Don't Worry—It Can't Happen

By JEAN HARRINGTON

JUST about a year ago, two German physicists who had been gunning at the metal uranium with neutron bullets, just to see what would happen, suddenly found that they had caused the biggest explosion in atomic history. It wasn't a big explosion in an everyday sense; no Berlin window panes rattled at the blast, and no one heard the noise. But it seemed big and loud to other physicists all over the world. They had never before known of an atomic blast of such tremendous energy, and presently they began to worry about it.

Scientific American, for October, 1939, contained an article, "Two Atoms for One," which described the German discovery and the flurry of research and excitement which followed. The new phenomenon was called "nuclear fission," because Hahn and Strassmann, the two Germans, had found that their neutron bullets split the heavy cores of uranium (and a few other heavy elements) into halves.

Previous experiments had succeeded only in knocking chips off atomic nuclei, and these operations released only a tiny fraction of the boundless energy locked up in atoms. But, when uranium cracked in two, 200,000,000 volts of energy burst forth in the form of radiation, heat, and speed.

Scientists have long wanted to convert matter into usable energy, and this was the biggest step they had ever taken in that direction. No matter that there was still an almost astronomical number of steps to be taken. Feverishly they began to attack uranium in their laboratories.

IT was soon apparent that quite a number of strange and wonderful things happened when the uranium nucleus blew up, as the accompanying diagram shows. Besides the two main fragments, a few spare neutrons (two or three per fission) were thrown off from the original nucleus. In addition, the two new atoms were unstable, erupting neutrons and other particles in a whole series or chain of reactions until they finally subsided. The result was a great hodgepodge of new atoms and extra neutrons.

Early last summer, in the midst of all this research, a chilly sensation began tingling up and down the spines of the experimenters. These extra neutrons that were being erupted — could they not in turn become involuntary bullets, flying from one exploding uranium nucleus into the heart of another, causing another fission which would itself cause still others? Wasn't there a dangerous possibility that the uranium would at last become explosive? That the samples being bombarded in the laboratories at Columbia University, for example, might blow up the whole of New York City? To make matters more ominous, news of fission research from Germany, plentiful in the early part of 1939, mysteriously and abruptly stopped for some months. Had government censorship been placed on what might be a secret of military importance?

The press and populace, getting wind of these possibly lethal goings-on, raised a hue and cry. Nothing daunted, however, the physicists worked on to find out whether or not they would be blown up, and the rest of us along with them.

Now, a year after the original discovery, word comes from Paris that we don't have to worry — at least, probably not. Frederic Joliot, son-in-law of Mme. Curie, and three co-workers, von Halban, Kowarski, and Perrin, finally traced to its end the tumultuous course of the uranium-fission chain reaction. They found that, instead of building up to a grand climax, it runs down and stops like an unwound clock.

Their method was to measure the total number of neutrons emitted in one of these chain reactions. The original fission liberates two or three. They found that the remainder of the chain produced five or six more, an average of eight for each split nucleus. If the process were cumulative, there should be far more than that.

With typical French — and scientific — caution, they added that this was perhaps true only for the particular conditions of their own experiment, which was carried out on a large mass of uranium under water. But most scientists agreed that it was very likely true in general.

The key to the problem is probably the speed of the neutrons. In the original experiments it was soon found that relatively slow neutron bullets were the most effective in producing fissions. As the chain reaction proceeds, and more and more energy is released, the uranium target becomes heated. The extra neutrons are perhaps so speeded up by the heat that they cease to be efficient atom-busters. Thus the reaction poohs out as the temperature rises.

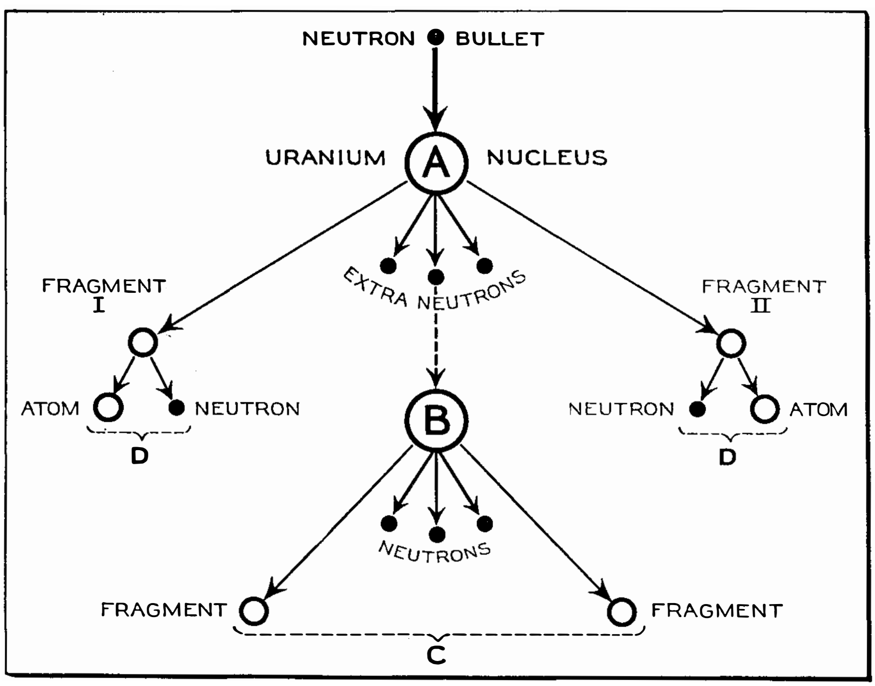

Diagram of a theoretical chain reaction for uranium. The neutron bullet at the top splits the uranium nucleus *A* into fragments I and II and, in addition, erupts three extra neutrons. One of the latter may hit another uranium nucleus *B*, and split it into similar fragments and neutrons *C*. Each of the first two fragments may break down into another atom plus a neutron, as at *D*. The total number of neutrons is eight. Readers made insomnious by "newspaper talk" of terrific atomic war weapons held in reserve by dictators may now get sleep