

Part 10

The Russian Bomb Part 2

After Hiroshima

Hiroshima and Moscow

Before Hiroshima no one really knew the atomic bomb. The few who saw the Trinity test were awed by its power; it was bright beyond description and threw up an enormous mushroom cloud; desert plants were reduced to ashes for miles around and the ground turned to glass, but no one was hurt, no buildings were destroyed and after the test, things were pretty much normal again on the Jornada del Muerto plain. But in Hiroshima people were incinerated and buildings thrown down; a city was ruined and in a few seconds, thousands died. It suddenly occurred to those gathered on that July morning that if America could destroy Hiroshima, perhaps someday an enemy could destroy Seattle.

The distance from Tinian to Hiroshima is a little over fifteen hundred miles; the same as the distance from London to Moscow. In a matter of hours, a single B-29 flying from England could succeed where the massive armies of Napoleon and Hitler had failed, and Moscow would be decimated, but this was not Stalin's most immediate worry.

As of June 22, 1941, the USSR was Germany's enemy and thus America's "friend"; after the Nazi defeat that "friendship" was no longer necessary. The change was not lost on Stalin. Remembering that after the 1917 Revolution, America and Great Britain warred against the Bolsheviks, he knew it could happen again. After the defeat of Germany, he took comfort in the fact that the Red and American Armies were of comparable strength, but once the bomb was dropped on Hiroshima, that balance of power tipped and Stalin's insecurity soared. All the advantage that had been gained by the defeat of Germany had been lost. Until they caught up, the

Soviet Union was in a weaker negotiating position and Stalin expected that the existence of the bomb would be used by the west to extract concessions. To conceal their weakness, the USSR took a fearless, inflexible and bellicose stance in its negotiations. Each side stiffened their positions and agreements became nearly impossible.

Shortly after Hiroshima, to accelerate the languishing atom bomb project, Stalin put Lavrentiy Beria, the cruel and ruthless chief of the secret police, in charge. Everyone's pressure increased but so did their resources. Stalin called Kurchatov into his office and told him an old Russian proverb. "If a child doesn't cry," he told him, "the mother knows not its wants. Ask for whatever you like. You won't be refused." What was a once project to explore nuclear weapons, now became a quest to create a whole new atomic industry. All the scientists got significant raises in pay and they got right to work. One of the initial problems was that the engineers did not understand what they were building, so Kurchatov began giving seminars explaining the relationship between an atom they could not see and the factories they had to build; he persisted until they understood.

In early 1946 there was an attempt to put the atomic genie back in its bottle with the United Nations Atomic Energy Commission, but each side tried to emasculate the other while itself remaining intact and the genie remained at large.

Uranium

Uranium was the first problem to be overcome. During the war, there was very little in the Soviet Union, and in 1945, America and Britain had seen to it that none could be purchased abroad. However, in Soviet-occupied Germany, just across the border from Saxony, is the Czech town of Joachimsthal. In the 1500s rich silver deposits were mined there and made into coins; a bothersome by-product, pitchblende, from which uranium is obtained, was discarded. The Czech mines were the source of the pitchblende from which Madam Curie extracted radium, the uranium atoms

split by Hans and Strassman and the metal used in Heisenberg's uranmaschine. In November 1945, the Soviets acquired all the uranium stock and reactivated several moribund mines. Other mines in occupied Germany began producing as well. This time, it was the silver ore, which accompanies uranium, that was discarded. By 1948, the uranium supply problem was well on the way to being solved.

Just as the Americans had done in Operation Alsos, Gregory Flerov and several of Kurchatov's physicists, all dressed as NKVD officers, followed in the wake of the triumphant Red Army, looking for German scientists, equipment, information and, especially uranium; they found them all. Near Berlin in Oranienburg they located Nicholas Riehl, a director of the German firm producing metal for the Uranium Club. Along with his laboratory and all the industrial equipment that had not been ruined by American bombs, Riehl was moved to Moscow and his lab reassembled in the town of Elektrostal east of the city. Most importantly, they liberated a total of three hundred tons of uranium, enough for Kurchatov's first uranium reactor.

Chelyabinsk-40

In 1946, Kurchatov had seventy-six men working with him to build a reactor. By the summer they had enough pure graphite and uranium metal to put together a series of small test piles, none of which went critical and by November, they had sufficient experimental data to start on the real thing.

In contrast to the secretive, squash court beneath the football stadium where Fermi created the first chain reaction, Kurchatov had a new building at Laboratory No. 2, designed for just such a purpose. It had radiation-protected laboratories, a pit for the reactor, its own electrical substation, devices to measure radiation, and lights and sirens to warn of danger.

At six-o'clock on Christmas Day, 1946, after adding the sixty-second layer, the control rods were slowly withdrawn and Kurchatov's pile, named Fizicheskii-1 or F-1

sustained a nuclear chain reaction, the first outside America. It maintained a power of one hundred watts until late that night, when Kurchatov shut it down. Those who worked on the reactor came to visit that night and heard Kurchatov comment that "Atomic energy has now been subordinated to the will of Soviet man." Four months before, the designs for a production reactor specifically to produce plutonium, had been approved. Now Kurchatov had the data he needed to make sure the designs would work.

Chelyabinsk Oblast¹ is a region in the Ural Mountains on the Soviet border with Kazakhstan. It abounds in lakes (to cool power plants), roads, railroads and a robust power grid. In 1946 the CIG² began to get information of a giant construction project northwest of its capital of the same name. Long steel reinforcing rods, thousands of bags of cement and heavy excavating equipment were being shipped on a new rail line to Kyshtym. Phone lines, fuel storage tanks and barracks for prison laborers sprouted up overnight. The area for thirty miles around was off limits. By the end of 1947, the buildings were ready and the entire population of the restricted area, including the forced laborers who built the plants, was replaced by loyal Communists from across the country. Trains with blacked out windows passed through Kyshtym without stopping, barbed wire fences extended for miles. This was Kurchatov's new nuclear city known as Chelyabinsk-40. It was where plutonium was produced, extracted and purified. Its flag was a golden salamander guarding a nuclear pile.

Kurchatov moved there in early 1948 to supervise the building of the reactor. In a speech to the new residents of the secret city, he promised all the amenities of modern Soviet life including, "kindergartens, fine shops, a theater and, if you like, a symphony orchestra!" In June, the reactor, known as Annushka, began producing plutonium, but not without some difficulties.

Annushka ran at full power for only twenty-four hours before Kurchatov pulled the lever inserting the control rods and stopping the reaction. The cooling water had run low in the feed canals and some aluminum-cased uranium slugs had ruptured

and melted, but because of Beria's pressure, Kurchatov kept the damaged reactor running. By January, 1949 it was estimated that the plutonium produced in the damaged slugs was enough for one bomb, and the reactor had to be emptied, but this could not be done as designed because melted slugs were jammed in the tubes; the highly radioactive material would have to be removed by hand. The undamaged slugs were returned to the reactor to further enrich their plutonium content for subsequent bombs.

Everyone was involved in emptying the reactor including supervisors and scientists and was exposed to many times the safe amount of radiation; a "cleansing" glass of Vodka was administered after their shift. The reactor building itself was contaminated and no amount of effort would remove the dangerous radioactive byproducts.

The Smyth report had given Kurchatov a blueprint for the plutonium extraction and concentration process, but in the construction of the processing building, he deviated from its detailed plans. Construction as well as design was hasty and slipshod. As the plumbing fell apart, the isolation of the processes disappeared and the repeated chemical steps were all done by hand.³

Everything about the process was sloppy. Plumbing clogged, rubber dissolved, poorly-trained technicians dropped vessels and caused explosions. There were uncountable spills with no provision for recovering the precious metal except with mops and buckets. Once again, hundreds or thousands of workers were exposed to nearly lethal doses of radiation, of which they knew nothing. To Beria, workers were expendable and to the workers, Beria was more feared than any exposure to radiation. Despite these problems, by June 1949, there was enough plutonium for Russia's first atomic bomb.

¹ An oblast is an administrative district in the Soviet Union.

² The Central Intelligence Group (CIG) was the forerunner of the U. S. Central Intelligence Agency (CIA)

³ Fear of the German bomb caused the Manhattan Project to risk constructing buildings before the machinery had been designed; fear of Beria caused Kurchatov to risk starting operations before the plants were complete and the workers trained.

Arzamas-16

By all evidence, there is a marvelous museum of nuclear weapons in the town of Sarov. There are the casings of the first Russian atomic bomb and the Tsar Bomba, the largest thermonuclear weapon ever created, but you cannot visit. For the last seventy years Sarov has been a closed city with electrified barbed wire fences and guarded gates. No one goes in or out without permission.

Sarov was once one of the holiest places of the Russian Orthodox Church and the home of their beloved Saint Seraphim, but in the Spring of 1946, Yulii Khariton chose it as the location for his bomb laboratory and renamed it Arzamas-16. Within a year, the town had disappeared from the maps and the monks' cells were full of Soviet physicists. As with all other major constructions, long lines of grey-clad prisoners marched to and from their camps to build the laboratories and factories.

Khariton faced the same set of problems Robert Oppenheimer did at Los Alamos, but thanks to several Soviet spies, he had a head start. The bounty from Klaus Fuchs, Ted Hall and David Greenglass had to be checked and re-checked; detonators, explosive lenses, wiring and neutron initiators all had to be fabricated and tested. Even with the plans, materials and dimensions for a bomb, there was a great deal of trial and error. Progress was as swift at "Los Arzamas⁴" as it was at Los Alamos and by New Year's Day, 1949, they had most of the problems solved, but there was only one chance to get it right.

Semipalatinsk-21

In the spring, there was enough plutonium for a bomb and in the summer, scientists began to gather at the test site, Semipalatinsk-21, on the Kazakhstan steppe. Trainloads of material, equipment, instruments and scientists began to arrive and on August 28 the bomb, code named RDS-1, was assembled. Kurchatov, Khariton, Flerov and others watched.

Beria was in the bunker as the countdown clock approached the time for detonation. "The bomb will not work," he said to Kurchatov. Khariton had opened the door away from the blast so they could see the light reflected from the far-away hills. He would shut it before the pressure wave hit.

In the seconds after detonation, a cascade of emotion washed over Kurchatov. He was relieved that the bomb was a success and he and his fellows would not be shot. He was overjoyed that the six years of constant and complex work has resulted in a successful test. He wanted to shout, or sing or dance, but, with Beria there, he did not want to show that he had had even a hint of doubt. Beria hugged him and kissed him on the forehead.

The steel tower was vaporized. The artificial pond, which had attracted a flock of birds, was gone and the birds turned to steam. The shards of brick houses rose within the mushroom cloud. Wooden houses burned, planes and tanks were crushed or overturned. An ionized cloud floated over the steppe. On August 29, 1949, the Soviet Union became the second nation to possess a nuclear weapon.

⁴ In 1993, Los Alamos and Arzamas-16 became sister cities.