

PHYSICS

Giant Navy Magnet to Become Atom-Smashing Apparatus

Built at Time of War for Wireless Telegraph Transmitter, Now to Provide Powerful Research Tool

THE GIANT, and now-obsolete electromagnet of the Navy's radio station has been shipped to Columbia University where scientists will turn it into one of the most powerful tools in the world for smashing atoms and learning new facts about atomic nuclei.

Built for wartime use, the 130,000 pound electric giant long lay dismantled in a field. On Dec. 14 a fleet of trucks took the many 5-ton sections to Columbia's physics department where a special submerged concrete bed—jokingly called the wading pool from its appearance—awaited its coming.

So large are the various sections of the equipment that a special sloping trench has been dug, down which the apparatus can be skidded into its basement laboratory. When assembled it will stand ten feet high.

Across the large pole piece—forty inches in diameter—Columbia scientists will be able to create intense magnetic fields tens of thousands of times stronger than those of the earth which keep compasses pointing to the north.

In technical terms, the magnet will have a magnetic field strength of from 10,000 to 12,000 gauss.

The resurrection of the Navy's electromagnet will bring into use another apparatus for possible experiments on atomic transmutation, artificial radioactivity and studies on the happenings within the cores, or nuclei, of atoms when they are bombarded with other atomic particles accelerated to high energy in the device.

Pioneer equipment in the field is the apparatus of Prof. E. O. Lawrence of the University of California which still holds the record for size, weighing 85 tons and having pole pieces with an effective diameter of 45 inches.

The California apparatus has as its essential part another wartime electromagnet built for, but never shipped to, one of the now-defunct Chinese governments. At the time of the war such huge electromagnets were planned and built for Poulsen quenched arc wireless telegraph transmitters, the latest development at that time. The advent of vac-

uum radio tubes has now rendered this type of equipment generally obsolete for radio communication.

Explaining the operation and usefulness of the equipment, Dr. George B. Pegram, professor of physics at Columbia University said:

"The large atomic particle accelerator which we plan to build from the Navy equipment operates on the scientific principles used in the cyclotron apparatus as designed and employed by Prof. E. O. Lawrence at the University of California.

"Essentially, charged particles, either protons, the nuclei of hydrogen atoms, or deuterons, nuclei of the isotopic heavy form of hydrogen known as deuterium, are introduced into the cyclotron apparatus.

Once inside the accelerating chamber, which looks like a large covered frying pan, they are bent by the strong

magnetic field existing across the pole pieces of the large electromagnet. Under the action of the magnetic field they travel round and round in a circular, or strictly, a spiral path.

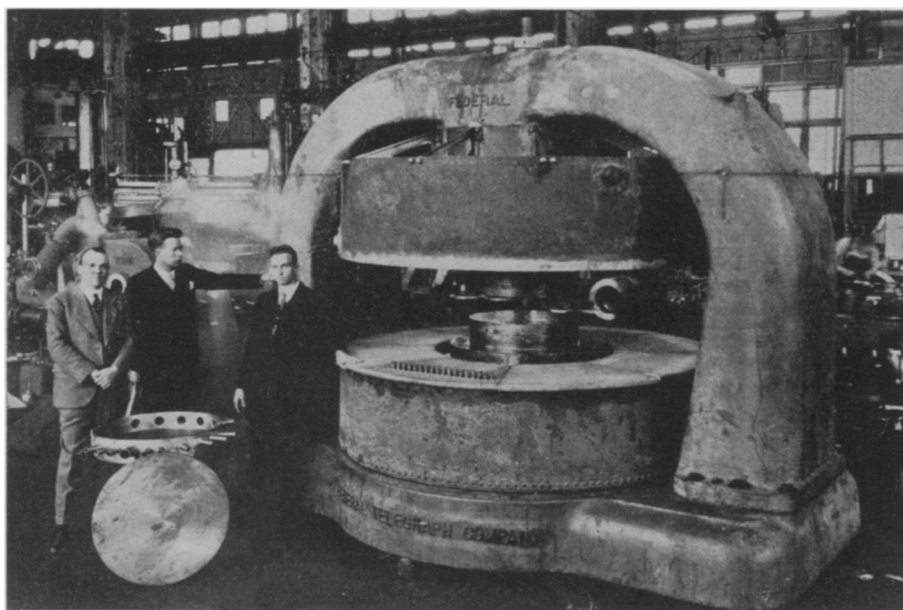
"Twice each trip around the circuit the charged particles are speeded up by several thousand volts potential provided and properly timed by auxiliary electrical equipment. These individual increases of velocity—often called electrical 'kicks'—ultimately raise the total energy of the whirling particles to very large values.

"In a few seconds and a few hundred trips around the circuit of Prof. Lawrence's apparatus, for example, the velocity and kinetic energy of the charged particles can be increased to several millions of electron volts.

"There are only a few other types of apparatus in the world which can create such high energy particles.

"The advantage to be gained by the use of an electromagnet with large pole pieces lies in the fact that with increasing energy at each revolution the accelerated particles spiral out from the center of the pole pieces. The number of revolutions they can make and hence the number of times their total energy can be raised in small steps, is thus intimately linked to the size of the pole pieces and the intensity of the magnetic field across them.

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WHIRLIGIG ATOM SMASHER

Giant 85-ton cyclotron atom-smashing apparatus of Prof. E. O. Lawrence at the University of California. Across its 45-inch diameter pole pieces shown above scientists can create magnetic fields, tens of thousands of times as powerful as those of the earth, for use in atomic transmutation experiments. The men left to right are: C. U. Foulds, Prof. E. O. Lawrence and Dr. M. S. Livingston. New apparatus shipped by Navy to Columbia University will give science a new device of same design and equally useful service.