PHYSICS

Powerful Atom Smasher

Plans for 15-billion-electron-volt accelerator, a "colossatron," are now being circulated. The proposed machine will develop five times as much energy as now available.

➤ THE WORLD'S most powerful atom smasher, a 15-billion-electron-volt "colossatron," can be built in about three years for $6,000,000 to $8,000,000.

Plans for the new giant atomic accelerator, which will mimic under man's control some of the power unleashed by cosmic rays, are being circulated among scientists for criticism by the design group headed by Dr. M. S. Livingston of Massachusetts Institute of Technology.

The proposed instrument, which the Atomic Energy Commission is being asked to build, uses the new, strong focusing principle worked out last year by a group of U. S. scientists. This will allow the "colossatron" to develop five times as much energy as the present world's largest atom smasher, the cosmotron at Brookhaven National Laboratory on Long Island, with an outside diameter of 75 feet.

The strong focus is developed by using many small magnet sections, rather than the larger ones now common, to focus the whirling atomic particles. The 15-billion range was chosen by the Cambridge Design Study Group, composed of scientists at Harvard University and MIT, because unleashing such energies would enable scientists to delve deeper into the heart of matter under conditions controlled by man.

The powerful cosmic rays bombarding earth from outer space have energies ranging from about two billion to several thousand billion electron volts. Where and when they strike, however, is not predictable, and their tracks are caught on photographic plates sent 20 miles or so above the earth only by chance. So to get a better picture of the atom, man is building more and more powerful atom smashers.

The cosmotron has operated at 2.3 billion electron volts, and is expected some day to reach 3 billion, at the very lowest level of cosmic ray energies.

Officially, the proposed 15-billion-electron-volt machine is known as an "aternating gradient focusing synchrotron." The strong focusing idea was worked out last year by Drs. Livingston, Ernest D. Courant, Harland S. Snyder and John P. Blewett of Brookhaven, and was first suggested by N. Christophilos, a Greek citizen. By this method, the size of the magnet to accelerate to a given energy can be reduced very considerably, thus saving considerable metal, time and money.

The machine will speed up protons, the hearts of hydrogen atoms and one of the building blocks of all matter. They will circle in a thin-walled metal tube, oval-shaped and only two by four inches in diameter. Diameter of the doughnut ring around which the cluster of protons is whirled would be 320 feet.

The ring consists of 48 sections of magnet, each 16 feet long, separated by gaps of five feet. Each magnet section has equal lengths of diverging and converging focusing fields. These magnetic fields act on the protons in much the same way that convex and concave mirrors, used alternately, act to focus light waves.

As the protons whirl around the circular path, electrodes, spaced 12 times around the ring, will kick the cluster to higher and higher velocities. Finally, as in all atom smashers, the protons will crash into the target under study.

The greater the energy of the bombarding particles, the more revealing such a smash-up is. By studying the disintegration products, scientists can learn new facts about the mysterious forces that hold atomic hearts together.

The U. S. scientists are cooperating closely with a European group known as the Council for European Research, Nuclear, or CERN, which is making plans for a 30-billion-electron-volt accelerator, using the same principle, to be built in Geneva on a site already donated.

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AERONAUTICS

Stratojet Bomber Acts As Flying Filling Station

➤ THE U. S. Air Force has a "convertible" jet bomber. It can rain bombs upon the enemy, or it can deliver fuel to its fellow bombers while they are streaking to or from enemy territory.

Boeing's B-47 medium bomber has been successfully converted for aerial tanker duty, Air Force Air Research and Development Command headquarters in Baltimore report. The B-47 Stratojet can be converted under field conditions into an aerial tanker and can be switched back for bombing duty easily.

Using an adaptation of the probe-and-drogue in-flight refueling system, the bomber lowers a flexible hose with a funnel-like device called a "drogue" on its end. To refuel while flying, another Stratojet slips a probe-like tube into the dangling funnel. Then fuel is pumped from the tanker into the receiving bomber.

The refueling fixtures are installed in the tanker ship's bomb bay. Certain instruments are added to the cockpit to monitor the fuel transfer.

JET-POWERED TANKER—A Boeing B-47 Stratojet has been modified to make it an aerial refueling station, using a "probe and drogue" system. As shown in the photograph, the tanker airplane (right) trails a long hose, to the end of which is attached a funnel-like "drogue." The receiver airplane approaches the drogue, then engages the spear-like probe in its coupling mechanism, after which the fuel can be pumped.