PHYSICS

New Type Atom-Smashing Generator Nears Completion

See Front Cover

THE NEW TYPE electrostatic high voltage generator being constructed by the Massachusetts Institute of Technology at Round Hill, Mass., with a Research Corporation grant, will be in operation in a few weeks. Dr. R. J. Van de Graaff, its inventor, President Karl T. Compton of Massachusetts Institute of Technology and Dr. L. C. Van Atta so informed the American Physical Society.

It will develop a steady direct current potential of 10,000,000 volts with a continuous power output of about 20,000 watts. One of the first tasks of the generator will be atom-smashing.

To provide a portable high voltage machine, Dr. Van de Graaff and E. H. Bramhall have designed a rugged machine mounted on rubber tired casters that will develop 1,500,000 volts.

Both generators work on the principle of the old-fashioned static electricity generator and belts carry the electric charges to large discharging spheres.

The size of the giant electrostatic generator is apparent from the photograph taken where the apparatus is being assembled in an airship dock. The spherical aluminum electrodes are 15 feet in diameter and weigh one and one-half tons each.

The interior of each sphere will be a compact laboratory, and, though the circular cells are to be subject to high voltages, they will be the safest places for the scientists while the machine is in operation.

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CHEMISTRY

Oxygen-Hungry Gases Held To be Cause of Haystack Fires

WHY HAYSTACKS sometimes catch fire through spontaneous ignition was explained to chemists attending the American Association for the Advancement of Science by Dr. C. A. Browne of the bureau of chemistry and soils, U. S. Department of Agriculture.

Hay losses from this cause in the United States run into big money; approximately $20,000,000 a year, Dr. Browne said. This is enough to endow a big university or build a couple of first-class cruisers. Research that may eventuate in the repeal of this unauthorized tax is therefore judged very much worth conducting.

Many chemists for many years have observed, experimented and speculated over the question of how a haystack can make itself hot enough to catch fire. A part of the answer was easy enough, once it was demonstrated that the life processes of plants generate heat no less than do those of animals. The digestive ferments in half-cured hay will raise its temperature appreciably; but even more important than this is the fermentive action of bacteria and other microorganisms, which carry on the process to an even higher temperature.

Nevertheless the major part of the riddle remained unsolved, for the highest temperatures attainable by living bacteria are still many degrees short of the ignition temperature of hay. Bacteria alone can make hay hot, but they cannot set it afire. They are killed by their own self-generated heat before the hay even chars, let alone bursts into flame.

The puzzling temperature gap can be bridged, Dr. Browne is convinced, by examining the decomposition products given off by the action of the bacteria on the hay. The first thing that happens is the conversion of part of the starches and celluloses into sugar, which then proceeds to ferment. Buried deep in the haystack, without access to the outside air, the fermentation takes place under oxygen-deficient conditions and does not proceed to the normal end-point. Instead of the complete chemical breakdown into carbon dioxide and water, the fermenting process produces complex gases rich in carbon and hydrogen but lacking in oxygen. At the same time the surrounding layer of hay acts as a heat insulator, driving the temperature higher.

The gases generated by the imperfect fermentation have an avid hunger for oxygen. If a little reaches them, they absorb it eagerly, generating still more heat. If they are kept blanketed in until a large supply of air suddenly has access to them, they are very apt to react with the oxygen so energetically as to produce actual flame.

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BOTANY

Mosses' Lowly Cousins Give Shelter to Fungus

COMPANIONSHIP, apparently on a basis of mutual help, between two lowly members of the plant world was reported before the Botanical Society of America by Sister Mary Ellen O'Hanlon of Rosary College, River Forest, Ill. She has found fungi growing within the bodies of liverworts, which are relatives of the mosses, but a rung or two lower on the evolutionary ladder.

Eight different species of liverworts were found to be harboring the fungus growth. Although it invaded their tissues quite freely, it appeared to do them no harm. Sister Mary Ellen conjectured that by helping to conserve moisture for its sheltering host, the fungus growth paid for the nourishment it got. It would thus be a case of "mutualism" rather than of parasitism.

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