NUCLEAR PHYSICS

Hope To Detect Bomb Test

Study of radioactive clouds offers promise that American investigators may be able to detect the test explosion of an atom bomb in other parts of the world.

➤ IF SOVIET scientists have figured out a way to make atom bombs, would they be able to carry out the necessary single test explosion without our knowing it?

Assuming, as some Americans do, that the USSR will immediately attack the United States as soon as the Red Army has this most powerful of all weapons, Russian leaders would hardly be so reckless as to launch such a surprise assault without first making at least one test, just as we used up the first bomb built in the New Mexico test before we ventured to drop the next two on Hiroshima and Nagasaki.

This is because of the unique nature of the atom bomb. It does not explode because a primer and booster charge are fired in a mass of uranium 235 or plutonium. Atomic explosions take place when the amount of either of these fissionable elements in one chunk reaches a point where their spontaneous breakdown, or fission, produces neutrons sufficient to produce an almost instantaneous chain reaction. This spontaneously exploding quantity of the bomb element is called its critical mass.

An atom bomb is made by taking two chunks of uranium 235 or plutonium, each less than the critical mass, and suddenly thrusting them together into one mass that is above this critical explosion point. The mechanism of an atom bomb must therefore be quite different from that of an ordinary TNT bomb; and that is why the Russians would have to make a test if they succeeded in producing a bomb of their own.

They might do as we did during the war: make all preparations with the greatest secrecy, not tell anyone when or where the test was made, and trust that the effects could never be detected. But we had the advantage then of almost total unpreparedness by even our enemies for such a test. With all the world shivering in fear of the possibility of a new war, such relatively easy secrecy will not be attainable.

On the other hand, Russia diplomats and military men might attempt to run a colossal bluff: tell the world boldly that they possessed an atom bomb and had made the necessary test.

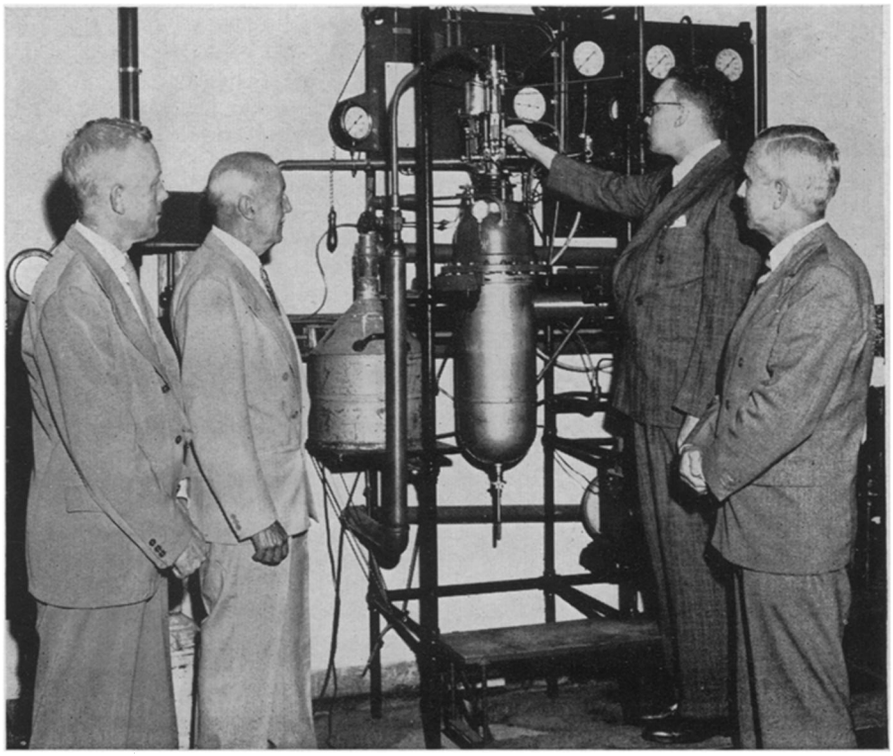
Is there any way for outsiders to get at the facts, in spite of the security precautions which the Soviet leaders could naturally be expected to take in their own interest?

Disregarding possible use of "orthodox" methods of espionage, what are the scientific methods that might be used to detect a test explosion of an atom-bomb a long way off?

Principal methods suggested are three: seismic, or check on the earthquake-like waves in the earth started by such a giant explosion; microbarographic, or detection of a pressure-wave in the air; radiometric, or spotting of the spreading cloud of atomic fragments by their electrical charges.

Least promising, probably, is the seismic method. True, the jar of the Alamogordo test was detected by a few earthquake observatories, but these were less than 300 miles away; more remote instruments, even in the United States, showed no trace of it. Neither did the underwater explosion at Bikini record itself on any seismographs except those especially installed on the atoll itself.

Use of the microbarograph, which is an instrument built to record exceedingly minute changes in air pressure, does not look much more promising. True again, such an instrument in England did record the fall of a great meteorite in Siberia in 1908. However, this immense missile from outer space released more destructive energy than a hundred or more atom bombs all at the same place in the same instant. If Soviet scientists were to explode a mere single atom bomb in the same place (which would be a pretty good one for the purpose) or in the deserts of southwestern Asia (which might be better) it is rather unlikely that its pressure-wave would be detectable by microbarographs outside the boundaries of the USSR.



LIQUID HELIUM MACHINE—Being examined in the Sloane Physics Laboratory at Yale, where temperatures approaching absolute zero have been reached, by, left to right: William W. Watson, chairman of the Yale Physics Department; President Charles Seymour of Yale; Cecil T. Lane, associate professor of physics in charge of liquid helium experimentation; and Edmund W. Sinnott, director of the Sheffield Scientific School and the University Division of Sciences.