

## The Knowledge Bank at The Ohio State University

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# SMASHING THE ATOM

By ELGAR BROWN

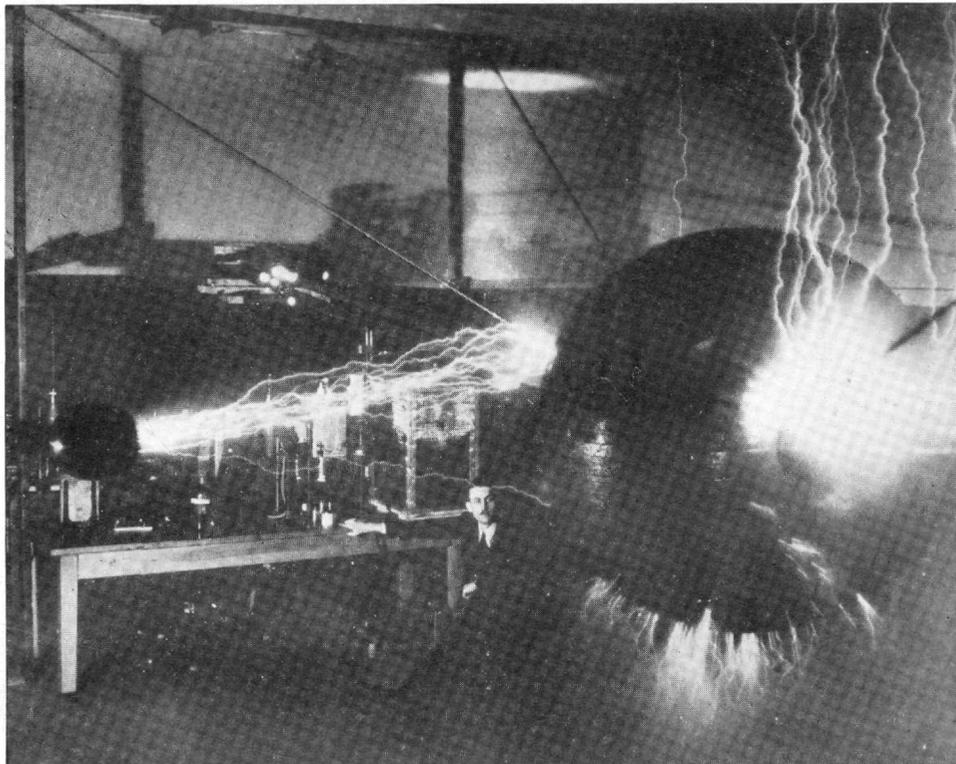
PERHAPS the most publicized of the numerous scientific research fields today is that having to do with smashing the atom, that process dealing with the immense possibilities now presented to the modern physicist by his discovery of methods of adding or removing electrons from the atom thus transmuted the element. This wild dream of our leading physicists is being realized in laboratories throughout the country in our universities and larger electrical plants where the work is supervised by men who have spent the best years of their lives in research in this field and who are now, at least in part, successful in the attainment of their lifetime ambitions.

Four methods of smashing the atom are being used by research men in this country in their more or less successful attempts at smashing the atom. The first method makes use of a cyclotron which is a sort of atomic "whirligig" accelerating atoms to very high velocities, then releasing them into a tube from which they are directed at the material to be disintegrated. The second method produces high voltages by means of transformers and might be described as a kind of brute force method. The third method makes use of a Van de Graaf generator of the kind to be described here. A special tube which is different from those used in any of the other methods is used in the fourth method. In the three machines previously used posi-

tive ions are used in the bombardment process, but in the new machine negative ions are used with apparently better results. The construction of this machine is being directed by Dr. Willard H. Bennett and his associates in the Department of Physics at Ohio State University, and the details are at present known only to the men actually engaged in the work. Work upon the apparatus is at present proceeding as rapidly as limited time and funds will permit. A Van de Graaf generator was completed, however, in January, 1936. This generator was found to be capable of generating an electromotive force of nearly one million volts.

The generator consists of a large copper sphere with a hole in the center through which passes a long silk belt six inches wide. The belt extends across the entire room and is powered by a three-quarter horsepower electric motor at one end.

The most essential and the hardest to construct of the units was the sphere. Because of the discharging tendency of sharp edges it was necessary for the sphere to have a smooth external surface, and this was accomplished by building it in two hemispherical sections over a hollow wood shell turned to the correct shape. The hemispheres were then covered with thin strips of copper, each soldered to the next and sandpapered smooth to prevent discharge as nearly as possible. A hole was then made in the bottom of the



sphere and a brass disc twelve inches in diameter inserted to lower the center of gravity, hence stabilizing it. After the shell was completed the charging unit consisting of a number of copper screens for placing on and removing charges from the sphere and belt was installed inside. In addition, four circular brass rods were used to guide the belt through the sphere.

The belt was made of six inch silk ribbon fastened together with collodion and boiled in wax. Although any dielectric material might have been used for the belt, silk was chosen because of its toughness and durability and plans are now being made for the use of a belt of spun glass sometime in the near future. The length of the belt is about thirty-five feet, and screens made of copper gauze soldered to copper were placed over the belt at each end in a manner similar to those installed within the sphere. The purpose of the screen over the belt is to spray the particles with which the sphere is charged upon the belt. A power line of copper tubing connects these screens with the power source.

The source of power is a one hundred ten volt fifteen ampere alternating current. By means of a Kenetron transformer this voltage is stepped to about ten thousand volts and then changed from alternating to direct current by rectifying tubes, and the potential supplied to the transformer is smoothed out by condensers in the circuit. A xylene alcohol resistor then cuts the voltage to the exact magnitude of nearly five thousand volts.

There are two types of natural lightning. The more familiar type is characterized by irregular streaks while the other (heat lightning) is light blue and appears to cover the whole sky rather than to occur in streaks. Corona in electrical discharge greatly resembles heat lightning and is due to the ionization of the air about a conductor bearing a heavy charge. The spun glass ropes supporting the electrostatic generator are the best paths of ionization around and the air about them often glows with a dull blue light when the machine is in operation. If a knife is held several feet from the sphere with the blade pointing toward it, the end of the blade will glow and the bottoms of the holder's feet will glow.

When the rate of charge exceeds the rate of discharge in the sphere, a maximum charge is reached and a violent discharge in the form of a spark takes place at some point on the sphere. This discharge is referred to as artificial lightning and is indeed identical in most respects to the lightning that streaks across the sky during an electric storm. Sometimes a spark follows a rope support for a short distance, then curves off toward the ceiling; sometimes it goes to the floor. Usually the discharge occurs about every half second, but if several people are in the room the intensity of the charge is greatly lowered and the discharges occur less frequently. Anyone who happens

to be in the room when the machine is operating has a high charge induced into his body and so draws from the charge on the sphere. When one approaches too near the charged ball his hair stands on end and he feels as though a gentle breeze were fanning his face. Although tests have shown that potentials ranging from six hundred thousand to over a million volts have been produced, the amount of power produced is only about one hundred watts, so it is practically harmless.

The ultimate aim of this research group when they finally complete their experiment is not to merely smash the atom as so many scientists are doing already, but to study the procedure and to observe what really happens in conjunction with the process. Much has already been done for the field of medicine by the discovery of a way to manufacture rare radio-active materials, and it seems highly probable that if the principles involved were better understood much more might be accomplished by their application. New elements might be made and rare ones manufactured in larger quantities. As these experiments are still in their preliminary stages it is hard to predict just what the outcome will be and it may be months or even years before the conclusion of the work is reached.

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