sible kinds of bombarding particles has been increased to nine, in Prof. Karapetoff's scale, so that the varieties of the various impacts which can occur set up a great mass of data.

Prof. Karapetoff's new scale brings order out of this drudgery and forms a convenient tool for the experimental and theoretical physicist in his nuclear research. The scale gives all the theoretically possible transmutations of elements; quantum-mechanical computations and the experiment are necessary to decide on those which can actually take place.

Sun's Expenditure

To maintain the existing radiation pouring out from the sun it is necessary that each one of the trillions upon trillions of protons and neutrons contained in it must give out a photon of light every 20,000 years. Calculations of the sun's energy and estimates of its radiation production were presented by Dr. Arthur E. Haas, mathematical physicist of the University of Notre Dame, before the physicists' meetings.

Every second the sun liberates photons represented by an enormous number consisting of the figure 2 followed by 45 ciphers, or 2,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000 photons a second.

The total number of particles in the sun (the protons and neutrons) Dr. Haas estimates as consisting of 1.2×10^{57} particles, or a number represented by 12 followed by 56 ciphers.

It takes the sun about 20,000 years to liberate a number of photons equal to the number of particles it contains.

Once in 20,000 Years

"We must therefore assume," said Dr. Haas, "that each primordial particle contained in the sun experiences, at least in intervals of about 20,000 years, some reaction leading to the emission of a photon, or we must assume that extremely 'hard' primary photons produced in the interior of the sun split into a variety of softer photons on the way to the surface of the sun, or perhaps we must combine both assumptions."

Cosmic rays may be the most piercing and powerful of all radiation but one modern steam generating plant develops about the same amount of energy as do all the cosmic rays incident on the surface of the earth. Dr. Thomas H. Johnson of the Franklin Institute's Bartol Research Foundation estimated that the total cosmic ray energy striking the earth comes out to be about a million kilowatts. This is the same energy rating as the new steam generator plants of the South Philadelphia electric utility company.

The total number of rays striking the earth per second, said Dr. Johnson, is 8×10^{17}, or 800,000,000,000,000,000. This makes the cosmic ray current to the earth .13 amperes.

Science News Letter, March 5, 1938

PHYSICS

Harvard to Have Largest Cyclotron Atom Smasher

A NEW type cyclotron, a 100-ton atom-smasher that promises to yield the most accurate information ever obtained concerning atomic disintegration, will be put into operation at Harvard University this summer. It will be the largest of the twenty-odd such "big guns" now in use throughout the world in man's assault on the atom.

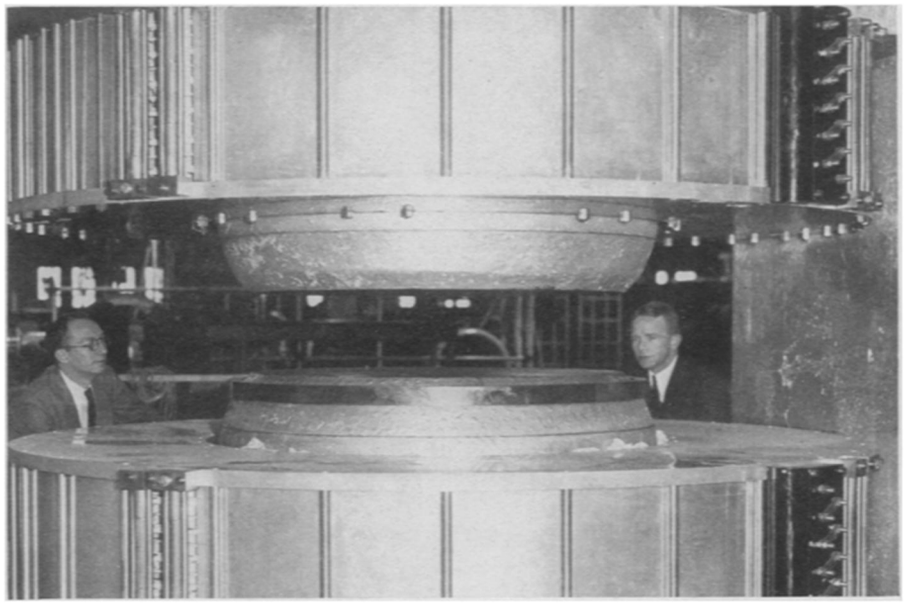
Major development in the Harvard apparatus is a special device that will enable the experimenters to use atomic bullets of only one known energy, a procedure that promises to permit far more precise and reliable quantitative measurements of the forces involved in atom-splitting than have heretofore been possible.

At the outset the Harvard cyclotron is expected to produce atom-smashing projectiles of about eight-million-electron-volt energies. Further development, however, is expected to enable the production of projectiles of much higher energies.

In direct charge of the cyclotron are four of Harvard's outstanding young physicists, Prof. Kenneth T. Bainbridge, Prof. Jabez C. Street, Prof. Harry R. Mimno and Dr. Roger Hickman. They have supervised the construction of the apparatus during the past year.

The new feature of the Harvard cyclotron, energy-control, is obtained by steering the stream of ions through a special magnetic field that attracts, or combs out, all the particles of a single, known energy content. Only these uniform projectiles are used in the bombardment and thus the energy needed to produce disintegration and the characteristic internal energies of the nuclei will presumably be accurately measurable. Other cyclotron experiments have used the entire stream of ions, the energy content of which may vary considerably.

Science News Letter, March 5, 1938



NEWEST ATOM-SMASHER

The Harvard University cyclotron is inspected by Prof. Jabez C. Street (left) and Prof. Kenneth T. Bainbridge.