

## PHYSICS

# Power from Speed

The speed with which the parts of the atom are moving is the secret of the atom's power. And this power is released by means of speed.

► SPEED is the secret of the atom's power—the speed with which the parts of the atom are moving. And it is by means of speed that this power has been released.

As pictured by modern science, atoms are like tiny solar systems with the electrons swinging in tiny orbits around a miniature sun. But the "years" in which the electrons complete their journey around their sun go flying by millions of millions of times in each second.

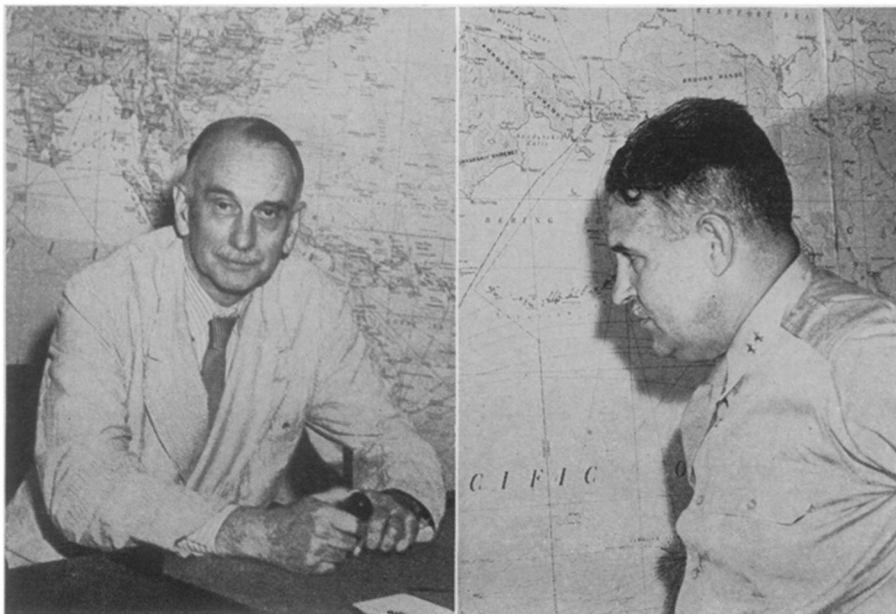
Speed is one form of energy, kinetic energy. And it is one of the axioms of science that although energy can never be created or destroyed, it is always possible to change it from one form to another, provided you know how. Thus, kinetic energy can always be converted to heat or it can be made to do work. The whole trick is in knowing how. And, so far as the atom is concerned, its great wealth of energy has through the ages been securely locked behind the barrier of its outer orbit of electrons.

It is the speed of these flying electrons

that has made the atom so impenetrable. There is plenty of room between the electrons. You might think that it would be easy to invade the atom through all this empty space—just as there is plenty of room for airplanes to fly between the earth and Mars. But it is not. And that is because the electrons are moving so fast that they keep everything out as effectively as if they were everywhere at once.

This is easy to understand if you look at an electric fan. When the fan is still, it is easy enough to put your hand between the blades—there is plenty of room. But just try to shoot peas at a revolving fan! It is only the lucky hit that will manage to fly between two blades and get through—and it has to be a pretty small pea at that.

The only thing that can be shot into an atom is a fragment of another atom: a proton, a neutron or an electron. And it must be shot with great speed. In the research on the atomic bomb, neutrons



**WORKED ON BOMB**—Dr. Richard C. Tolman (left), of Washington, normally of the Graduate School of the California Institute of Technology, has served as a special adviser to Major General L. R. Groves (right), Officer in Charge of the Manhattan Engineer District, in the development of the atomic bomb. Official U. S. Army photograph.

## Power of the Atom

► HERE IS what atomic energy could do if and when it is ever made fully available to work for man:

Smashing the atoms in one pound of water would create enough energy to heat 100 million tons of water from freezing to boiling temperature.

A breath of air would operate a powerful airplane for a year continuously.

A handful of snow would heat a large apartment house for a year.

The pasteboard in a small railroad ticket would run a heavy passenger train several times around the globe.

A teacup of water would supply the power of a great generating station of 100,000 kilowatts capacity for a year.

If the atomic energy in matter is made fully available for mechanical use, all other forms of energy would be antiquated, such as fuels and explosives. Dams and electrical transmission lines would be as outmoded as stagecoaches.

These estimates were made before the war (1934) when physicists were just beginning to visualize the tremendous potentialities of atomic research. They were published in *The Advance of Science*, edited by Watson Davis and published by Doubleday, Doran and Company.

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are used as projectiles, some are shot at tremendous speeds, others at speeds relatively slower. Details on such matters are naturally not available now.

Often, the atomic projectile will go right on through the atom without doing anything—just as comets shoot through the solar system without touching anything. But somehow, scientists have at last found the secret for which many learned men have sought for many years—how to use the atomic projectile effectively to disintegrate the atomic heart.

Atom-smashing results in the release of a tremendous electric charge. The discovery is truly great, but even greater is the discovery of how to control this tremendous weapon to do man's will.

*Science News Letter, August 18, 1945*