energies as low as 10^{-10} eV, much smaller than was thought possible.

In a talk at the December APS meeting, Witteborn described a new, enlarged apparatus with a free-fall region 5 cm in diameter and 300 cm long. Preliminary results indicate that freely falling electrons experience the same gravitational force as electrons bound in a metal (in agreement with a recent theoretical paper by Leonard Schiff and M. V. Barnhill of Stanford). By passing a current through the walls of the drift tube a known uniform force smaller than gravity could be applied on the otherwise freely falling electrons. Comparison of the time-of-flight distributions taken with various applied forces demonstrated that the slowly moving particles were electrons and that no other net forces larger than $\pm$ 0.2 *mg* existed within the drift tube (where *m* is the electron's inertial mass and *g* is 980 cm/sec^2.)

To solve the more difficult problem of obtaining low-energy positrons, a source is being developed by John Madey, a graduate student. Positrons emitted from a radioactive source will be slowed down by multiple collisions with gas atoms. Witteborn notes that their experiment will be the first direct determination of the gravitational properties of antimatter.

Bevatron Shut Down 3 Months: Metal Fatigue in Alternator

Metal fatigue has cracked the dovetail on the rotor of a Bevatron alternator. Repairs will shut down the Berkeley 6-GeV proton synchrotron for at least three months. During routine maintenance in December, Bevatron technician W. B. Thompson found some indications that one of the poles had cracked; further inspection showed that the other Bevatron alternator also had cracked poles. Westinghouse is fabricating new parts for the alternator, which is expected to be running again around March.

The alternators, each rated at 46 MW, energize the large Bevatron magnet; they are pulsed about 10 times per minute. Similar alternators are used at Brookhaven, CERN, Argonne and NIMROD in the United Kingdom.

Last year metal fatigue on a NIMROD alternator caused a crack while the accelerator was running; the moving rotor grabbed the stationary stator and tore it to pieces. The damage took almost a year to repair. When PHYSICS TODAY spoke to Harold Vogel (who is in charge of the Bevatron power supply), he noted that the NIMROD fatigue failure occurred after only about 7 million alternator pulses, whereas the Berkeley machine, running since 1954, has been pulsed about 37 million times. The Brookhaven AGS, running since 1959, has already been pulsed 57 million times, because it pulses more frequently.

Brookhaven accelerator people, concerned over the possibility of metal fatigue in their own alternators, are studying the Bevatron failure. They have inspected the AGS alternator in detail and found no signs of fatigue cracks there.

Radiation-Damaged Hose Causes Fire at AGS

A fire at the Brookhaven AGS on 9 Dec., which destroyed the coils on one magnet and downed the accelerator for six days, is a symptom of the radiation damage that is becoming a serious problem at the facility. Because the accelerator is operated at 15 times its original design intensity, water hoses burst, magnet insulation turns a sickly greenish yellow and some of the AGS staff is being exposed to almost the allowable radiation limit. So we were told by Kenneth Green, chairman of Brookhaven's accelerator department. Green feels that the AGS in its present configuration cannot continue running at its average intensity, 1.5×10^{12} protons/pulse, for more than another year or so. However, he expects that the AGS conversion project (PHYSICS TODAY, September 1964, page 98) will soon relieve some of the radiation problems involving men and equipment.

Burst water hoses have occurred with increasing frequency at the AGS since the neoprene rubber hoses used to cool magnet coils last only two or three months in the intense radiation. To protect equipment from water damage, operating personnel had spread polyethylene sheets. On 9 Dec. a

water hose burst and aimed its spray directly at magnet G12. Water caused high-voltage insulation to deteriorate, arcing followed and "did a pretty good job of frying the coils on G12," Green says. Finally the fire ignited the protective polyethylene sheets.

Since G12 is the favorite target position at the AGS, the area was highly radioactive (10–20 roentgens/hour); so only a cursory inspection could be made the day of the fire (Friday). Riggers removed the concrete roof beams the same evening. By Monday a detailed survey could be made. Magnets G11 and G12 were a bit wet; so they were dried out. The insulation on G12 was gone, although its core was unharmed, and some of the copper bus in G11 was burned; both magnets were replaced by spares. Some of the O rings in the vacuum system were replaced also. Six days after the incident the AGS was again ready for a beam.

The modified AGS, which is expected to produce at least 10^{13} protons/pulse (with a pulse every second instead of every 2.5 sec), will have many pieces altered to avoid radiation damage and improve handling of radioactive components. (a) Magnet coils, now surrounded by neoprene cooling hoses, will instead be cooled by insulated copper tubing as far down as the AGS floor. Then, out of radiation's way, the copper will couple to rubber hose. (b) The vacuum system, now sealed with organic O rings that last 1–2.5 months, will have metal O rings. (c) Where radiation damage is heavy, so is the necessary maintenance. Once the AGS is modified, disconnecting a piece of equipment will take only a couple of hammer blows instead of the present lengthy operation with wrenches of every description.

. . . *also of Interest: Space Experiments*

J. Duthie and two associates from the University of Rochester have completed an expedition to Australia on which balloon-lofted spark chambers searched for extraterrestrial gamma rays. . . Explorer 33 shows the earth's magnetic tail extends beyond the moon, says Norman Ness of Goddard Space Flight Center. □