 1950

NUCLEAR PHYSICS

Bomb Threat to Civilization

➤ "BEFORE deciding whether it should be made, the American people must be aware of the fact that a bomb 1000 times stronger than the Hiroshima bomb might easily destroy civilization."

This warning comes from Dr. Hans Bethe, of Cornell's Laboratory of Nuclear Studies, famous for his theory of atomic energy transformations that keep the sun and stars stoked. Dr. Bethe made his comment in response to a request for an evaluation of the supposed superbomb possibilities, and it was prepared before President Truman's Jan. 31 statement that superbomb work would continue.

"The D-D reaction is theoretically capable of releasing substantial amounts of energy," Dr. Bethe said. This reaction is between the hearts of heavy hydrogen, the atom of mass two called deuterium, a process first discussed 15 years ago and believed to be basic to the so-called hydrogen bomb.

"It requires high temperature comparable to the interior of the stars, but the required temperature is less than for any other nuclear reaction between charged particles," Dr. Bethe added.

"The only theoretically possible way to reach necessary temperatures on earth is use of the fission bomb as a starter, but whether the D-D reaction can actually be started this way is unknown."

This D-D reaction is not the same as Dr. Bethe's theory that explains the heat of the sun by a cycle of nuclear changes involving carbon, hydrogen, nitrogen and oxygen, leading eventually to the formation of helium. Dr. Bethe's theory is called "generally accepted" in the famous Smyth report of 1945.

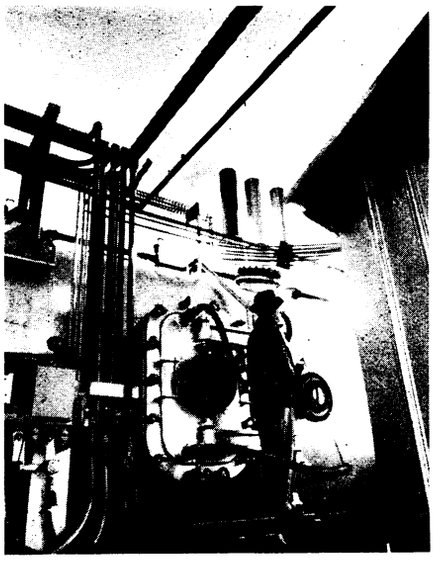
Both of them, as well as the fission bomb nuclear reaction, depend for released energy upon the conversion of a small amount of the mass into energy, according to Einstein's mass-energy equivalence.

Science News Letter, February 11, 1950

AERONAUTICS

Test Chamber Simulates Air Speeds and Altitudes

➤ TESTING chamber for ram-jet engines, in which air speeds of 2,600 miles an hour can be obtained and altitude conditions up to 80,000 feet simulated, was revealed by



TEST CHAMBER—The center section of the test chamber shows the access door and some of the lead-ins for instrumentation lines. The two hoses attached to the door are part of a cooling system which jackets the entire chamber with a layer of water.