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The Big-Henry Cloud Chamber

After Carl Anderson and Seth Neddermeyer discovered the mesotron in the mid 1930's, experiments with elementary particles were continued by obtaining a huge 20-ton electromagnet that became known as Big Henry. The magnet was obtained from the San Diego Naval Station, where it had originally served as the inductor component of a Poulsen arc generator in an early spark-gap style radio transmitter. A 1914 Pierce-Arrow truck housed two 550 kw dc generators to power the magnet and provide the magnetic fields needed for momentum measurements. Frank Capra donated the truck unit, which had previously been used to power arc lights used on movie sets of the 1930's.

The Big-Henry cloud chamber was built and mounted in the magnet in 1948 with the special purpose of making simultaneous ionization and momentum measurements to identify the newly discovered V-particles (strange particles). This was accomplished by several modifications of previous chambers. Helium was added to the usual argon mixture in the cloud chamber. The resulting larger droplet spacing gave better droplet counting but required faster expansion time and low distortion of the tracks to retain the momentum measurements. This result was obtained with a self-contained chamber that compressed the chamber gas without an external comprssion chamber or push rods. High pressure on part of the cloud chamber piston was balanced with a vacuum on another part. A small high speed valve unbalanced the equilibrium to trigger a fast expansion. The isolation of the chamber also helped remove the distortions induced by thermal gradients in the chamber gas.

The most important picture obtained in the Big-Henry chamber was that of the cascade decay of an unstable elementary particle now called the Xi particle. Publication is in Physical Review, Vol.94, No.1,161-166, April, 1954. The enclosed glass plates are contact prints of the pictures of the cascade tracks that retain the high droplet resolution that has been lost in the reproductions in the article.

Initial suggestion of a cascade decay came from the Manchester group headed by Rochester and Butler, who dicovered the first of the heavy unstable particles. They found an event which was either a cascade, a heavy particle decaying into fragments one of which decayed again into a heavy fragment, or two lambda particles originating at the same origin and decaying independently. The first evidnce that the cascade hypothesis was correct was published in the reference cited above. Simultaneous momentum and ionization measurements permitted identification of the ionizing tracks in the successive decays of the cascade as well as a momentum balance that confirmed the cascade nature of the decays. Another event of similar nature was published a short time later by Fretter. A more detailed account of the cascade decay experiments with many references is given in R. W. Thompson's article in the book Progress in Cosmic Ray Physics, Vol. III edited by J. G. Wilson.

Eugene W. Cowan