Forgotten Creators of the German Atomic Bomb

Dr. Todd H. Rider **thor@riderinstitute.org**

riderinstitute.org/revolutionary-innovation

Der Welt Erbe gewänne
zu eigen,
wer aus dem Rheingold
schüfe den Ring,
der maß lose Macht
ihm verlieh'.

The whole world can be
possessed by one
who from the Rhinegold
forges the Ring,
which can bestow
immeasurable power.

Richard Wagner, *Das Rheingold*, Scene I, Wellgunde (1854)

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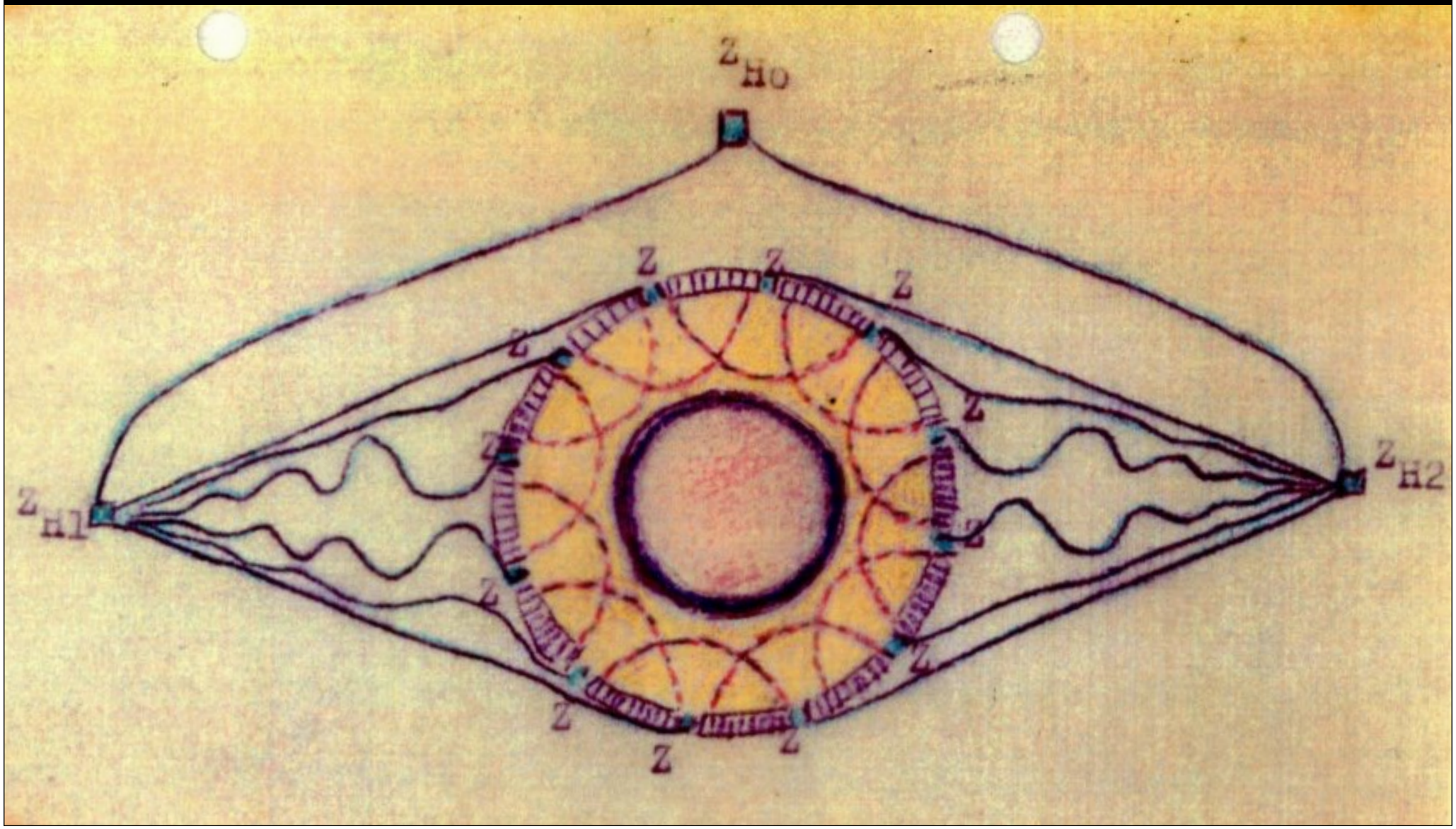

This Work Only Uses Information from Unclassified Sources, Such As:

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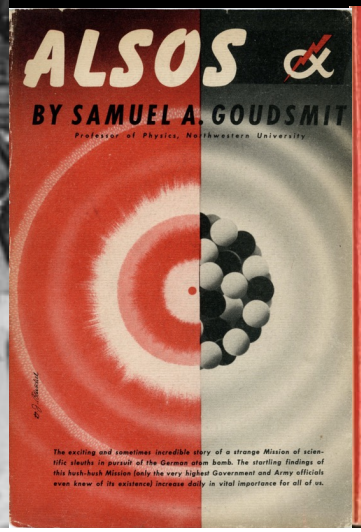
Complete set of slides and more available at riderinstitute.org/revolutionary-innovation

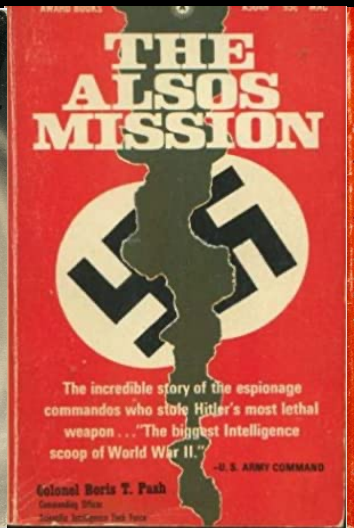
1. Conventional view of the wartime German nuclear program
2. Origins and organization of the German nuclear program
3. Sources of uranium and thorium
4. Enrichment of uranium-235 (^{235}U)
5. Breeding plutonium-239 (^{239}Pu) or uranium-233 (^{233}U) in fission reactors
6. Breeding ^{239}Pu or ^{233}U in electronuclear systems
7. Production of heavy water (D_2O) and other nuclear-related materials
8. German fission bomb design (explosive yield ~ tens of kilotons)
9. German hydrogen bomb design (explosive yield ~ megatons)
10. October 1944 test explosion on the Baltic coast
11. ~November 1944 test explosion in Poland
12. March 1945 test explosions in Thuringia
13. Wartime/postwar Axis belief in the reality of German nuclear weapons
14. Wartime/postwar Allied belief in the reality of German nuclear weapons
15. Conclusions and further work

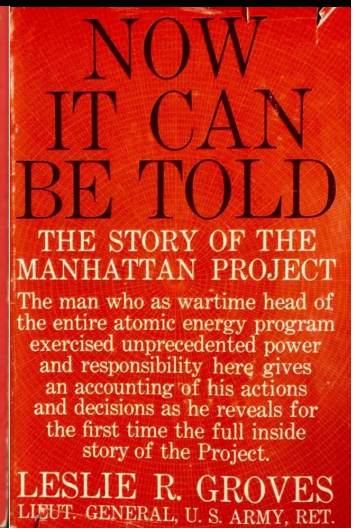
1. Conventional View of German Program: Alsos

At the end of the war, the U.S.-led Alsos Mission searching for nuclear work found an incomplete fission reactor at Haigerloch, some papers on basic nuclear physics, and apparently not much else, according to the public accounts.

Haigerloch







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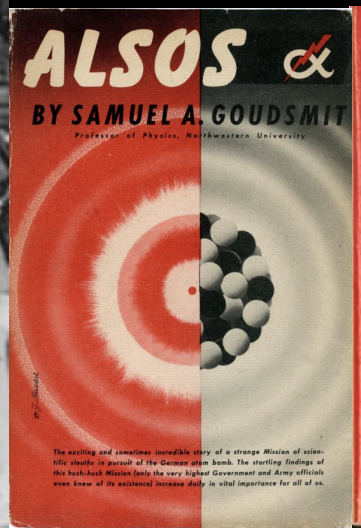
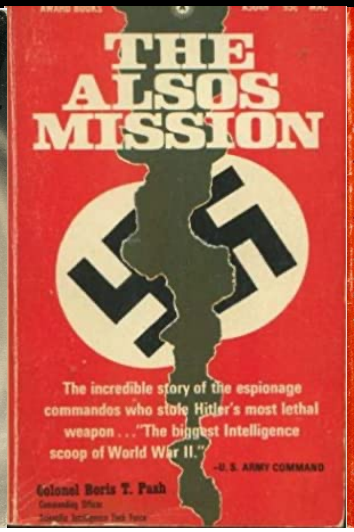
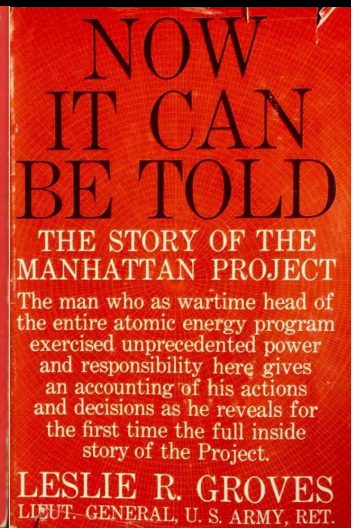
Alsos failed to properly investigate numerous specific organizations, scientists, and locations that could have revealed a more advanced nuclear program.

If any more advanced nuclear work had in fact been discovered, that information would have been automatically classified at the time, and could remain classified or buried in archives and unreleased to this day.

Haigerloch



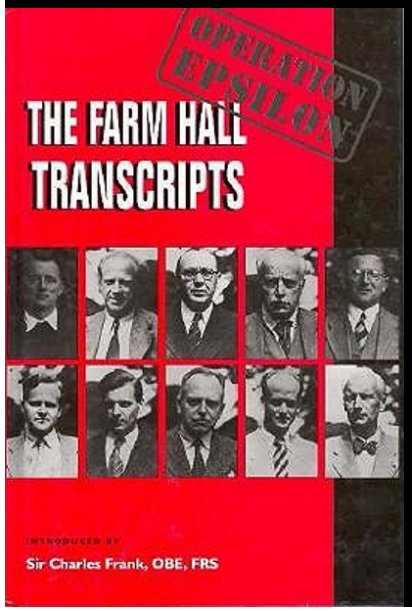


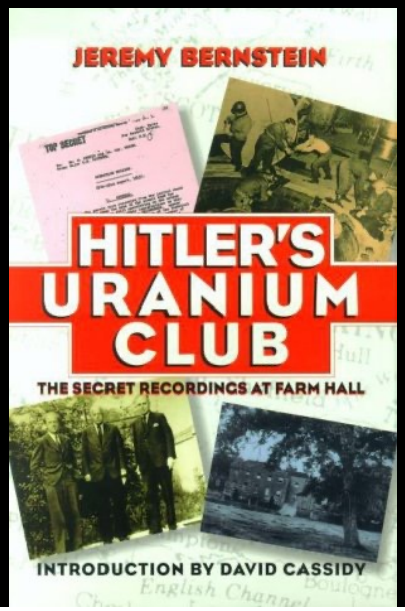


1. Conventional View of German Program: Farm Hall

10 scientists (Erich Bagge, Kurt Diebner, Walther Gerlach, Otto Hahn, Paul Harteck, Werner Heisenberg, Horst Korsching, Max von Laue, Carl Friedrich von Weizsäcker, and Karl Wirtz) were kept under house arrest July 1945–January 1946 at Farm Hall, U.K., where their conversations were secretly recorded.

The transcripts record the scientists' surprise at news of the 6 August 1945 Hiroshima bombing and do not reveal significant apparent knowledge of nuclear weapons design and development.





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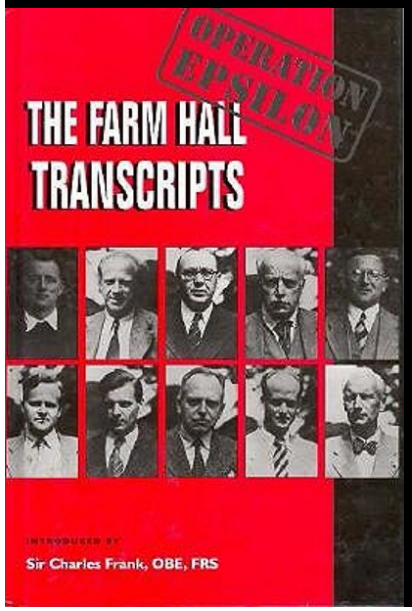

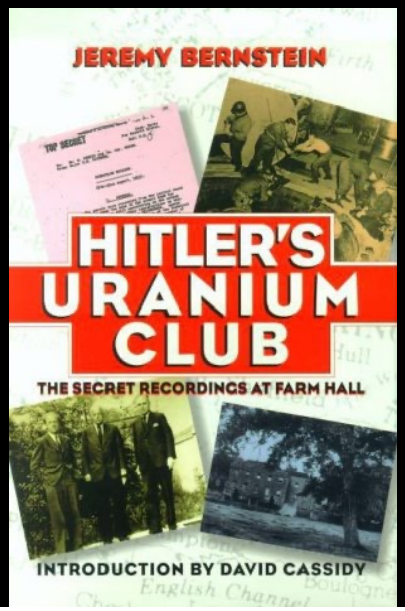

A huge number of relevant nuclear scientists were not at Farm Hall.

Those who were there suspected surveillance and presumably conducted their conversations accordingly.

The preserved transcripts document only a small fraction of the discussions that would have occurred among ten people and their British attendants during those six months.

The transcripts are English translations, which may not accurately reflect the original German conversations.

Oddly, both the original recordings and the original German transcripts just happen to have been completely lost.

1. Conventional View of German Program: Public Remarks

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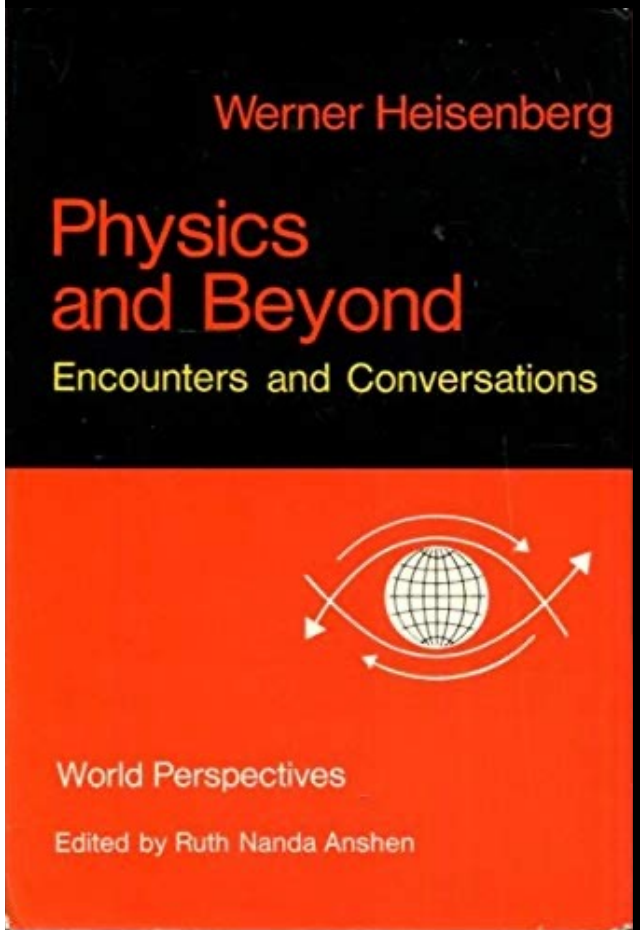

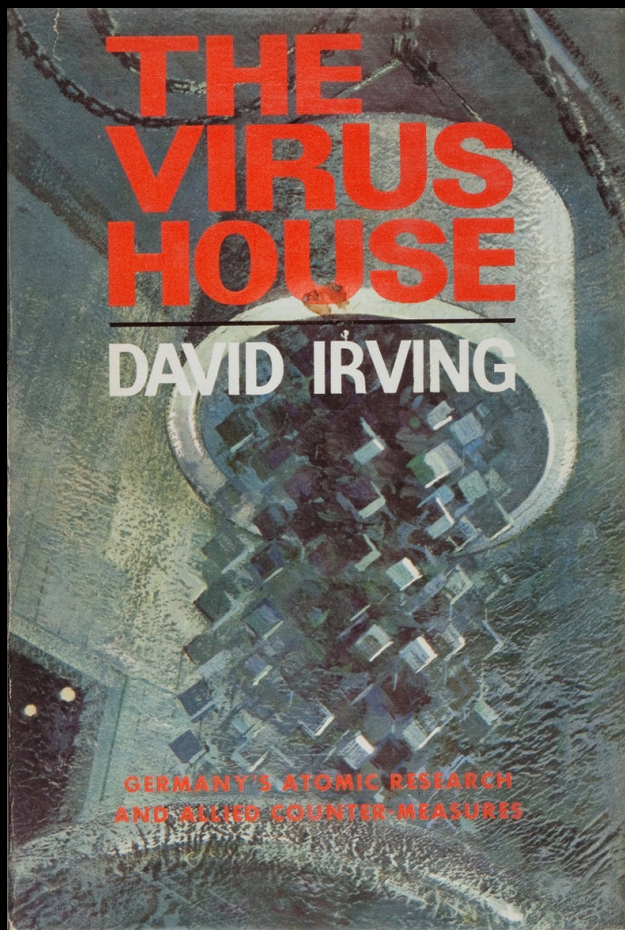

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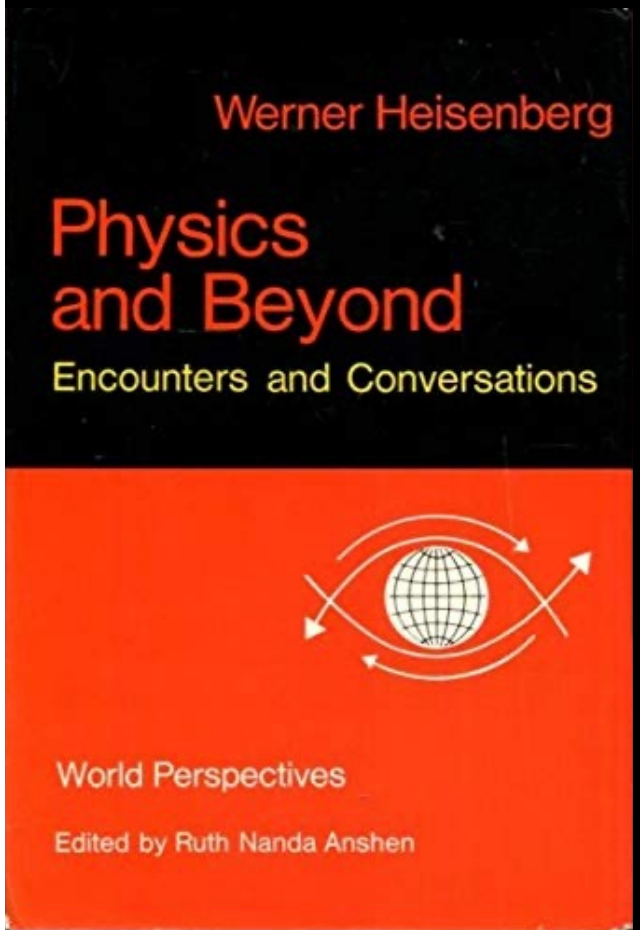
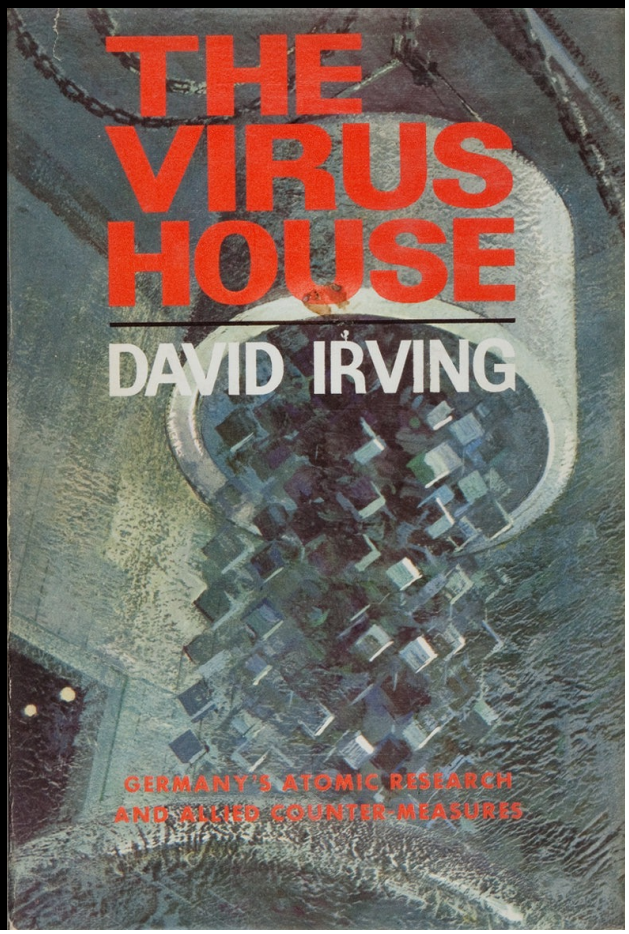
Only a small number of nuclear scientists went on the public record.

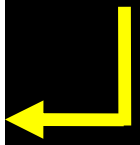
It was in their best personal interests to downplay the wartime German nuclear program, their knowledge of it, and their support for it.





2. Origins of the German Nuclear Program

1928: Fritz Houtermans and Georg Stetter began work on fusion in Germany and Austria



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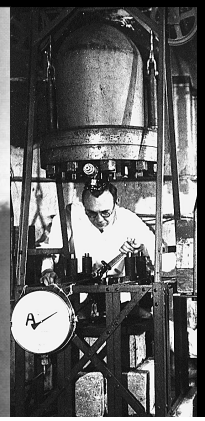

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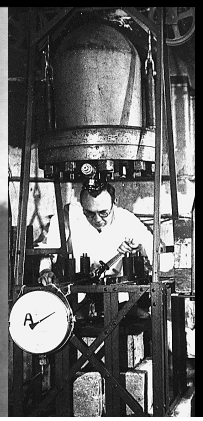

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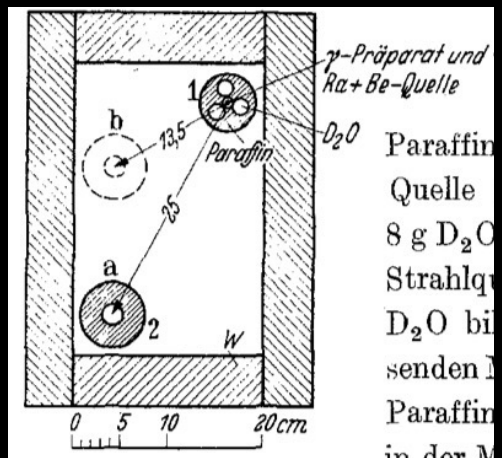

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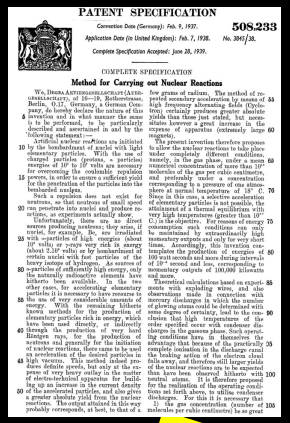


PATENT SPECIFICATION

Convention Date (Germany): Feb. 9, 1937.

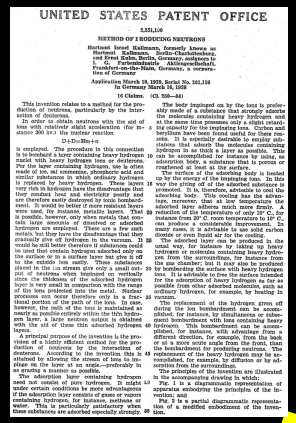
508,233

Application Date (in United Kingdom): Feb. 7, 1938. No. 3845/38.

Complete Specification Accepted: June 20, 1939.

COMPLETE SPECIFICATION

Method for Carrying out Nuclear Reactions



UNITED STATES PATENT OFFICE

2,251,156

METHOD OF PRODUCING NEUTRONS

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Application March 18, 1939, Serial No. 262,156

In Germany March 24, 1938

16 Claims. (Cl. 250—84)

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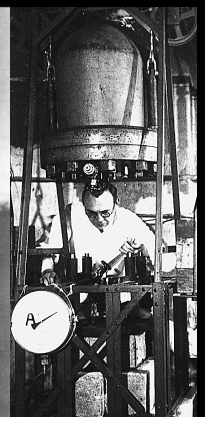

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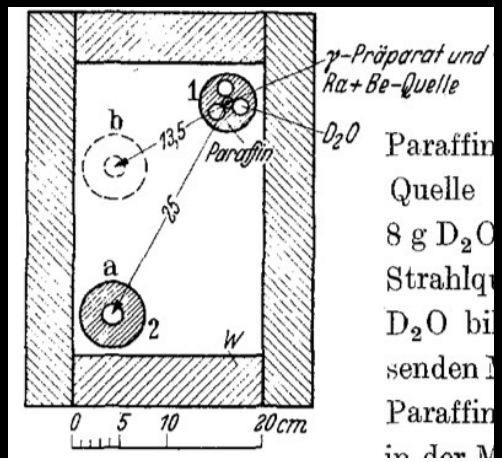

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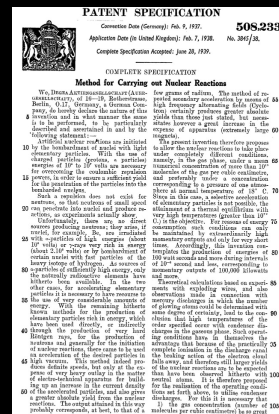
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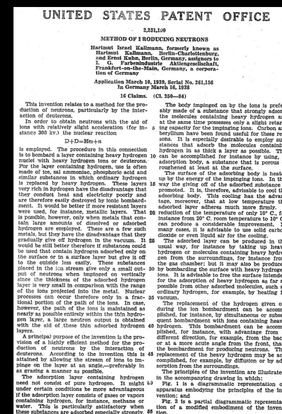
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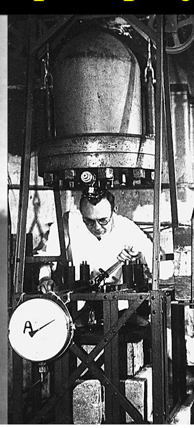

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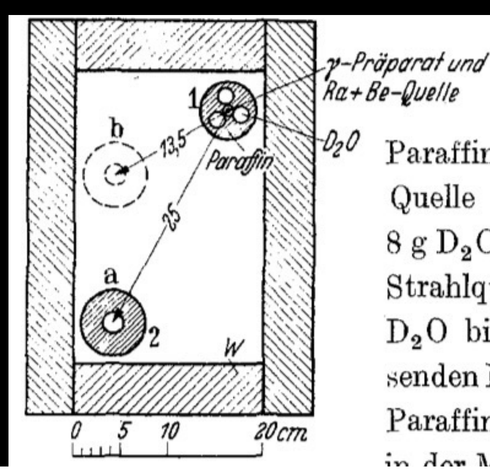
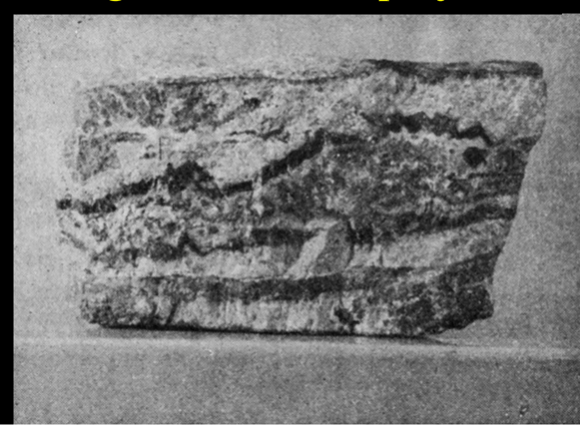


Germany began mining uranium in Bulgaria for secret Organisation Todt project



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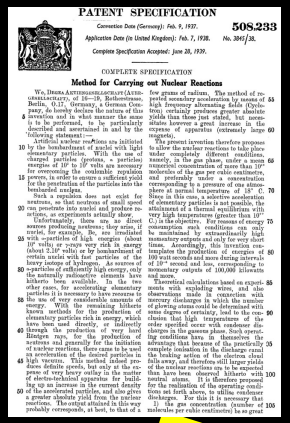

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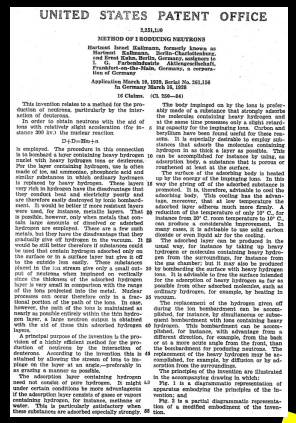

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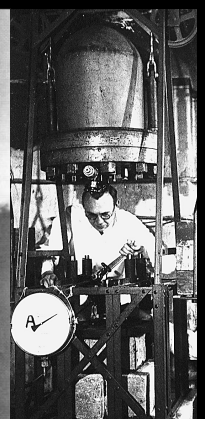

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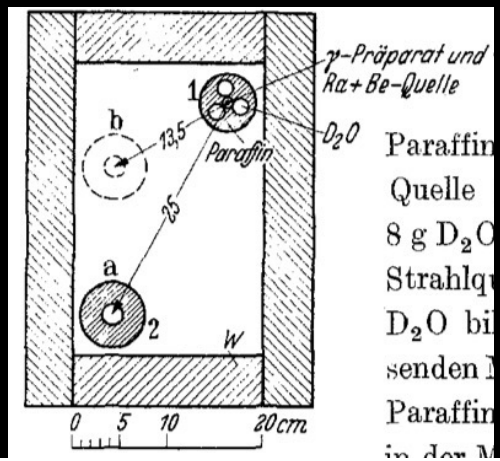

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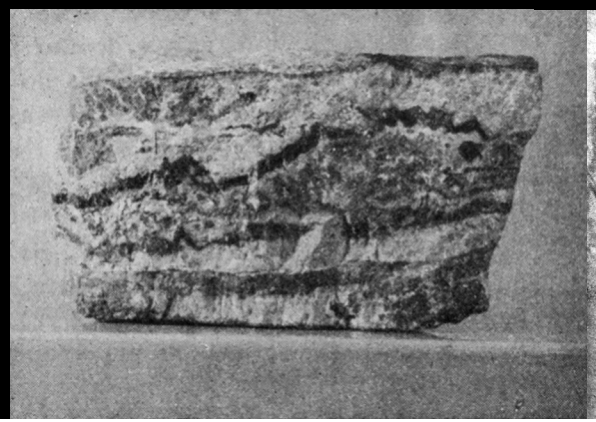
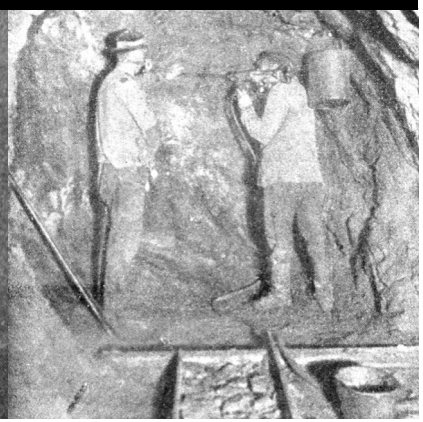


Germany took over Czech uranium mines, transported ore on planes



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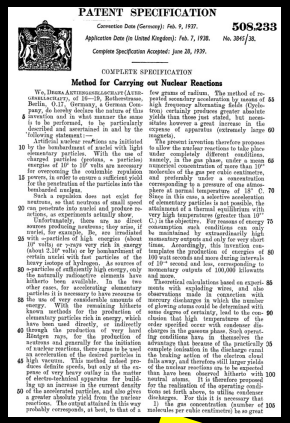

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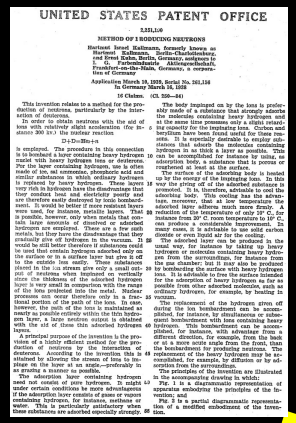

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Otto Hahn and Fritz Strassmann experimentally demonstrated neutron-induced uranium fission

1934 | 1935 | 1936 | 1937 | 1938

Erich Schumann (implosion expert) hired

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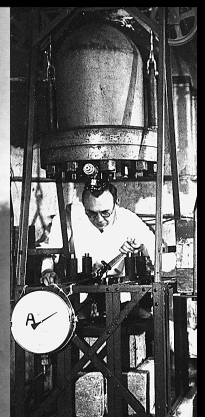
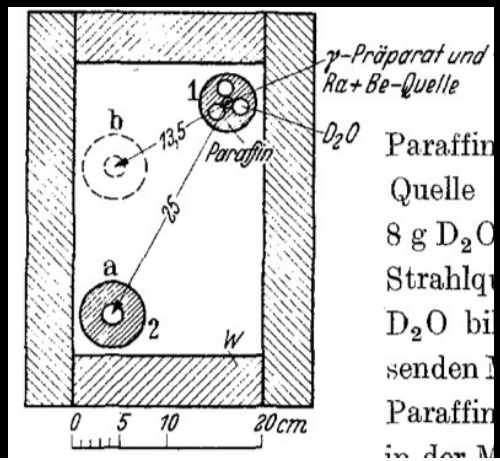
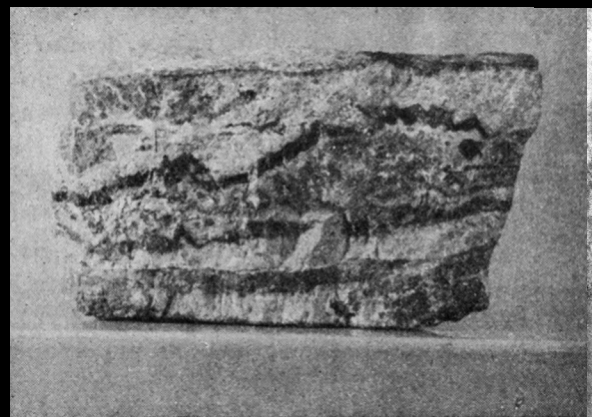


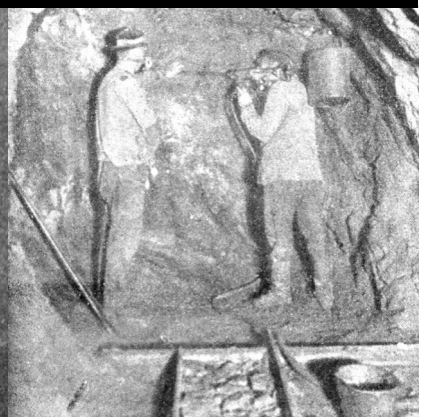
Rausch von Traubenberg began using surrounding neutron reflectors



Germany began mining uranium in Bulgaria for secret Organisation Todt project



Germany took over Czech uranium mines, transported ore on planes



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Paul Harteck & Wilhelm Groth proposed a fission bomb, then worked on many aspects of it

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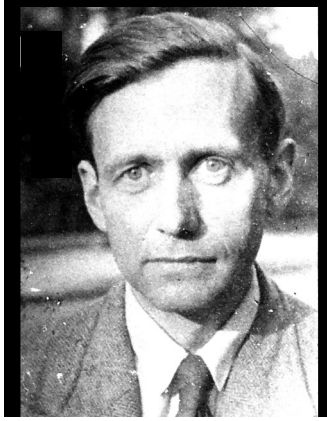

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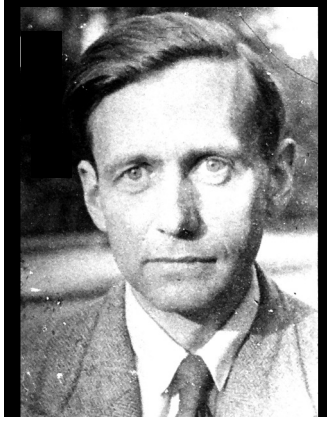

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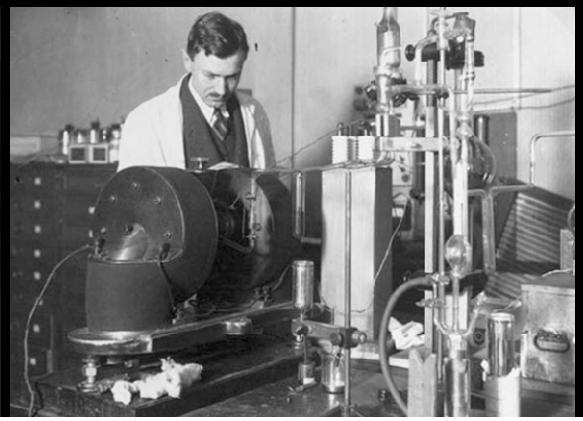

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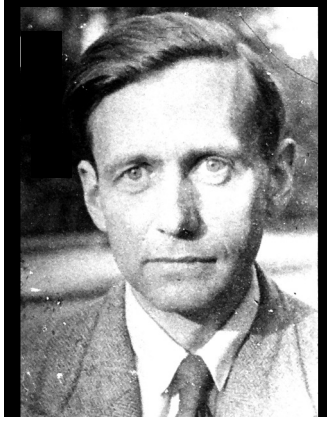

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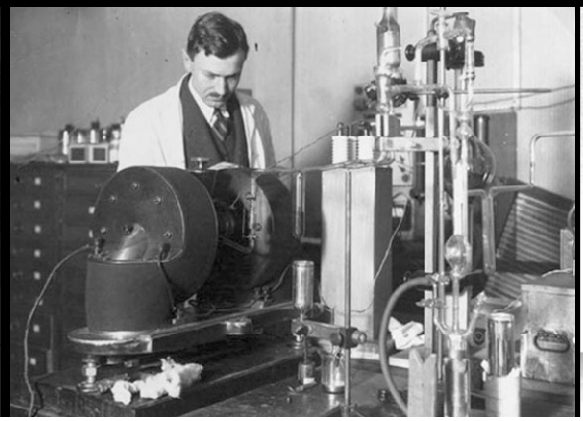

Nikolaus Riehl began processing uranium on an industrial scale for military projects

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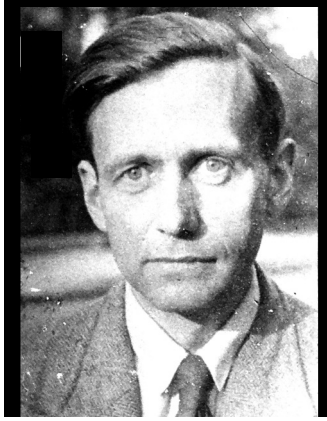

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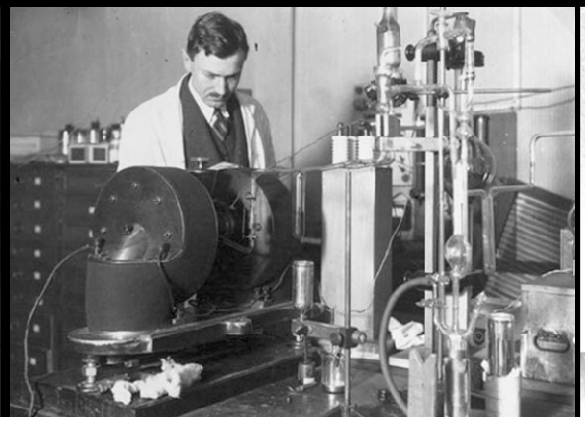

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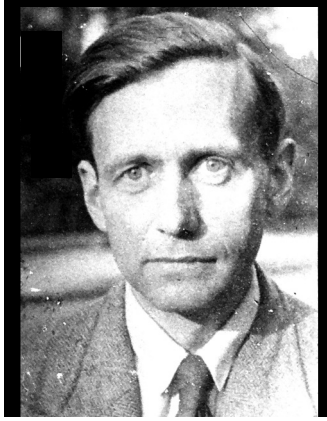

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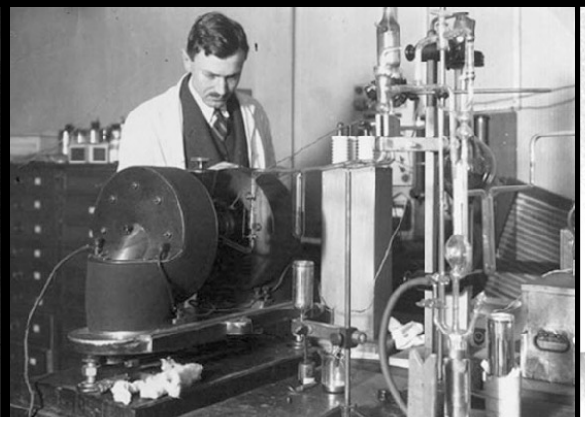

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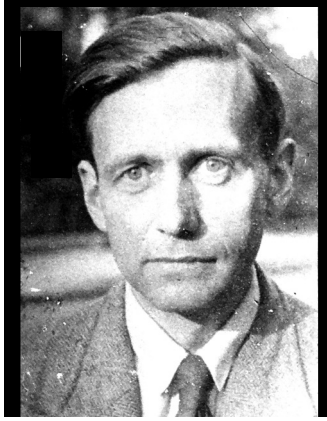

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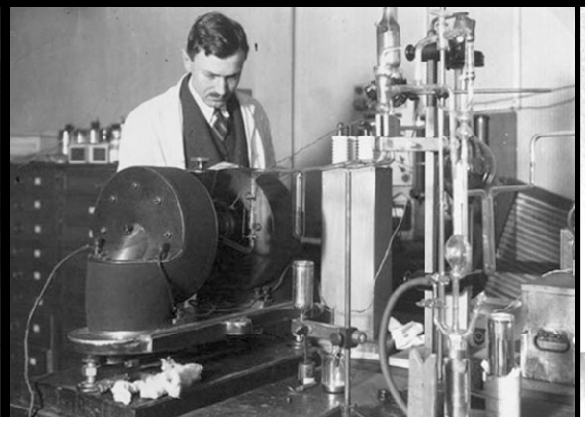
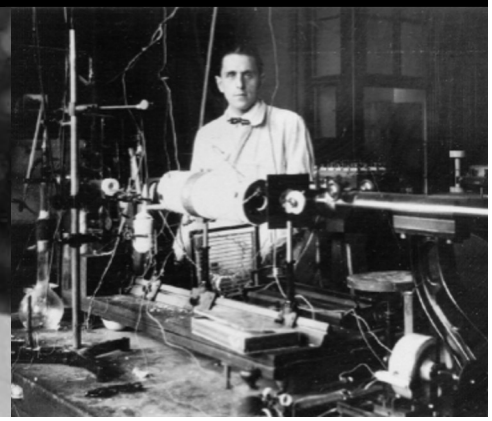


Nikolaus Riehl began processing uranium on an industrial scale for military projects

Carl Friedrich von Weizsäcker, Fritz Houtermans, and others proposed and calculated the suitability of plutonium-239 for bombs



2. Organization of German Nuclear Program

Coordination 1939-1942: Army
Head: Emil Leeb, Erich Schumann
Senior staff: Kurt Diebner, Siegfried Flügge, etc.

Coordination 1942-1945: SS
Head: Heinrich Himmler
Senior staff: Alfred Baubin, Gottlob Berger, ? Brandt, Werner Grothmann, Hans Kammler, ? Knapp, Rudolf Mentzel, Erich Purucker, Walther Schieber, Otto Schwab, etc.

Note: Names are alphabetical, not in order of importance

Reich Research Council
Head: Hermann Göring, Abraham Esau (1939-1943), Walther Gerlach (1943-1945)
Senior staff: Kurt Diebner, Siegfried Flügge, Rudolf Mentzel, etc.

Army Ordnance Office
Implosion staff: Walter Basche, Friedrich Georg Geist, Richard Glasgow, Erich Habann, Gerd Hinrichs, Gerhard Jung, Walter Kadow, Günter Sachsse, Rudi Schall, Erich Schneider, Erich Schumann, Walter Trinks, Kurt Wolk, etc.
Fission staff: Erich Bagge, Friedrich Berkei, Werner Czulius, Kurt Diebner, Georg Hartwig, Walter Herrmann, Siegward Hülsmann, E. Kamin, Oskar Pfetscher, Heinz Pose, Heinz Rackwitz, Fritz Rehbein, Ernst Rexer, Ernst Stuhlinger, etc.
U centrifuge staff: Werner Holtz, Ortwin Schulze, Werner Schwietzke, etc.
Locations: Berlin, Hillersleben, Kummersdorf/Gottow, Ohrdruf, Stadtilm, etc.

Austria-based
Head: Georg Stetter
Staff: Alfred Bönisch, Alfred Brukl, Friedrich Hernegger, Richard Herzog, Willibald Jentschke, Berta Karlik, Karl Lintner, Otto Merhaut, Gustav Ortner, Josef Schintlmeister, Adolf Smekal, Herta Wambacher, Gernot Zippe, etc.
Locations: Gusen, Linz, Lofer, Quarz, Redl Zipf, Sopron, Thumersbach, Vienna, etc.
Work: Pu breeding, H bomb, etc.

Hamburg/Kiel-based
Head: Paul Harteck
Staff: Konrad Beyerle, Rudolf Edse, K. H. Eldau, Wilhelm Groth, J. Hans Jensen, Friedrich Knauer, Werner Kuhn, Hans Martin, Hans Suess, Albert Suhr, Wilhelm Walcher, Rolf Wideröe, etc.
Locations: Celle, Hamburg, Kiel, etc.
Work: U centrifuges, D_2O production, electronuclear, etc.

Post Office
Head: Wilhelm Ohnesorge
Staff: Manfred von Ardenne, Otto Baier, Friedrich Banneitz, Siegfried Flügge, Fritz Houtermans, Detlof Lyons, Georg Otterbein, Otto Peter, Helmut Salow, Kurt Sauerwein, etc.
Locations: Berlin area--several, Silesia, Thuringia, Dresden, etc.
Work: Electromag. enrichment, implosion bomb design, electronuclear breeding, etc.

SS + Organisation Todt
Staff: Karl-Heinz Boseck, Helmut Fischer, etc.
Locations: Austria, Czech, Poland, Oranienburg, Lüneburg Heath, Thuringia, etc.
Work: U mining/enrichment, Pu breeding, testing, etc.

Czech/Silesia-based
Staff: Alesch, Bajer, Rolf Engel, Franz Hüttig, Kafka, Kappel, Odstracil, Ružek, Salow, Karel Staller, Tönies, Wilhelm Voss, etc.
Locations: Brno, Pibrams, Pilsen, Podmokly, Prague, Riese, etc.
Work: Electronuclear breeding, etc.

I.G. Farben programs
Head: Otto Ambros
Staff: Karl Geib, Paul Herold, Walter Kwasnik, Erich Noack, etc.
Locations: Auschwitz, Frankfurt, Leuna, Leverkusen, Ludwigshafen, Oppau, Pölitz, Waldenburg, etc.
Work: Chemical compounds for U enrichment, Pu extraction; D_2O production, etc.

Kaiser Wilhelm Institutes
Military-related staff: Ludwig Bewilogua, Heinz Ewald, Georg Graue, Ulrich Jetter, Alfred Klemm, Josef Mattauch, Werner Maurer, Peter Thiessen, Karl Wirtz, etc.
Non-military-related staff: Walther Bothe, Rudolf Fleischmann, Otto Hahn, Werner Heisenberg, Max von Laue, Fritz Strassmann, Carl Friedrich von Weizsäcker, etc.
Locations: KWI Physics, Chem, Bio, etc.

Auer/Degussa
Staff: Philipp Hoersch, Egon Ihwe, Fritz Klänhardt, Henry Ortmann, Kurt Quasebart, Rabbe, Nikolaus Riehl, Karl-Heinz Riewe, Walter Völkel, Karl Weis, Günter Wirths, Paul Max Wolf, etc.
Locations: Berlin, Oranienburg, Frankfurt, Stadtilm
Work: U/Th ore/metal

Buchler
Staff: ?
Location: Harz, Braunschweig
Work: U/Th ore

Maier
Staff: ?
Location: Villingen
Work: U/Th ore

Treibacher
Staff: ?
Location: Althofen
Work: U/Th ore

Union Minière
Staff: ?
Location: Brussels
Work: U/Th ore

Air Force
Head: Hermann Göring
Staff: Adolf Busemann, Gottfried Guderley, Hubert Schardin, etc.
Locations: Braunschweig, etc.
Work: Implosion, etc.

Navy
Head: Wilhelm Rhein
Staff: Helmut Hasse, Otto Haxel, Fritz Houtermans, Pascual Jordan, Heinz Schlicke, etc.
Locations: Berlin, Kiel, etc.
Work: Nuclear submarines, etc.

University of Leipzig
Staff: Karl-Friedrich Bonhoeffer, Robert Döpel, Gerhard Hoffmann
Work: Fission, cyclotrons, etc.

University of Munich
Staff: Klaus Clusius, Gerhard Dickel, Walther Gerlach, Ludwig Waldmann
Work: Thermal enrichment, etc.

Göttingen University
Staff: Wilhelm Hanle, Georg Joos, Hans Kopfermann, Wolfgang Paul
Work: Electromag. enrichment, etc.

Henschel
Staff: Herbert Wagner, etc.
Locations: Berlin
Work: Fission bomb, fission propulsion

AEG
Staff: Wolfgang Ferrant, Hartmut Kallmann, Ernst Kuhn
Locations: Berlin, etc.
Work: Fusion fuel, neutron initiators, etc.

Siemens
Staff: Heinz Barwich, Gustav Hertz, Max Steenbeck, etc.
Locations: Berlin, etc.
Work: Uranium enrichment, etc.

Reichswerke H. Göring
Head: Hermann Göring
Locations: Berlin, Salzgitter, Linz, etc.
Work: Metallurgy, etc.

Norway-based
Staff: ?
Locations: Vemork, Trondheim, etc.
Work: D_2O production, etc.

Denmark-based
Staff: ?
Locations: Bornholm, etc.
Work: ?

For more information, see *Forgotten Creators* 8.8 and Appendix D

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Ref No SAIC/FIR/15
27 Jul 45

SEVENTH ARMY INTERROGATION CENTER
APO 758

NOTES ON HIMMLER AND HIS STAFF
BY WILHELM FUEHRER, ADJ TO HIMMLER
Final Interrogation Report

4. PERSONALITIES

a. HIMMLER's Field Hq

GROTHMANN, SS-OSTUBAF (Lt Col) — Adj to HIMMLER from 1941 to the last; supervised military matters of WAFFEN-SS. Born HAMBURG; 39 years old; blue eyes, 1,75 m tall.

c. Scientific Personalities

SCHUMANN, Prof	nuclear	Director, First Physics Institute, University of BERLIN, and of HEERESWAFFENAMT (Army Ord Dept).
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2. SS Coordination of the Nuclear Program 1942-1945

NARA RG 238, Microfilm M1270, Interrogation Records
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Bundesarchiv Lichterfelde, NS 19-2012

XIa 165 22

DER REICHSFÜHRER-SS
CHEF DES SS-HAUPTAMTES
Cd/SSHA/Be/Vo. VS-Tgb.Nr. 313/42 g.Kdos.

Berlin W 35, den 8. Sept. 1942
Lützowstraße 46/49
Postschließfach 48

2 Ausfertigungen
Prüf.Nr. 1

Betr.: Reichspostminister Dr. Ohnesorge.

An den
Reichsführer-SS
und Chef der Deutschen Polizei,
Feld-Kommandostelle.

Reichsführer !

Reichspostminister Dr. Ohnesorge ist sehr aktiv und sehr beweglich aus seinem Urlaub zurückgekehrt. Drängt gewaltig, zum Führer zu kommen aus folgenden Gründen:

a) Nach seinen Beobachtungen fasst im Augenblick Amerika die gesamten Professoren der Physik und der Chemie zusammen, um besondere Leistungen hervorzubringen. Er möchte hierüber kurz dem Führer Vortrag halten.

b) Dr. Ohnesorge möchte sein nun ausprobiertes Gerät, aufgebaut auf einem Panzerjäger, dem Führer vorführen, um überhaupt die Möglichkeit zu erhalten, es für die Waffen-SS in genügender Menge herstellen lassen zu können. Die Konstrukteure würden selbst in das Führerhauptquartier fahren, das Gerät an einem vorhandenen Fahrzeug, bezw. Geschütz aufbauen, sodass es kurz dem Führer gezeigt werden könnte.

c) Dr. Ohnesorge möchte dem Reichsführer-SS für seinen Kulturfonds einen Scheck über 5 Mill. Mark persönlich übergeben.

Ich wäre in besonderem Masse dankbar, wenn der Besuch von Dr. Ohnesorge im Führerhauptquartier bald ermöglicht werden könnte, jedenfalls vor dem Mitte September beginnenden Europäischen Kongress.

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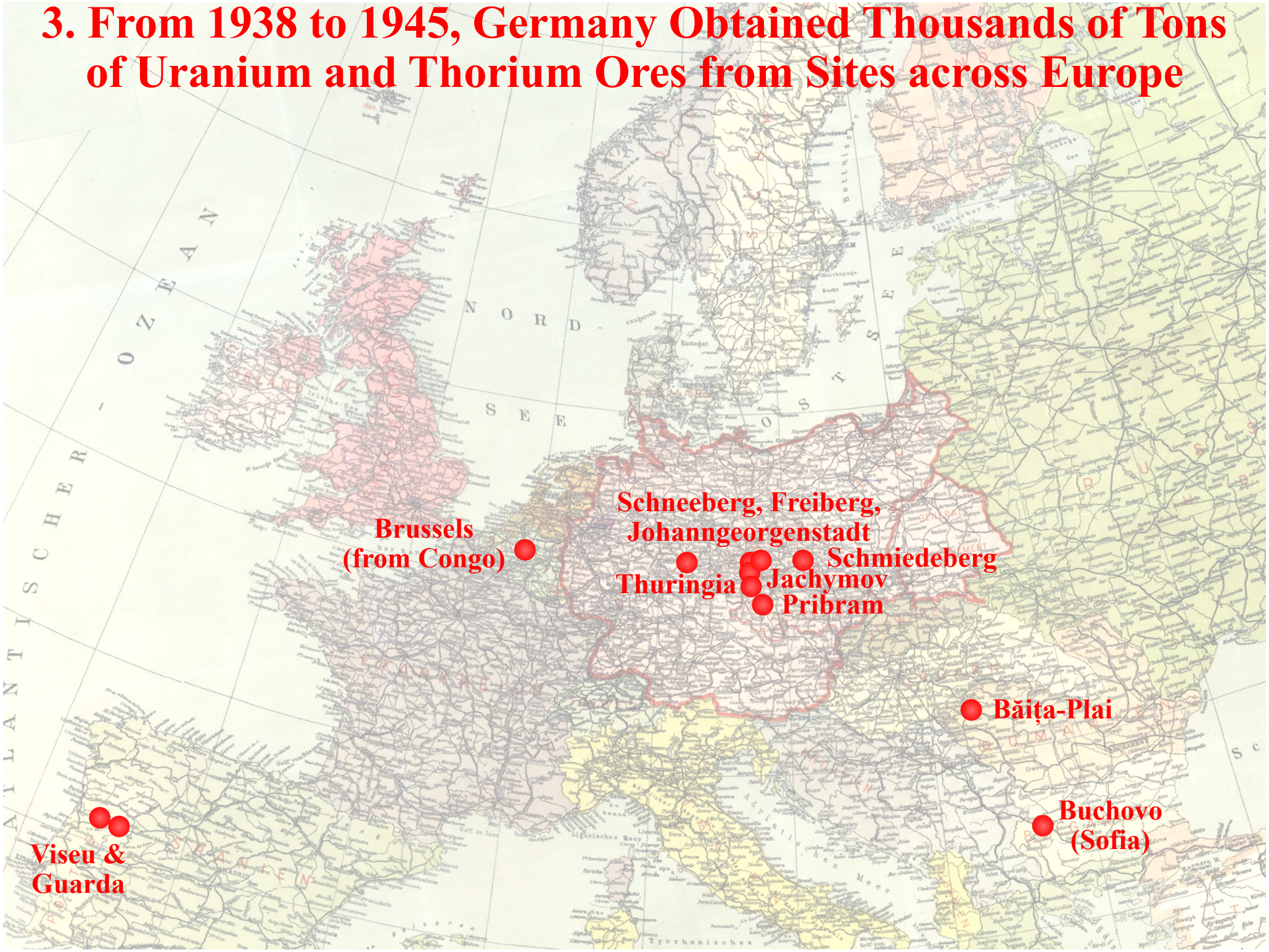
SS-Gruppenführer

According to his [Ohnesorge's] observations, at the moment America is gathering all the professors of physics and chemistry to produce special achievements. He would like to give a short lecture about this to the Führer.

3. From 1938 to 1945, Germany Obtained Thousands of Tons of Uranium and Thorium Ores from Sites across Europe



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William Casey. 1988. *The Secret War Against Hitler.* Regnery Gateway. p. 49.
When the British government learned that the Germans, on occupying Norway and Belgium, were increasing Norwegian heavy water production and had seized 3500 tons of uranium from Union Minière in Belgium, the Ministry of Supply was directed to study what would happen if an atom bomb was detonated in the center of a large British city.
[Nikolaus Riehl also reported the amount as 3500 tons instead of the usually given 1200 tons; see David Irving. 1967. *The Virus House.* William Kimber. pp. 65, 90--91.]

Vladimir L. Rychly, NARA RG 38, Entry 98C,
Box 9, Folder TSC #2601-2700, 11 February 1946.
The Germans put [uranium] mining on a high priority and only mining was done throughout the 6 years occupation. The ore was delivered by special planes to Germany and Austria.
Box 12, Folder TSC #3301-3400, 5 December 1946.
During the German occupation of Czechoslovakia, the Germans continued operations in this mine to the very last moment.

Peter Hayes. 2004. *From Cooperation to Complicity: Degussa in the Third Reich.* Cambridge University Press. p. 235.
Radium-Bergbau GmbH of Berlin, which in 1941-43, further developed mines in Portugal…

Jonathan E. Helmreich. 1986. *Gathering Rare Ores: The Diplomacy of Uranium Acquisition, 1943-1954.* Princeton University Press. p. 70.
The CDT [Combined Development Trust] did not know of the valuable deposits in Saxony, just north of the East German border with Czechoslovakia and the Joachimstal mines. Discovered by the Germans in 1943…

Report on Treibacher Chemical Works AG. 10 October 1945. CIOS Evaluation Report 343, AFHRA A1008 frames 0794-0797.
During the war they used Pitchblende from Joachimstahl in Czechoslovakia (where it was first discovered) and from Erzgebirge.

https://www.cia.gov/readingroom/docs/DOC_0000198124.pdf
Kowary area (the old Schmiedeberg area exploited by the Germans) where uranium was produced before the war…

Manhattan District History, Book I, Volume 14, Foreign Intelligence Supplement No. 1.
The ALSOS Mission had learned that 11 tons of crude sodium uranate had been delivered to the Radium Chemie Companie, of Frankfurt... Through questioning the Deputy Director of the firm it was learned that a stock of 11 tons of uranium products, 1/2 ton of Schmiedeberg ore and a few drums of monazite sand were on hand… The shortage of radium in Germany made it worth while to exploit the Schmiedeberg deposits.

Brussels (from Congo)

Schneeberg, Freiberg, Johanngeorgenstadt

Thuringia

Schmiedeberg

Jachymov

Pribram

http://taifasuri.ro/index.php/taifasuri/mozaic/17838-bomba-atomica-ruso-americana-hranita-din-uraniul-romanesc-nr748-sapt19-25-sept-2019
And those mines were in the Apuseni Mountains, in Biharia, at Stei-Baita. It seems that the uranium deposits here were discovered by German aviators who, around 1938-1939, flying over the perimeter, noticed a drop in pressure and a bizarre development of the films, which led the Germans to carry out a geological survey of the area with modern equipment, so they installed 40 probes in the area… The uranium that was obtained from those mines was… picked up by the SS service and shipped to laboratories in Germany. To facilitate transport on an industrial scale, the Germans built new sections of the Avram Iancu-Bulzeşti-Baia de Cris road and completed part of the Brad-Deva railway, a megastructure with viaducts and impeccable tunnels.

Băița-Plai

https://www.cia.gov/readingroom/docs/DOC_0000198124.pdf
The most important uranium deposit in Bulgaria is located in the old lead mining area of Goten Peak, near the monastery of Buhovo, northeast of Sofia. In late 1945, the Soviets continued the former German exploitation of this area.

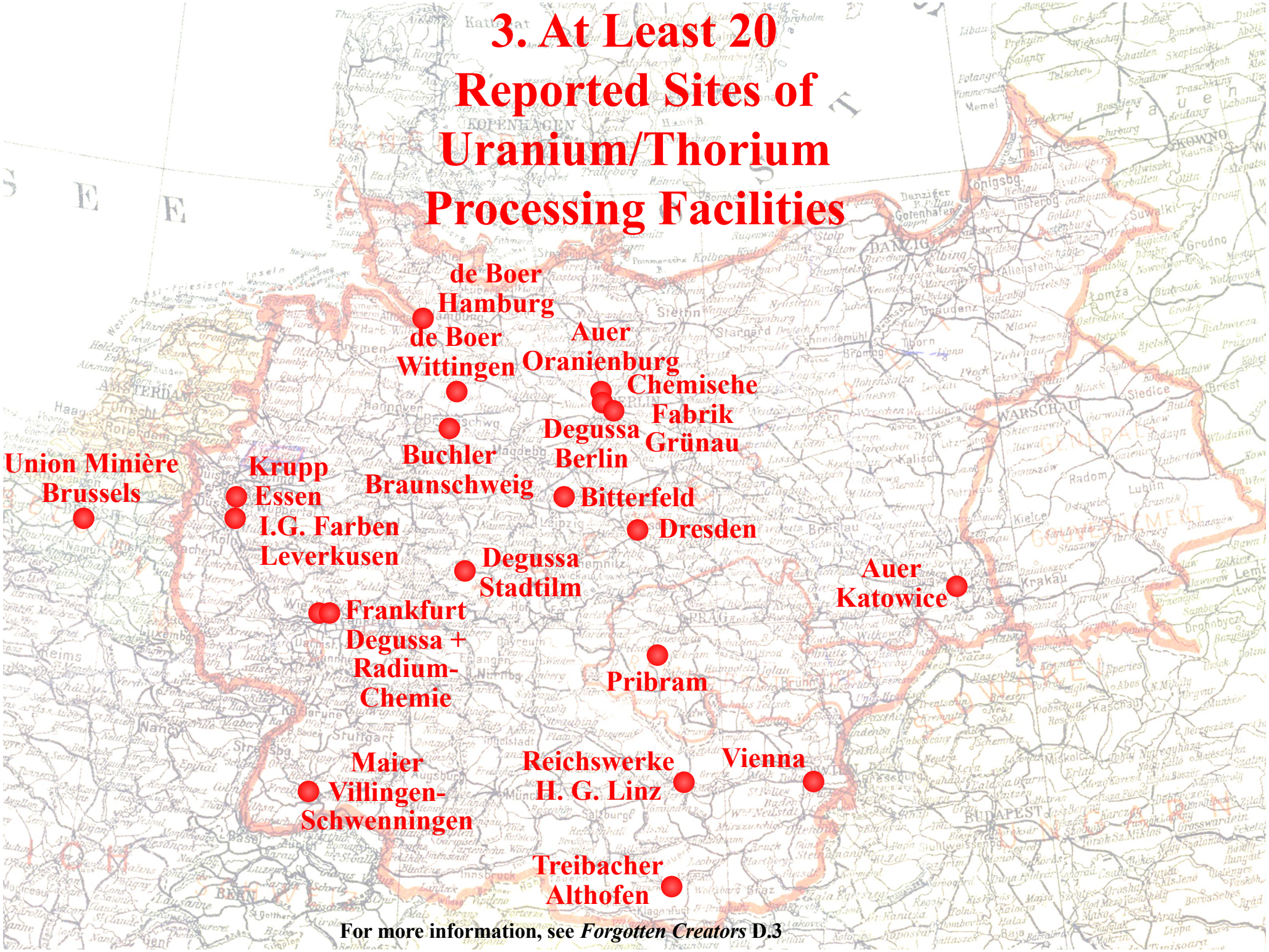
Buchovo (Sofia)

Viseu & Guarda

U.S. Embassy, Istanbul, 18 December 1943, AFHRA A1261 p. 27.
In the course of a violent argument with a Bulgarian officer, an engineer of the Todt organization revealed in Sofia that the Germans now possess a new type of incendiary far surpassing anything yet used in warfare. The engineer intimated that London would suffer a fate worse than that of Berlin or Hamburg in the near future.

For more information, see *Forgotten Creators* D.3

3. At Least 20 Reported Sites of Uranium/Thorium Processing Facilities


3. At Least 20
Reported Sites of
Uranium/Thorium
Processing Facilities
de Boer
Hamburg
de Boer
Wittingen
Auer
Oranienburg
Chemische
Fabrik
Grünau
Degussa
Berlin
Buchler
Braunschweig
Union Minière
Brussels
Krupp
Essen
I.G. Farben
Leverkusen
Bitterfeld
Dresden
Degussa
Stadtilm
Auer
Katowice
Frankfurt
Degussa +
Radium-
Chemie
Pribram
Maier
Villingen-
Schwenningen
Reichswerke
H. G. Linz
Vienna
Treibacher
Althofen
For more information, see *Forgotten Creators* D.3

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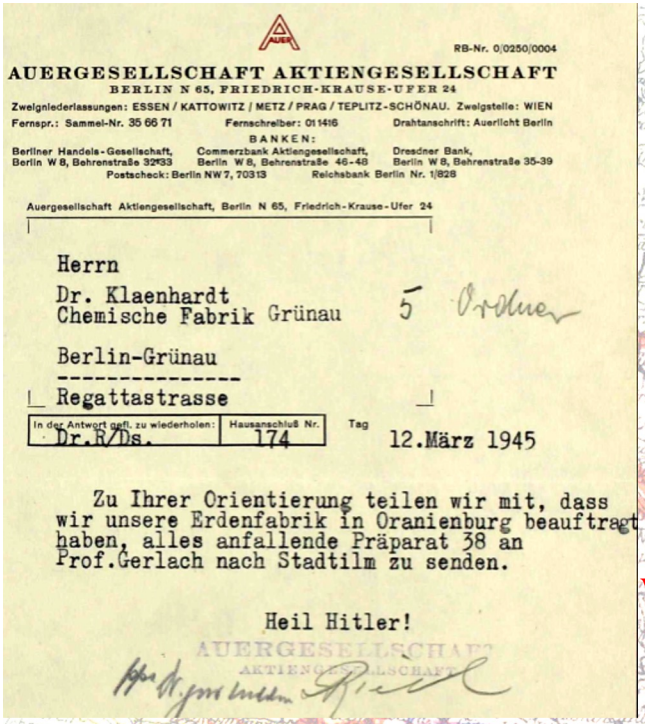


AUERGESELLSCHAFT AKTIENGESELLSCHAFT
BERLIN N 65, FRIEDRICH-KRAUSE-UFER 24
Zweigniederlassungen: ESSEN / KATTOWITZ / METZ / PRAG / TEPLITZ-SCHÖNAU. Zweigstelle: WIEN
Fernspr.: Sammel-Nr. 35 66 71 Fernschreiber: 01 1416 Drahtanschrift: Auerlicht Berlin
BANKEN:
Berliner Handels-Gesellschaft, Berlin W 8, Behrenstraße 32/33 — Commerzbank Aktiengesellschaft, Berlin W 8, Behrenstraße 46-48 — Dresdner Bank, Berlin W 8, Behrenstraße 35-39
Postscheck: Berlin NW 7, 70313 Reichsbank Berlin Nr. 1/828

RB-Nr. 0/0250/0004

Auergesellschaft Aktiengesellschaft, Berlin N 65, Friedrich-Krause-Ufer 24

Herrn
Dr. Klaenhardt
Chemische Fabrik Grünau
Berlin-Grünau
Regattastrasse

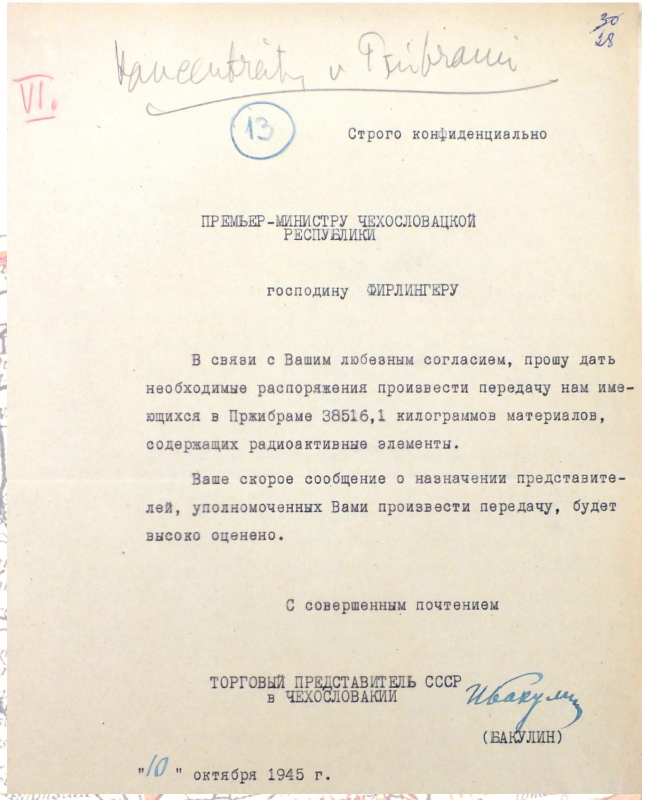
In der Antwort gefl. zu wiederholen: Dr.R/Ds. | Hausanschluß Nr. 174 | Tag 12.März 1945

Zu Ihrer Orientierung teilen wir mit, dass wir unsere Erdenfabrik in Oranienburg beauftragt haben, alles anfallende Präparat 38 an Prof.Gerlach nach Stadtilm zu senden.

Heil Hitler!

AUERGESELLSCHAFT AKTIENGESELLSCHAFT

10 October 1945 letter from Ivan Bakulin to Zdeněk Fierlinger, Národní archiv, Ústřední výbor KSČ, Klement Gottwald, sv. 81, aj. 1031



Строго конфиденциально

ПРЕМЬЕР-МИНИСТРУ ЧЕХОСЛОВАЦКОЙ РЕСПУБЛИКИ

господину ФИРЛИНГЕРУ

В связи с Вашим любезным согласием, прошу дать необходимые распоряжения произвести передачу нам имеющихся в Пржибраме 38516,1 килограммов материалов, содержащих радиоактивные элементы.

Ваше скорое сообщение о назначении представителей, уполномоченных Вами произвести передачу, будет высоко оценено.

С совершенным почтением

ТОРГОВЫЙ ПРЕДСТАВИТЕЛЬ СССР В ЧЕХОСЛОВАКИИ (БАКУЛИН)

"10" октября 1945 г.

de Boer Hamburg

de Boer Wittingen

Auer Oranienburg

Chemische Fabrik Grünau

Degussa Berlin

Buchler Braunschweig

Union Minière Brussels

Krupp Essen

I.G. Farben Leverkusen

Bitterfeld

Dresden

Degussa Stadtilm

Frankfurt

Degussa + Radium-Chemie

Pribram

Auer Katowice

Maier Villingen-Schwenningen

Reichswerke H. G. Linz

Vienna

Treibacher Althofen

https://www.cia.gov/readingroom/document/cia-rdp83-00415r003900020006-0

[Chemische Fabrik Grünau:] Production was increased during World War II and the manufacture of uranium metal from pitchblende was started on a large scale. At that time the factory employed over 1,000 workers. About 60 per cent of the factory was damaged by air attacks in spring 1945, and... all the uranium installations, as well as the company's own power plant, were fully dismantled after the Red Army occupied Berlin.

David Gattiker and George C. Davis. 16 May 1945. Report on visit to Joachimsthal. NARA RG 77, Entry UD-22A, Box 160, Folder APR 45--Dec. '45.
I and Davis entered Czechoslovakian target yesterday morning and spent three hours with Dr. Patzochke, German director of the mines. […] These concentrates contain 60 per cent U_3O_8 and were sent to Germany and Austria for radium extraction, and were divided equally between Auer, Buchler at Brunswick, and Goldschmidt at Treibach in Austria.

G-157. I.G. Farben Leverkusen. 11 June 1942.
Kwasnik developed process whereby uranium oxide is carried through a rotating inclined nickel tube heated to 650°C through which a stream of fluorine gas is passed. The UF_6 thus formed is frozen by CO_2 in containers. About 500 grams UF_6 thus produced per hour. The UF_6 to be frozen in large crystalline block to reduce amount of adsorption of other gases.

For more information, see *Forgotten Creators* D.3

4. ^{235}U Enrichment: Centrifuges

Zeitschrift für Physikalische Chemie A 17:459 (1895)

Ueber den Einfluss der Zentrifugalkraft auf chemische Systeme.

Von

G. Bredig.

(Mit 3 Figuren im Text.)

Gas centrifuges were invented in Germany before 1895.

Einleitung.

Die Frage, ob durch den Einfluss äusserer Kräfte, wie z. B. durch die Gravitation, sich in einem ursprünglich homogenen Gemenge Konzentrationsverschiedenheiten in der Richtung dieser Kräfte ausbilden, ist bereits im Anfange dieses Jahrhunderts diskutiert worden. So stellte bereits Gay-Lussac[1]) in den Kellern der Pariser Sternwarte Versuche darüber an, ob eine Salzlösung in einer vertikalen 2 m langen Säule unter dem Einfluss der Schwerkraft am unteren Ende der Säule eine andere Konzentration annehme, als am oberen Ende. Er erhielt ein negatives Resultat, was nach den neueren Berechnungen von Gouy und Chaperon[2]) auch verständlich wird, da diese Autoren thermodynamisch den Einfluss der Gravitation auf die Konzentration aus der Änderung der Dichte mit der Konzentration zu berechnen vermögen und denselben so klein finden, dass seine experimentelle Feststellung schwerlich ausführbar ist.

Die Theorie solcher Systeme ist bereits mehrfach, von J. W. Gibbs[3]), Gouy und Chaperon[4]), P. Duhem[5]), van der Waals[6]) und anderen gegeben worden.

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[1]) Ann. chim. phys. **11,** 306 (1819). — Vergl. auch Ostwald, Lehrbuch der allg. Chemie 2. Aufl. I, 700. — Beudant, Ann. chim. phys. **8,** 15. — Bischof, Lehrbuch der ch. und ph. Geol. II, 1712. — Lieben, Lieb. Ann. **101,** 77 (1857).

[2]) Ann. chim. phys. (6) **12,** 384 (1887).

[3]) Thermodynam. Studien S. 171 ff. Deutsch von Ostwald.

[4]) Siehe oben und Compt. rend. **105,** 117.

[5]) Journ. de phys. (2) **8,** 391 (1888).

[6]) Diese Zeitschr. **5,** 157.

[7]) Wied. Ann. **46,** 296; **49,** 284; Diese Zeitschr. **12,** 143.

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[6]) Diese Zeitschr. **5**, 157.
[7]) Wied. Ann. **46**, 296; **49**, 284; Diese Zeitschr. **12**, 143.

PATENTSCHRIFT

№ 833 487

KLASSE 12e GRUPPE 305

Dr.-Ing. Helmuth Hausen, München-Solln
ist als Erfinder genannt worden

Gesellschaft für Linde's Eismaschinen A. G.,
Höllriegelskreuth bei München

Verfahren und Vorrichtung zur Zerlegung von Gas- und Flüssigkeitsgemischen in Zentrifugen

Patentiert im Gebiet der Bundesrepublik Deutschland vom 18. Juni 1939 an
Der Zeitraum vom 8. Mai 1945 bis einschließlich 7. Mai 1950 wird auf die Patentdauer nicht angerechnet
(Ges. v. 15. 7. 51)
Patentanmeldung bekanntgemacht am 26. Juli 1951
Patenterteilung bekanntgemacht am 7. Februar 1952

Es hat bisher nicht an Versuchen gefehlt, Gasgemische durch Zentrifugieren zu zerlegen. Ein brauchbares Ergebnis konnte jedoch mit diesen Verfahren nicht erzielt werden, weil die Trennwirkung der bekannten Zentrifugierverfahren verhältnismäßig gering ist. Auch theoretisch läßt sich nachweisen, daß die Zerlegungswirkung einer nach den bekannten Verfahren betriebenen Zentrifuge selbst bei den höchsten heute möglichen Umfangsgeschwindigkeiten und bei Gemischen mit großen Unterschieden im Molekulargewicht nur sehr gering ist.

Nach der vorliegenden Erfindung läßt sich aber der an sich kleine, durch Zentrifugalwirkung erzielbare Trenneffekt dadurch zu größerer Wirkung bringen, daß man ihn durch Gegenstromführung der Gase verstärkt. Eine solche Verstärkung durch Gegenstrom ist z. B. bei der Rektifikation bekannt. Die nur geringe Zerlegungswirkung eines einzelnen Rektifikationsbodens wird dadurch vervielfacht, daß man eine große Zahl von solchen Böden übereinander anordnet und Flüssigkeit und Dampf im Gegenstrom führt. Ebenso läßt sich grundsätzlich die Trennwirkung einer Zentrifuge dadurch ver-

PATENTSCHRIFT

№ 906 094

KLASSE 12e GRUPPE 305

Dr. Werner Kuhn, Basel (Schweiz) und Dr. Hans Martin, Kiel
sind als Erfinder genannt worden

Dr. Hans Martin, Kiel

Vorrichtung und Verfahren zur Trennung von Gasgemischen durch Anwendung von künstlich erzeugten Schwerefeldern

Patentiert im Gebiet der Bundesrepublik Deutschland vom 12. Juli 1939 an
Der Zeitraum vom 8. Mai 1945 bis einschließlich 7. Mai 1950 wird auf die Patentdauer nicht angerechnet
(Ges. v. 15. 7. 51)
Patentanmeldung bekanntgemacht am 12. März 1953
Patenterteilung bekanntgemacht am 28. Januar 1954

Es ist bekannt, daß man eine teilweise Trennung von Gas- oder Dampfgemischen, welche sich aus verschieden schweren Bestandteilen zusammensetzen, dadurch erreichen kann, daß man das Gasgemisch in einen Hohlkörper bringt und denselben mit hoher Umlaufzahl um eine Achse rotieren läßt. Durch das bei der hohen Umlaufzahl auftretende Schwerefeld wird eine Anreicherung der schwereren Bestandteile in den peripheren Teilen, eine verhältnismäßige Anreicherung der leichteren Bestandteile in den der Achse benachbarten Teilen des Hohlkörpers hervorgebracht. Es ist indessen bekannt, daß eine solche Trennung nur in recht geringem Ausmaße erfolgt und daß sie nur dann merkliche Beträge annimmt, wenn das Molekulargewicht der in dem Gemische vorliegenden Bestandteile große Unterschiede aufweist.

Um auch bei kleinen Unterschieden im Molekulargewicht, wie sie z. B. bei Luft oder bei Isotopengemischen vorliegen, eine weitgehende Trennung herbeizuführen, ist es notwendig, die bei der Zentrifugierung anfallenden Gasfraktionen wiederholt zu zentrifugieren. Es ist dabei naheliegend, anstatt einer einzigen eine Reihe von Zentrifugen vorzusehen und diese durch Rohrleitungen derart zu verbinden, daß die zweite Zentrifuge mit der in der ersten anfallenden schweren Fraktion gespeist wird, die dritte Zentrifuge mit der in der zweiten anfallenden noch schwereren Fraktion usf. Auf diese Weise können Fraktionen er-

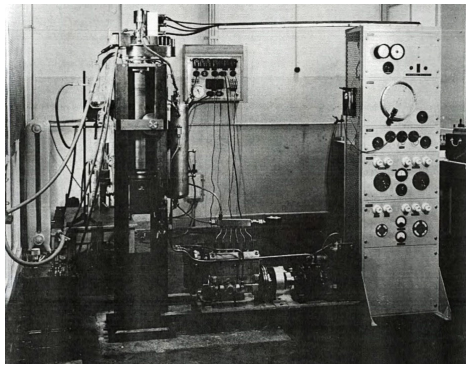
Gas centrifuges were invented in Germany before 1895.

By World War II, uranium gas centrifuges were produced in:

- **Kiel (2 groups)**
- **Munich**
- **Freiburg**
- **Göttingen**
- **Thuringia**
- **Breslau/Wrocław**
- **Swiss factories (!)**
- **+ more locations?**

Werner Schwietzke. 1947. National Archives of Australia. Series MT105/8, ctrl 1/6/3094, code 934755.

Since the theoretical calculations of the stress distribution of the rotor rotating at high speed can only be carried out with a certain approximation, it was recommended that the precisely balanced rotor be subjected to a test run below the maximum rotational speed of 65,000 rpm, which was calculated as critical, and that any changes in the rotor be precisely determined by precision measurements after the run. After a considerable number of test series over several hours at 60,000 rpm a deformation of the rotor never could be detected, so that a constant operating speed of 56,000 rpm could be selected for the intended tests without danger. This ultracentrifuge, which requires little space and effort, has proven itself extraordinarily good in practice.



Marshal Georgy Zhukov. 2 October 1945. Report to Joseph Stalin. Archive of the President of the Russian Federation, Fund 93, Division 77 (45), List 4-11.

The main specialists in the field of isotope separation in Germany were Professor Harteck, Dr. Groth, who, together with the chief designer of the Anschütz company (Kiel, English zone), Dr. Beyerle, invented an ultracentrifuge built by the above company, as well as by the Hellige company (Breslau, USSR zone).

DECLASSIFIED Authority NND 972012

NARA RG 77, Entry UD-22A, Box 166, Folder 32.22-1
GERMANY—Research—TA—(1943–June 1946)

CONFIDENTIAL

C.I.C. 75/295

10 September 1945

COPY NO. 66

COMBINED INTELLIGENCE COMMITTEE

COMBINED INTELLIGENCE OBJECTIVES SUBCOMMITTEE
EVALUATION REPORT 318 (35th August 1945)

FRITZ HELLIGE & CO.
FREIBURG - BREISGAU
MANUFACTURERS OF ULTRAZENTRIFUGE

Source: JOLLES, Friedrich Wolfgang (44, non Aryan, never in Party)
Steckelenbergerstr. 34
Thale/Harz
Source was drafted for service with the Wirtschaftsgruppe
Feinmechanik & Optik, working for the civilian sector of the Group.

1. Fritz Hellige & Co., were the makers of an ULTRAZENTRIFUGE (ultra-centrifuge) which was designed to be used in the manufacture of a new explosive ten million times more destructive and powerful than any heretofore known.

2. The raw material used was pitchblende. The end product was a liquid which had to be charged in order to become an explosive.

3. Only a few grams of the liquid had been produced by the spring of this year, which explains why the new explosive was never used against the Allies.

4. In November 1944, the plant, originally located in a suburb of Freiburg/Breisgau, was completely bombed out. According to a Pruefungsbericht which Jolles saw, the plant was evacuated to Knudern, south of Freiburg, where the Ultrazentrifuge was set up in a little house about 300 meters from the main factory building.

5. Betriebsleiter FRITZENSCHAFT, who may be located in the suburb of Freiburg where the plant was originally located, or at Knudern, knows everything about the Ultracentrifuge and the new product.

6. Source also stated that the new explosive had important peacetime uses, since a quantity about the size of a match box contained enough energy to drive a motor car for twenty years.

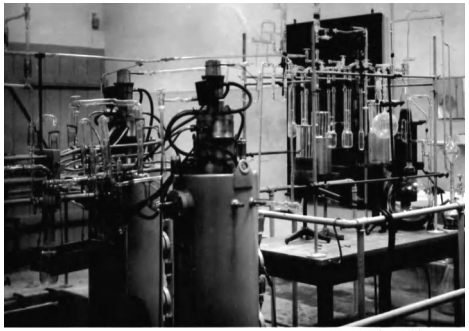
7. Source believed that the new explosive was in some way related to the splitting of the atom.

CARDED

E.L. Deuss
CIOS Team VII
9th U.S. Army

H.R. Hebicht

Deutsches Museum
FA 002/811



March 14, 1944

MEMORANDUM

TO; Major R. H. Furman

FROM; H. T. Wensel

DECLASSIFIED 812018 By MHC Date 3/6/89

This memorandum will put on record the information which I gave you orally yesterday.

Dr. H. C. Urey of Columbia University was approached through a Professor Perrin, who was then an exchange Professor in the Chemistry Department at Columbia University, on behalf of one Constantin Chilowsky. Chilowsky was desirous of selling an invention, the exact method never disclosed to us, for accomplishing the same purpose which the Manhattan District is seeking to. Professor Urey indicated that he was not interested in the matter but passed the information on to the OSRD, and I was asked to interview Chilowsky by Dr. Conant to see what I could find out. I used my credentials as a member of the National Bureau of Standards and indicated to Chilowsky and Professor Perrin that I had no other government connection.

Chilowsky was a Swiss and refused to divulge even the approximate nature of his method but, inasmuch as I indicated that the government would be apathetic to the idea until shown that something practical was involved, in order to "sell" me on the importance of the job, he indicated to me that the Germans were actively engaged on the same objective. In particular, he told me he had personally seen in a factory in Switzerland centrifuges which were being produced to be sent to Germany for the Germans' work on this field.

Chilowsky also told me that he had a moral and financial obligation to offer first crack at his invention to the British group of Halban. It seems that Halban and his group had some part in developing the invention in question. Halban is at present with the British team in Montreal, and it may be that Chilowsky's whereabouts can be traced through Halban if no other means of approach is available.

NARA RG 227, Microfilm M1392, Bush-Conant File
Relating to the Development of the Atomic Bomb

ANSCHÜTZ & CO. G.M.B.H.
KREISELGERÄTE
KIEL-NEUMÜHLEN
BRIEFANSCHRIFT: KIEL, POSTSCHLIESSFACH

TELEGRAMMADRESSE: ANSCHÜTZCO-KIEL · FERNRUF: 4000 · POSTSCHECKKONTO: HAMBURG 5854
BANKEN: REICHSBANK-GIROKONTO 811, VEREINSBANK KIEL, WILH. AHLMANN, KIEL

An das
Institut für Physikalische Chemie
der Hansischen Universität
z.Hd. Herrn Dozent Dr.W.Groth,
Jungiusstr. 9,
Hamburg 36.

IHRE ZEICHEN	IHRE NACHRICHT VOM	UNSERE ZEICHEN	TAG
	9.12.41.	E.A.Dr.Bey/Rw.	11.12.1941.

BETREFF

Herstellung einer Ultrazentrifuge, Oelkreislauf.

Für Ihr Schreiben vom 9.12.41 danken wir Ihnen bestens.

Die Firma Bosch G.m.b.H. teilt uns soeben mit, dass der in unserem Schema 03 21 02 - 1 /Schem.1 bei 3) vorgesehene Einzylinder-Luftpresser nicht geliefert werden kann, dass aber Verdichter der Type SV/DRB 160 R 12 4 Wochen nach Auftragseingang erhältlich seien.

Wir haben unsere frühere Bestellung Nr. 82 11 vom 23.11.41 zurückgezogen und anstelle dessen 2 Stück Verdichter der letztgenannten Type soeben mit der Bitte in Auftrag gegeben, die angegebene Lieferzeit von 4 Wochen einzuhalten. Gleichzeitig haben wir darauf hingewiesen, dass es sich dabei um ein Bauteil handelt, für dessen schnelle Lieferung Sie sich bereits an die Firma Bosch gewandt hatten.

Heil Hitler !
ANSCHÜTZ u. CO. G.m.b.H.
Entwicklungs-Abteilung
i.A.

4. ^{235}U Enrichment: Centrifuges

Zeitschrift für Physikalische Chemie A 17:459 (1895)

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G. Bredig.

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Nun hat aber unlängst Herr Th. des Coudres in einer interessanten Abhandlung[7]) beiläufig darauf hingewiesen, dass man die Betrachtungen über den Einfluss der Schwere auf die Konzentration der Lö-

[1]) Ann. chim. phys. **11**, 306 (1819). — Vergl. auch Ostwald, Lehrbuch der allg. Chemie 2. Aufl. I, 700. — Beudant, Ann. chim. phys. **8**, 15. — Bischof, Lehrbuch der ch. und ph. Geol. II, 1712. — Lieben, Lieb. Ann. **101**, 77 (1857).
[2]) Ann. chim. phys. (6) **12**, 384 (1887).
[3]) Thermodynam. Studien S. 171 ff. Deutsch von Ostwald.
[4]) Siehe oben und Compt. rend. **105**, 117.
[5]) Journ. de phys. (2) **8**, 391 (1888).
[6]) Diese Zeitschr. **5**, 157.
[7]) Wied. Ann. **46**, 296; **49**, 284; Diese Zeitschr. **12**, 143.

PATENTSCHRIFT

№ 833 487

KLASSE 12e GRUPPE 3 05

G 414 IVb/12e

Dr.-Ing. Helmuth Hausen, München-Solln
ist als Erfinder genannt worden

Gesellschaft für Linde's Eismaschinen A. G., Höllriegelskreuth bei München

Verfahren und Vorrichtung zur Zerlegung von Gas- und Flüssigkeitsgemischen in Zentrifugen

Patentiert im Gebiet der Bundesrepublik Deutschland vom 18. Juni 1939 an
Der Zeitraum vom 8. Mai 1945 bis einschließlich 7. Mai 1950 wird auf die Patentdauer nicht angerechnet
(Ges. v. 15. 7. 51)
Patentanmeldung bekanntgemacht am 26. Juli 1951
Patenterteilung bekanntgemacht am 7. Februar 1952

Es hat bisher nicht an Versuchen gefehlt, Gasgemische durch Zentrifugieren zu zerlegen. Ein brauchbares Ergebnis konnte jedoch mit diesen Verfahren nicht erzielt werden, weil die Trennwirkung der bekannten Zentrifugierverfahren verhältnismäßig gering ist. Auch theoretisch läßt sich nachweisen, daß die Zerlegungswirkung einer nach den bekannten Verfahren betriebenen Zentrifuge selbst bei den höchsten heute möglichen Umfangsgeschwindigkeiten und bei Gemischen mit großen Unterschieden im Molekulargewicht nur sehr gering ist.

Nach der vorliegenden Erfindung läßt sich aber der an sich kleine, durch Zentrifugalwirkung erzielbare Trenneffekt dadurch zu größerer Wirkung bringen, daß man ihn durch Gegenstromführung der Gase verstärkt. Eine solche Verstärkung durch Gegenstrom ist z. B. bei der Rektifikation bekannt. Die nur geringe Zerlegungswirkung eines einzelnen Rektifikationsbodens wird dadurch vervielfacht, daß man eine große Zahl von solchen Böden übereinander anordnet und Flüssigkeit und Dampf im Gegenstrom führt. Ebenso läßt sich grundsätzlich die Trennwirkung einer Zentrifuge dadurch ver-

PATENTSCHRIFT

№ 906 094

KLASSE 12e GRUPPE 3 05

M 4147 IVb/12e

Dr. Werner Kuhn, Basel (Schweiz) und Dr. Hans Martin, Kiel
sind als Erfinder genannt worden

Dr. Hans Martin, Kiel

Vorrichtung und Verfahren zur Trennung von Gasgemischen durch Anwendung von künstlich erzeugten Schwerefeldern

Patentiert im Gebiet der Bundesrepublik Deutschland vom 12. Juli 1938 an
Der Zeitraum vom 8. Mai 1945 bis einschließlich 7. Mai 1950 wird auf die Patentdauer nicht angerechnet
(Ges. v. 15. 7. 51)
Patentanmeldung bekanntgemacht am 12. März 1953
Patenterteilung bekanntgemacht am 28. Januar 1954

Es ist bekannt, daß man eine teilweise Trennung von Gas- oder Dampfgemischen, welche sich aus verschieden schweren Bestandteilen zusammensetzen, dadurch erreichen kann, daß man das Gasgemisch in einen Hohlkörper bringt und denselben mit hoher Umlaufzahl um eine Achse rotieren läßt. Durch das bei der hohen Umlaufzahl auftretende Schwerefeld wird eine Anreicherung der schwereren Bestandteile in den peripheren Teilen, eine verhältnismäßige Anreicherung der leichteren Bestandteile in den der Achse benachbarten Teilen des Hohlkörpers hervorgebracht. Es ist indessen bekannt, daß eine solche Trennung nur in recht geringem Ausmaße erfolgt und daß sie nur dann merkliche Beträge annimmt, wenn das Molekulargewicht der in dem Gemische vorliegenden Bestandteile große Unterschiede aufweist.

Um auch bei kleinen Unterschieden im Molekulargewicht, wie sie z. B. bei Luft oder bei Isotopengemischen vorliegen, eine weitgehende Trennung herbeizuführen, ist es notwendig, die bei der Zentrifugierung anfallenden Gasfraktionen wiederholt zu zentrifugieren. Es ist dabei naheliegend, anstatt einer einzigen eine Reihe von Zentrifugen vorzusehen und diese durch Rohrleitungen derart zu verbinden, daß die zweite Zentrifuge mit der in der ersten anfallenden schweren Fraktion gespeist wird, die dritte Zentrifuge mit der in der zweiten anfallenden noch schwereren Fraktion usf. Auf diese Weise können Fraktionen er-

Gas centrifuges were invented in Germany before 1895.

By World War II, uranium gas centrifuges were produced in:

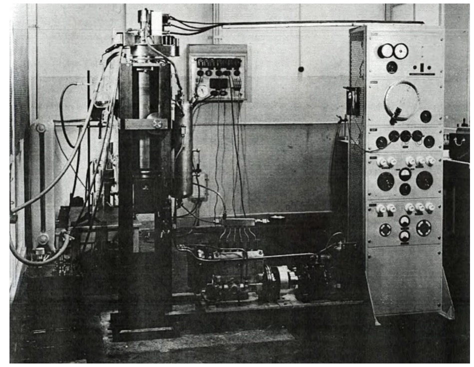
- **Kiel (2 groups)**
- **Munich**
- **Freiburg**
- **Göttingen**
- **Thuringia**
- **Breslau/Wrocław**
- **Swiss factories (!)**
- **+ more locations?**

How many uranium gas centrifuges did Germany produce?

For more information, see *Forgotten Creators* D.4.2.

Werner Schwietzke. 1947. National Archives of Australia. Series MT105/8, ctrl 1/6/3094, code 934755.

Since the theoretical calculations of the stress distribution of the rotor rotating at high speed can only be carried out with a certain approximation, it was recommended that the precisely balanced rotor be subjected to a test run below the maximum rotational speed of 65,000 rpm, which was calculated as critical, and that any changes in the rotor be precisely determined by precision measurements after the run. After a considerable number of test series over several hours at 60,000 rpm a deformation of the rotor never could be detected, so that a constant operating speed of 56,000 rpm could be selected for the intended tests without danger. This ultracentrifuge, which requires little space and effort, has proven itself extraordinarily good in practice.



Marshal Georgy Zhukov. 2 October 1945. Report to Joseph Stalin. Archive of the President of the Russian Federation, Fund 93, Division 77 (45), List 4-11.

The main specialists in the field of isotope separation in Germany were Professor Harteck, Dr. Groth, who, together with the chief designer of the Anschütz company (Kiel, English zone), Dr. Beyerle, invented an ultracentrifuge built by the above company, as well as by the Hellige company (Breslau, USSR zone).

NARA RG 77, Entry UD-22A, Box 166, Folder 32.22-1
GERMANY—Research—TA—(1943–June 1946)

DECLASSIFIED Authority NND 917017

D M A   CIO   28596   Card & File

CONFIDENTIAL   COPY NO. 66

C.I.C. 75/295

10 September 1945   Germ.

COMBINED INTELLIGENCE COMMITTEE

COMBINED INTELLIGENCE OBJECTIVES SUBCOMMITTEE
EVALUATION REPORT 318 (13th August 1945)

FRITZ HELLIGE & CO.
FREIBURG - BREISGAU
MANUFACTURERS OF ULTRAZENTRIFUGE

Source: JOLLES, Friedrich Wolfgang (44, non Aryan, never in Party)
Stecklenbergerstr. 34
Thals/Harz
Source was drafted for service with the Wirtschaftsgruppe
Feinmechanik & Optik, working for the civilian sector of the Group.

1. Fritz Hellige & Co., were the makers of an ULTRAZENTRIFUGE (ultra-centrifuge) which was designed to be used in the manufacture of a new explosive ten million times more destructive and powerful than any heretofore known.

2. The raw material used was pitchblende. The end product was a liquid which had to be charged in order to become an explosive.

3. Only a few grams of the liquid had been produced by the spring of this year, which explains why the new explosive was never used against the Allies.

4. In November 1944, the plant, originally located in a suburb of Freiburg/Breisgau, was completely bombed out. According to a Pruefungsbericht which Jolles saw, the plant was evacuated to Kandern, south of Freiburg, where the Ultracentrifuge was set up in a little house about 300 meters from the main factory building.

5. Betriebsleiter FRITZENSCHAFT, who may be located in the suburb of Freiburg where the plant was originally located, or at Kandern, knows everything about the Ultracentrifuge and the new product.

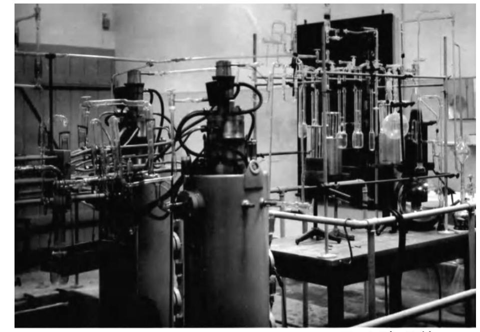
6. Sourve also stated that the new explosive had important peacetime uses, since a quantity about the size of a match box contained enough energy to drive a motor car for twenty years.

7. Source believed that the new explosive was in some way related to the splitting of the atom.

CARDED

E.L. Deuss   H.R. Habicht
CIOS Team VII
9th U.S. Army

Deutsches Museum FA 002/811



NARA RG 227, Microfilm M1392, Bush-Conant File Relating to the Development of the Atomic Bomb

March 14, 1944

MEMORANDUM

TO: Major R. R. Furman

FROM: H. T. Wensel

DECLASSIFIED 812018 By MHC NARS Date 2/6/89

This memorandum will put on record the information which I gave you orally yesterday.

Dr. H. C. Urey of Columbia University was approached through a Professor Perrin, who was then an exchange Professor in the Chemistry Department at Columbia University, on behalf of one Constantin Chilowsky. Chilowsky was desirous of selling an invention, the exact method never disclosed to us, for accomplishing the same purpose which the Manhattan District is seeking to. Professor Urey indicated that he was not interested in the matter but passed the information on to the OSRD, and I was asked to interview Chilowsky by Dr. Conant to see what I could find out. I used my credentials as a member of the National Bureau of Standards and indicated to Chilowsky and Professor Perrin that I had no other government connection.

Chilowsky was a Swiss and refused to divulge even the approximate nature of his method but, inasmuch as I indicated that the government would be apathetic to the idea until shown that something practical was involved, in order to "sell" me on the importance of the job, he indicated to me that the Germans were actively engaged on the same objective. In particular, he told me he had personally seen in a factory in Switzerland centrifuges which were being produced to be sent to Germany for the Germans' work on this field.

Chilowsky also told me that he had a moral and financial obligation to offer first crack at his invention to the British group of Halban. It seems that Halban and his group had some part in developing the invention in question. Halban is at present with the British team in Montreal, and it may be that Chilowsky's whereabouts can be traced through Halban if no other means of approach is available.

ANSCHÜTZ & CO. G. M. B. H.
KREISELGERÄTE
KIEL-NEUMÜHLEN
BRIEFANSCHRIFT: KIEL, POSTSCHLIESSFACH
TELEGRAMMADRESSE: ANSCHÜTZCO-KIEL · FERNRUF: 4000 · POSTSCHECKKONTO: HAMBURG 5854
BANKEN: REICHSBANK-GIROKONTO 811, VEREINSBANK KIEL, WILH. AHLMANN, KIEL

An das
Institut für Physikalische Chemie
der Hansischen Universität
z.Hd. Herrn Dozent Dr.W.Groth,
Jungiusstr. 9,
Hamburg 36.

IHRE ZEICHEN	IHRE NACHRICHT VOM	UNSERE ZEICHEN	TAG
	9.12.41.	E.A.Dr.Bey/Rw.	11.12.1941.

BETREFF

Herstellung einer Ultrazentrifuge, Oelkreislauf.

Für Ihr Schreiben vom 9.12.41 danken wir Ihnen bestens.

Die Firma Bosch G.m.b.H. teilt uns soeben mit, dass der in unserem Schema 03 21 02 - 1 /Schem.1 bei 3) vorgesehene Einzylinder-Luftpresser nicht geliefert werden kann, dass aber Verdichter der Type SV/DRB 160 R 12 4 Wochen nach Auftragseingang erhältlich seien.

Wir haben unsere frühere Bestellung Nr. 82 11 vom 23.11.41 zurückgezogen und anstelle dessen 2 Stück Verdichter der letztgenannten Type soeben mit der Bitte in Auftrag gegeben, die angegebene Lieferzeit von 4 Wochen einzuhalten. Gleichzeitig haben wir darauf hingewiesen, dass es sich dabei um ein Bauteil handelt, für dessen schnelle Lieferung Sie sich bereits an die Firma Bosch gewandt hatten.

Heil Hitler !
ANSCHÜTZ u. CO. G.m.b.H.
Entwicklungs-Abteilung

i.A. Beyerle

4. ^{235}U Enrichment: Electromagnetic Separators/Calutrons

Prototype calutron built and demonstrated by 1941 by Manfred von Ardenne and ELIN company [Russian archive/Rainer Karlsch]

4. ^{235}U Enrichment: Electromagnetic Separators/Calutrons

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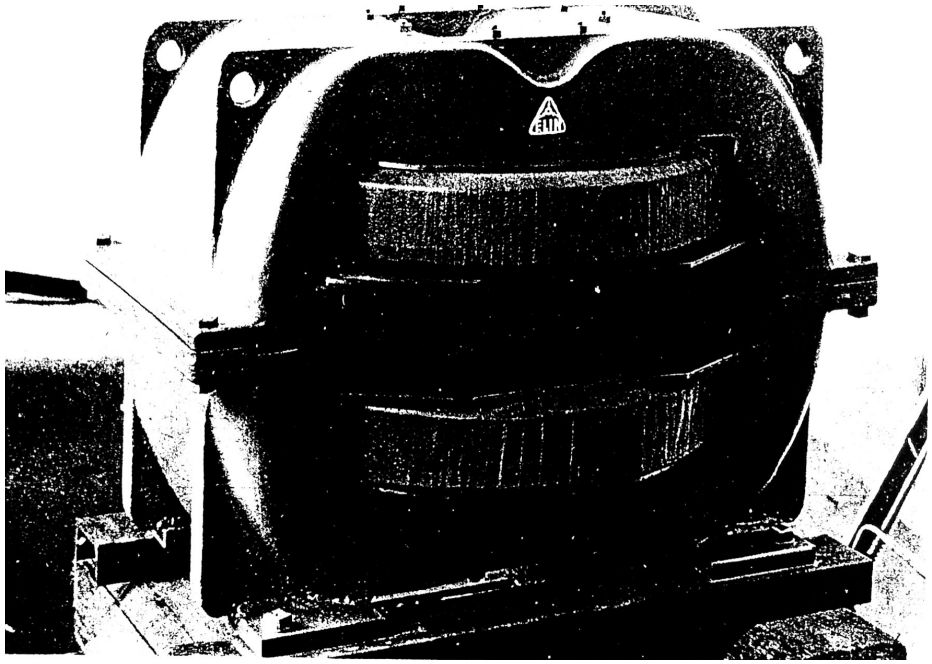


Heinz Ewald's March 1942 final report on calculations for the optimal performance of calutrons [Deutsches Museum G-139]

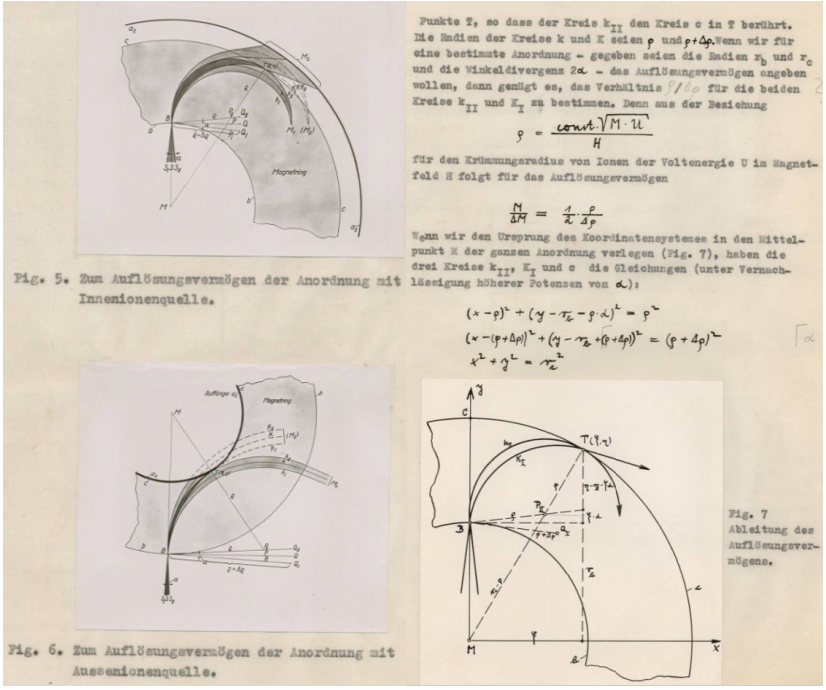


Fig. 5. Zum Auflösungsvermögen der Anordnung mit Innenionenquelle.

Punkte T, so dass der Kreis k_{II} den Kreis c in T berührt. Die Radien der Kreise k und K seien ρ und $\rho+\Delta\rho$. Wenn wir für eine bestimmte Anordnung – gegeben seien die Radien r_b und r_o und die Winkeldivergens 2α – das Auflösungsvermögen angeben wollen, dann genügt es, das Verhältnis $f/\Delta\rho$ für die beiden Kreise k_{II} und K_I zu bestimmen. Denn aus der Beziehung

$$\rho = \frac{const\cdot\sqrt{M\cdot U}}{H}$$

für den Krümmungsradius von Ionen der Voltenergie U im Magnetfeld H folgt für das Auflösungsvermögen

$$\frac{M}{\Delta M} = \frac{1}{2}\frac{\rho}{\Delta\rho}$$

Wenn wir den Ursprung des Koordinatensystemes in den Mittelpunkt M der ganzen Anordnung verlegen (Fig. 7), haben die drei Kreise k_{II}, K_I und c die Gleichungen (unter Vernachlässigung höherer Potenzen von α):

$$(x-\rho)^2+(y-r_z-\rho\cdot\alpha)^2=\rho^2$$

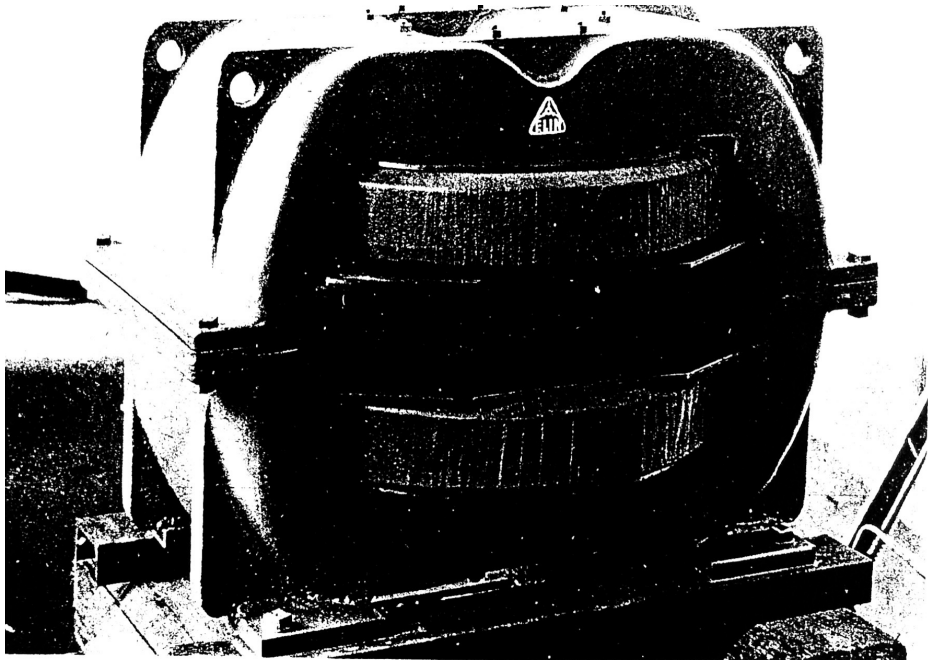
$$(x-(\rho+\Delta\rho))^2+(y-r_z+(\rho+\Delta\rho))^2=(\rho+\Delta\rho)^2$$

$$x^2+y^2=r_z^2$$

Fig. 6. Zum Auflösungsvermögen der Anordnung mit Aussenionenquelle.

Fig. 7 Ableitung des Auflösungsvermögens.

Prototype calutron built and demonstrated by 1941 by Manfred von Ardenne and ELIN company [Russian archive/Rainer Karlsch]



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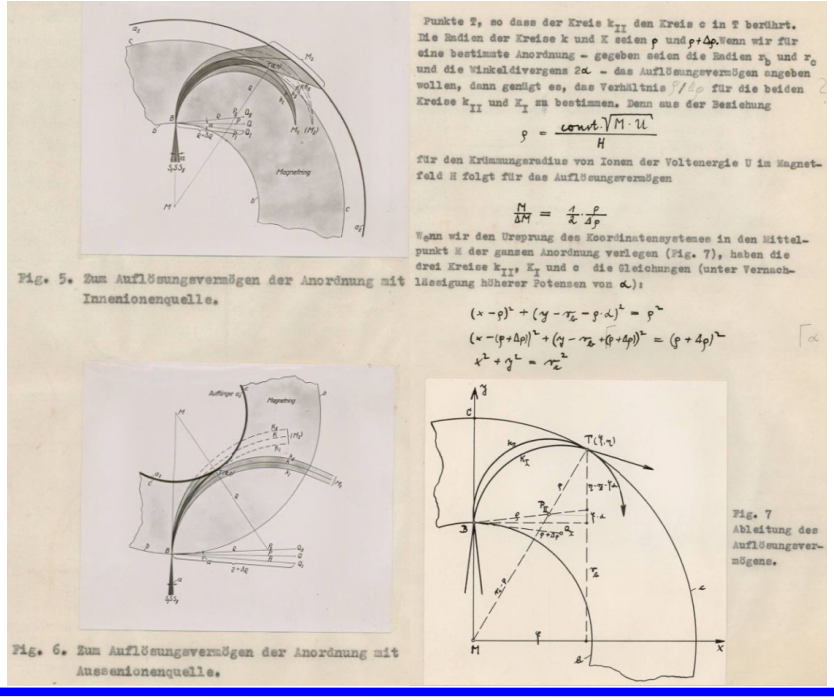

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Manfred von Ardenne. 1990. *Die Erinnerungen.* 10th ed. Munich: Herbig. p. 159

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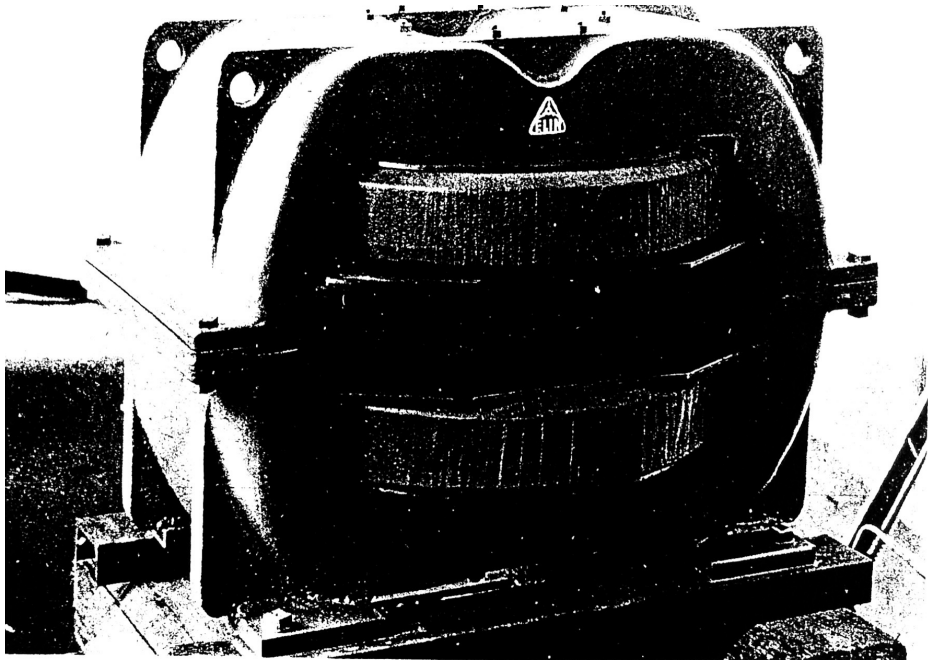

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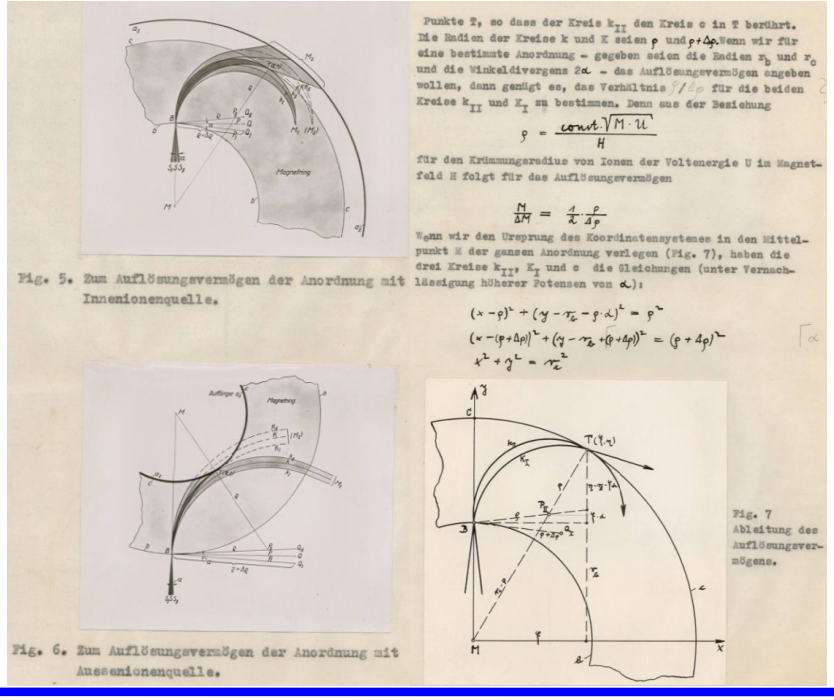

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OSS. 9 June 1944. NARA RG 77, Entry UD-22A, Box 171, Folder 32.7003-1 GERMANY: US Wartime Positive Int. (July 42–June 44)

The Reichs Postal Administration under the direction of Pose have installed three new high tension laboratories of which the location is not known. Professors Fluegge and von Ardenne are in charge.

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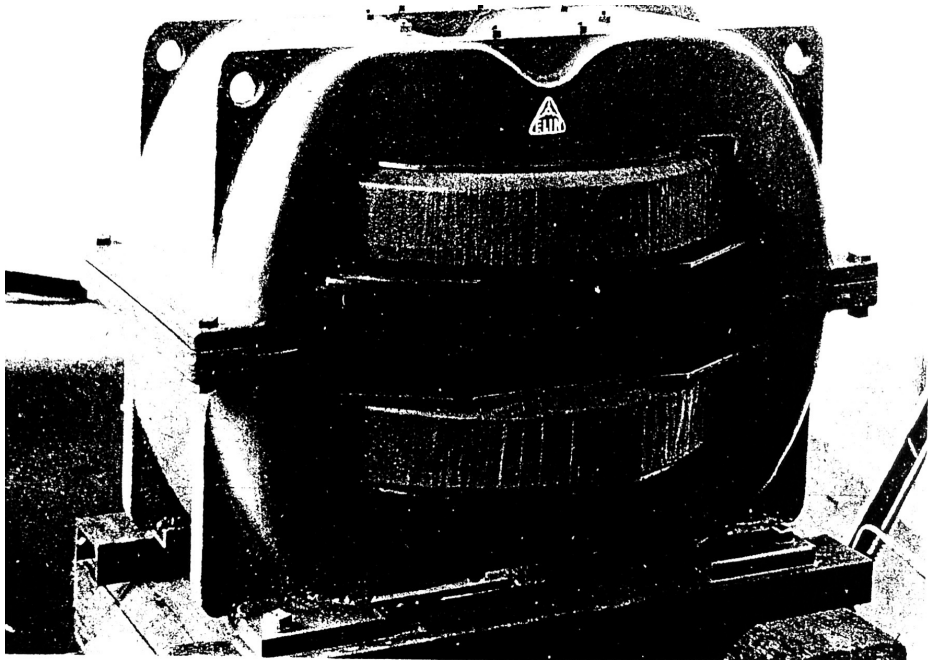

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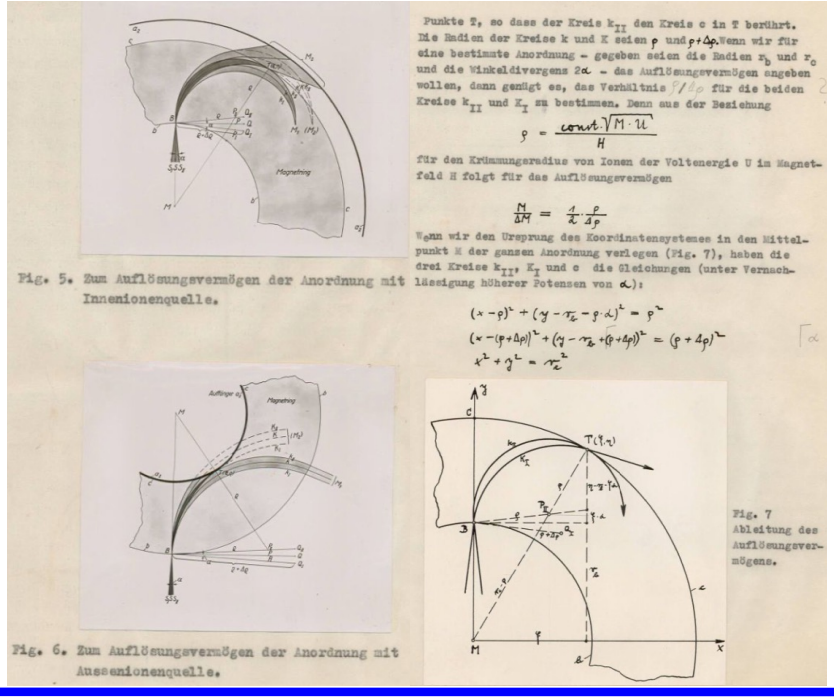

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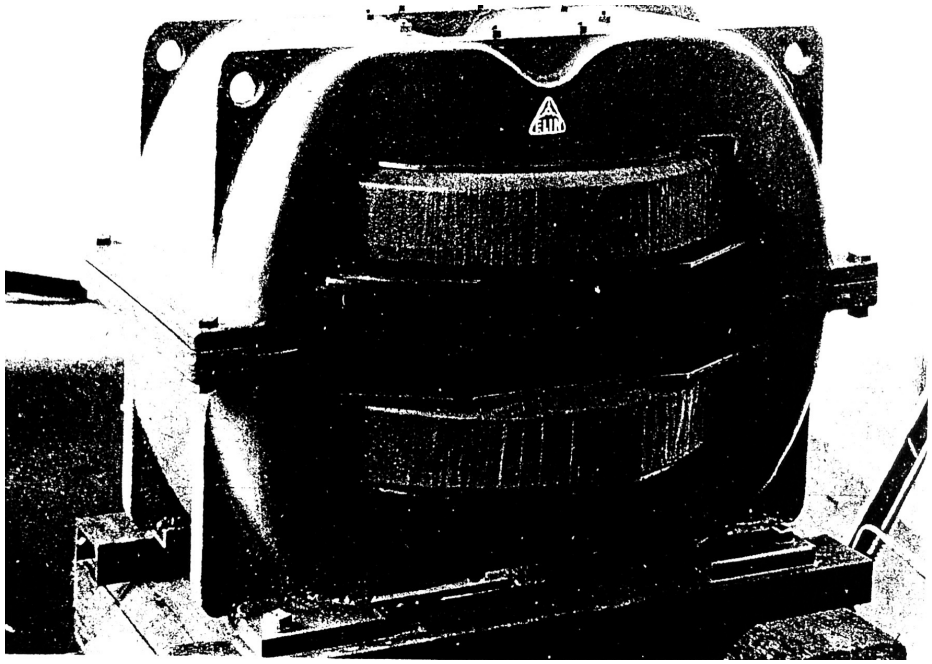

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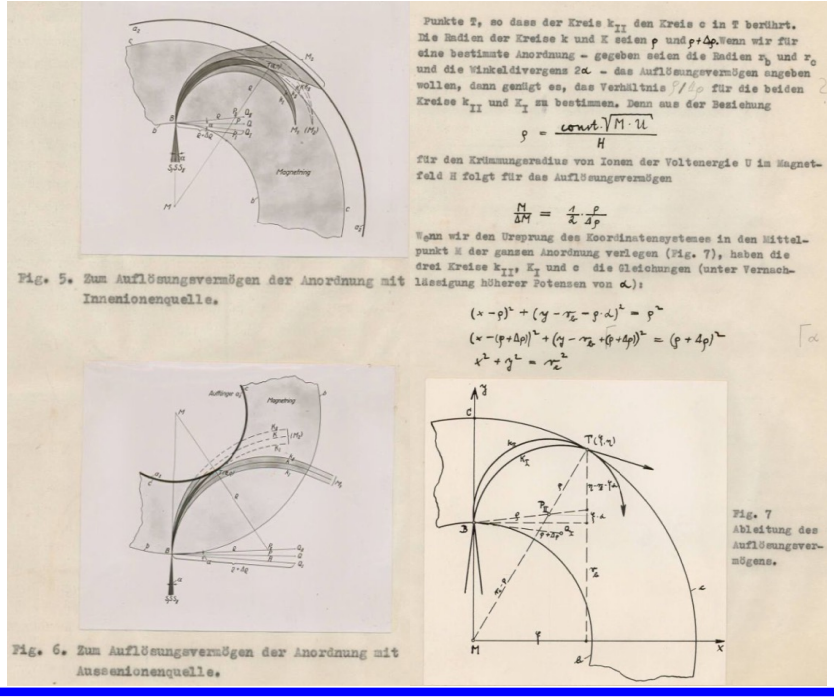

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DECLASSIFIED
Authority NND 917017

General Henry H. Arnold. 1949. *Global Mission*. New York: Harper. p. 491

The Germans were supposed to have perfected an electric machine which would make it possible to complete the development of the atomic bomb. I was then asked to have our bombers in England make special missions against the various branches of the Kaiser Wilhelm Institute in Berlin.

Did Germany mass-produce and use calutrons during the war?

For more information, see *Forgotten Creators* D.4.3.

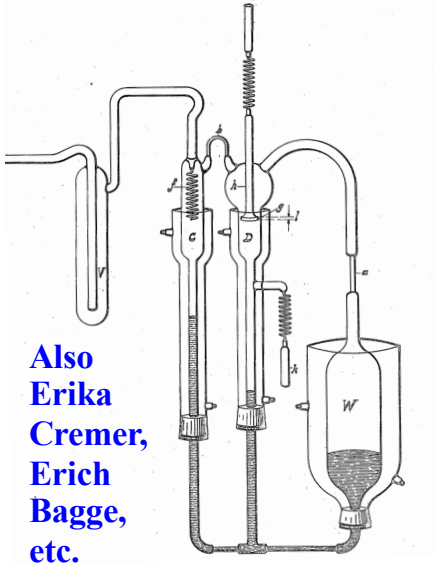
4. ^{235}U Enrichment: Gaseous Diffusion

Gustav Hertz patented gaseous diffusion in 1923, worked throughout the war despite his Jewish ancestry, then helped the Soviet Union build gaseous diffusion enrichment plants.

March 11, 1924. G. L. HERTZ 1,486,521 Klasse 12 d. Ausgegeben am 25. Oktober 1927.

METHOD OF SEPARATING GASES FROM A MIXTURE THEREOF

Filed April 17, 1923



ÖSTERREICHISCHES PATENTAMT.

PATENTSCHRIFT Nr. 107571.

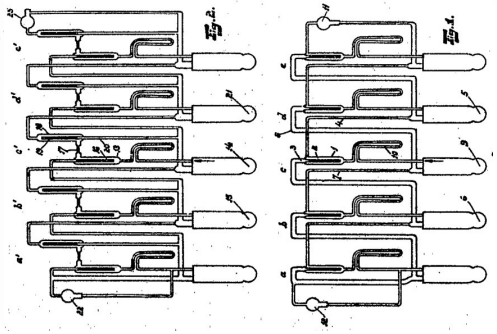
N. V. PHILIPS' GLOEILAMPENFABRIEKEN IN EINDHOVEN.

Verfahren zur ununterbrochenen Trennung eines Gasgemisches.

Angemeldet am 27. Oktober 1925; Priorität der Anmeldung in den Niederlanden vom 21. August 1925 beansprucht.

Beginn der Patentdauer: 15. Mai 1927.

Als Erfinder wird genannt: Dr. Gustav Ludwig Hertz in Eindhoven.



Also Erika Cremer, Erich Bagge, etc.

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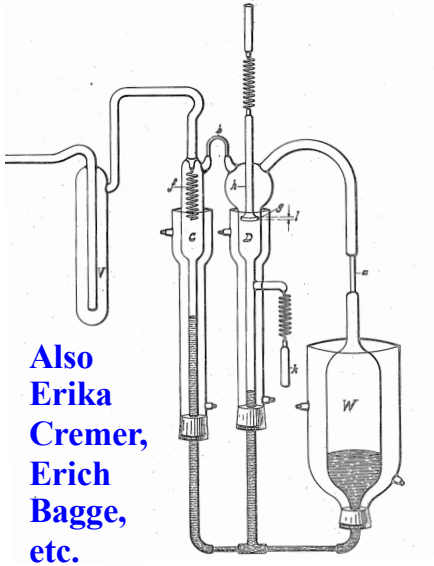

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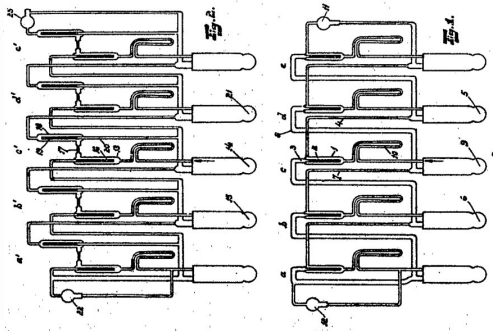
Beginn der Patentdauer: 15. Mai 1927.

Als Erfinder wird genannt: Dr. Gustav Ludwig Hertz in Eindhoven.



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BREVET D'INVENTION.

Gr. 14. — Cl. 6. N° 881.316

Procédé de séparation, par diffusion, de substances difficilement séparables.

Société dite : AUERGESELLSCHAFT AKTIENGESELLSCHAFT résidant en Allemagne.

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A maintes reprises, on a essayé de mettre à profit le fait qu'un atome plus léger doit posséder une vitesse de diffusion plus grande qu'un atome moins léger. On a donc fait diffuser à travers des membranes poreuses les espèces d'atomes étudiées en essayant de réaliser leur séparation par ce moyen. La majorité de ces essais n'ont toutefois pas réussi. Il a été trouvé, ces dernières années, un procédé par lequel on peut, dans de nombreux cas, exécuter une séparation d'isotopes avec une pleine réussite tout au moins pour des isotopes gazeux.

Il s'agit du procédé par « thermo-diffusion » indiqué par Chapius. Mais le procédé en question, aussi bien que tous les autres procédés qui produisent pour le moins une certaine ségrégation des isotopes, se limitent généralement à des corps gazeux. Un inconvénient plus grave encore des procédés indiqués jusqu'à présent réside dans la grande complexité, le prix élevé et le manque de robustesse des appareils que nécessite leur mise en œuvre. A cela s'ajoute la très grande dépense d'énergie nécessaire pour la séparation d'une certaine quantité de matière, dans tous ces procédés. Dans quelques cas particuliers, on réussit à séparer jusqu'à un certain degré des paires d'isotopes déterminées, sans franchir le cadre d'un procédé de laboratoire, mais les procédés employés jusqu'à présent n'ont aucune chance d'être appliqués à l'échelle industrielle.

La présente invention concerne un procédé de séparation d'isotopes, exempt de tous les inconvénients caractéristiques des méthodes employées jusqu'à ce jour et qui, pour la première fois, permet de réaliser une séparation d'isotopes sur le plan industriel. Comme il s'agit ici d'un nouveau procédé physico-chimique de séparation, il est également applicable à la ségrégation d'autres substances difficilement séparables telles que, par exemple, les paires d'éléments formant des mélanges azéotropiques. En outre, le procédé n'est pas applicable uniquement aux gaz, mais encore particulièrement à des substances en solution. C'est là précisément qu'il convient d'apprécier l'importance particulière du nouveau procédé, car la séparation de substances dissoutes a une importance industrielle beaucoup plus grande que la séparation des seuls corps gazeux. En effet, les métaux notamment ne se trouvent pas en général normalement à l'état gazeux, tout au moins aux températures utilisables au laboratoire et en exploitation.

La description qui va suivre, en regard du dessin annexé, donné à titre d'exemple non limitatif, fera bien comprendre comment l'invention peut être réalisée, les particularités qui ressortent tant du dessin que du texte faisant, bien entendu, partie de celle-ci.

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La fig. 1 sert à expliquer le procédé. Un cylindre 1, par exemple en tôle, est rempli d'une masse poreuse 2, telle que du sable, de la terre d'infusoires ou une masse céramique cohérente. La masse poreuse (telle que le sable) est noyée dans la solution des isotopes à séparer. A l'extrémité inférieure du cylindre, on évapore le solvant par la chaleur par ventilation ou par le vide, en prenant soin que l'évaporation soit suffisamment lente pour que le sel dissous ne risque pas de cristalliser. Par le haut, on verse du solvant frais goutte à goutte, en quantité égale à ce qui s'en évapore dans le bas. Il se passe alors le phénomène suivant : la solution se concentre au voisinage de la surface inférieure dans la mesure même où le solvant est évaporé à l'extrémité inférieure. Il se produit, par suite, une baisse de concentration de bas en haut et la matière dissoute commence à se diffuser de bas en haut. On a donc affaire ici à deux courants de sens contraires, L'un de ces courants est constitué par l'écoulement du solvant à travers la masse en direction descendante, l'autre est un courant de diffusion, en sens contraire, de la matière dissoute. Les atomes ou les ions ou molécules en solution, diffusent donc d'une manière ininterrompue de bas en haut, mais sans changer de place, car leur diffusion est continuellement compensée par le courant liquide s'écoulant à sa rencontre. (On pourrait illustrer les conditions régnant ici par l'exemple de l'écureuil dans sa cage rotative ; on sait que l'écureuil court continuellement sans changer de place, car la cage tourne en sens contraire). Grâce à la disposition adoptée, une diffusion ininterrompue et durable des isotopes s'établit de bas en haut et, par ce moyen, il se produit automatiquement une ségrégation, du fait que la partie basse de la solution s'enrichit peu à peu en isotope le plus lourd, la partie haute devenant plus riche en isotope le plus léger. Si l'on voulait entreprendre un fonctionnement de cette nature selon les méthodes usuelles de séparation, par exemple dans le genre de la cristallisation fractionnée, on serait conduit à employer des quantités de liquide exagérées et à surveiller et à préparer un très grand nombre de charges individuelles. Rien de tout cela n'est nécessaire pour le présent procédé. Tout le travail consiste à faire évaporer le solvant à l'extrémité inférieure de la colonne et à le faire retomber goutte à goutte à l'extrémité supérieure. Bien entendu, le dispositif doit comporter des appareils d'extraction, par exemple des tubulures d'aspiration qui permettent de prélever la solution de la colonne. Une telle colonne peut rester en service des mois, voire des années, sans nécessiter de frais importants en personnel de surveillance.

4. ^{235}U Enrichment: Gaseous Diffusion

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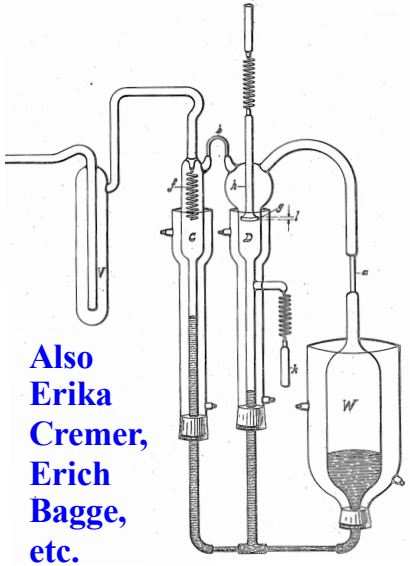

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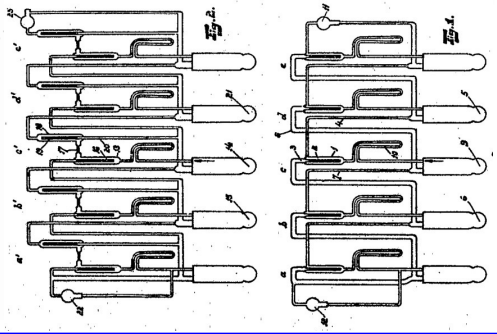

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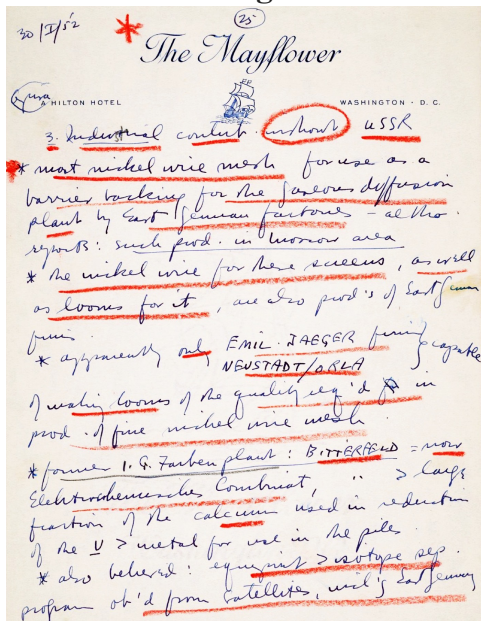
Soviets found Neustadt an der Orla factories that were uniquely skilled at producing nickel membrane filters for gaseous diffusion. What did those factories do during the war?



Princeton University Library, Special Collections, Moe Berg Papers (C1413), Box 20, Folder 3 — Loose Notes: Central Intelligence Agency.

For more information, see *Forgotten Creators* D.4.4

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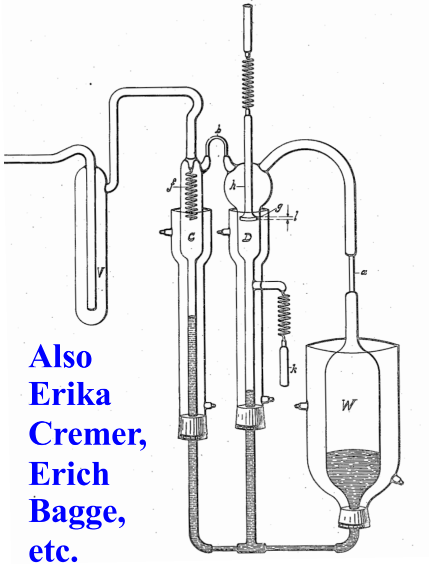

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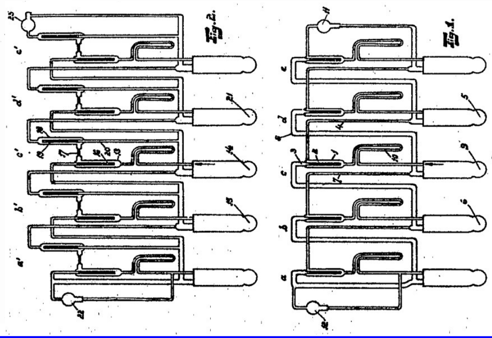

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Soviets found Neustadt an der Orla factories that were uniquely skilled at producing nickel membrane filters for gaseous diffusion. What did those factories do during the war?

30/II/52 (25)

The Mayflower

A HILTON HOTEL WASHINGTON · D. C.

3. Industrial contrib. without USSR

* most nickel wire mesh for use as a barrier backing for the gaseous diffusion plant by East German factories — altho. reports: such prod. in Moscow area

* the nickel wire for these screens, as well as looms for it, are also prod's of East German firms.

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* former I. G. Farben plant: BITTERFELD = now Elektrochemisches Combinat, → large fraction of the calcium used in reduction of the U → metal for use in the piles.

* also believed: equipment → isotope sep. program ob'd from satellites, incl's East Germany

Princeton University Library, Special Collections, Moe Berg Papers (C1413), Box 20, Folder 3—Loose Notes: Central Intelligence Agency.

The Manhattan Project believed the German gaseous diffusion program was ahead of them.

[SEC]RET

Metallurgical Laboratory
P.O. BOX 5207
CHICAGO 80, ILLINOIS

MUC-SKA-445
This document consists of 1 pages and 0 figures
No. 1 of 6 copies, Series A

BUTTERFIELD 4300

January 27, 1944

Brig. Gen. L. R. Groves
P.O. Box 2610
Washington, D.C.

Dear Gen. Groves:

Major Furman has told us that in connection with the work we are doing for him we should cover possible enemy activities in every phase of our project, that is, the X-10, Y-12, and K-25 processes.

We have dismissed as too improbable to require investigation the possibility that the enemy may be engaged in the Y-12 process on a scale of military importance. We believe, however, that due to the fact that the enemy was considerably in advance of us in certain work of the K-25 type before the war, there is a high probability that if he is doing anything of military interest in our field, he is operating along this line.

In order to suggest to Major Furman appropriate leads for investigation, we would like to request that Dr. Karl Cohen of the Columbia group be authorized to visit us and discuss various methods of accomplishing our result by K-25 processes. Dr. Cohen in his work for Dr. Urey has had wide experience in investigating several kinds of such processes, some of which have been dropped as not promising but may have been developed by the enemy.

Would it be possible for you to authorize such a visit in the near future?

Yours sincerely,

Samuel K. Allison

Samuel K. Allison

dj

CC Compton
Morrison
Vernon

Samuel K. Allison to Leslie R. Groves. 27 January 1944.
NARA RG 77, Entry UD-22A, Box 170, Folder 32.60-1
GERMANY: Summary Reports (1944)

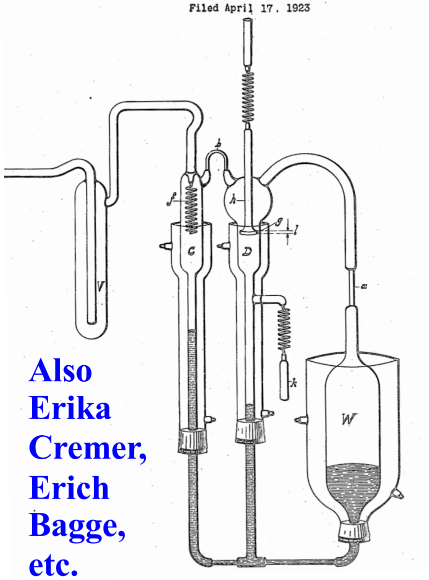
DECLASSIFIED
Authority NND

For more information, see *Forgotten Creators* D.4.4

4. ^{235}U Enrichment: Gaseous Diffusion

Gustav Hertz patented gaseous diffusion in 1923, worked throughout the war despite his Jewish ancestry, then helped the Soviet Union build gaseous diffusion enrichment plants.

March 11, 1924. 1,486,521 G. L. HERTZ METHOD OF SEPARATING GASES FROM A MIXTURE THEREOF Filed April 17, 1923



Klasse 12 d. Ausgegeben am 25. Oktober 1927.

ÖSTERREICHISCHES PATENTAMT.

PATENTSCHRIFT N$^{\text{R}}$ 107571.

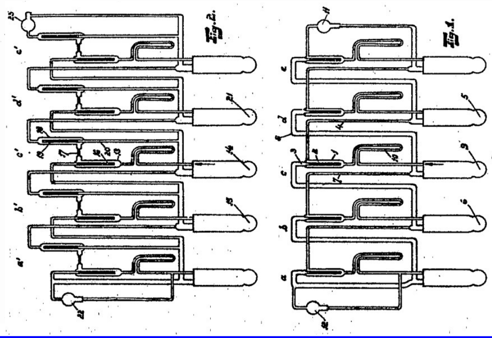
N. V. PHILIPS' GLOEILAMPENFABRIEKEN IN EINDHOVEN.

Verfahren zur ununterbrochenen Trennung eines Gasgemisches.

Angemeldet am 27. Oktober 1925; Priorität der Anmeldung in den Niederlanden vom 21. August 1925 beansprucht.

Beginn der Patentdauer: 15. Mai 1927.

Als Erfinder wird genannt: Dr. Gustav Ludwig Hertz in Eindhoven.



Also Erika Cremer, Erich Bagge, etc.

Auergesellschaft patented improved diffusion enrichment methods in 1940 and worked throughout the war. Then Nikolaus Riehl and other Auer personnel helped the Soviets.

ÉTAT FRANÇAIS.

MINISTÈRE DE LA PRODUCTION INDUSTRIELLE ET DES COMMUNICATIONS.

SERVICE DE LA PROPRIÉTÉ INDUSTRIELLE.

BREVET D'INVENTION.

Gr. 14. — Cl. 6. N° 881.316

Procédé de séparation, par diffusion, de substances difficilement séparables.

Société dite : AUERGESELLSCHAFT AKTIENGESELLSCHAFT résidant en Allemagne.

Demandé le 16 avril 1942, à 16^{h} 40^{m}, à Paris.

Délivré le 22 janvier 1943. — Publié le 21 avril 1943.

(Demande de brevet déposée en Allemagne le 21 septembre 1940. — Déclaration du déposant.)

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The Manhattan Project believed the German gaseous diffusion program was ahead of them. In September 1946, Leslie Groves sent Percival C. Keith, chief designer of Oak Ridge K-25, on a high-risk, two-week, Top Secret trip to Czechoslovakia. Was it to inspect/sabotage a former German enrichment plant?

RET

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DECLASSIFIED
Authority NND

Leslie Groves to U.S. Military Attaché London. 10 Sept. 1946. Top Secret cable WAR 99912. NARA RG 77, Entry UD-22A, Box 160, Folder 205.4 Cables Outgoing, Top Secret.

WAR DEPARTMENT
CLASSIFIED MESSAGE CENTER
OUTGOING CLASSIFIED MESSAGE

TOP SECRET

TOP SECRET

PARAPHRASE NOT REQUIRED. HANDLE AS TOP SECRET CORRESPONDENCE PER PARAS 51i and 60a. AR 380-5

Maj Gen. L. R. Groves' Office
Room 4166 78333 Major John C. Mattina

10 September 1946

MILATTACHE AMEMBASSY London England

Number: WAR 99912

Loco Personal for Dean from Shuler signed Groves

Mr P. C. Keith will be in Czechoslovakia from approximately 15 September to 28 September. The name of the Military Attache at Prague, Colonel Egmont F. Koenig, has been given to Keith. It is important that Koenig be notified of visit of Keith into Czechoslovakia so that Koenig may extend to him every courtesy possible should the occasion arise.

Wire Koenig immediately in Prague-Top Secret-priority-as follows and sign name of Dean: Mr P. C. Keith, President of U. S. Industrial Corporation, will be in Czechoslovakia on September 15th and may contact you personally. Important that every courtesy possible be shown him if occasion arises.

End

ORIGINATOR : Gen Groves

CM-OUT-99912 (Sep 46) DTG 101959Z se

For more information, see *Forgotten Creators* D.4.4

4. ^{235}U Enrichment: Many Sites, Mostly Underground

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OSS Report No. FF-83. 21 October 1944. Atom Smashing Secret Weapon. NARA RG 77, Entry UD-22A, Box 171, Folder 32.7003-2.

1. The Germans have completed a weapon which is founded on the principle of the disintegration of matter (Atomzertruemmerung). Experiments have been performed which have proved conclusive… 2… The radius of action is supposed to be about three kilometers... 3. Different conversations which have taken place with industrial leaders in charge of concentration of production of German war material give the impression that Germany has unlimited confidence in the use of this weapon, which is to bring them certain victory. 4. Herr Schneider, one of the directors of the German factories called Deutsche Waffen u. Munitions-fabrik (a combine representing some fifteen factories and 250,000 workers) declared with a smile: "… Our important factories where the assembly is carried out are all subterranean. An immense quantity of accessories is made in small lots everywhere throughout the country, so that bombing cannot interrupt the production."

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R. V. Shepherd. BIOS 313. Report on Visit to Czechoslovakia by Armament Design Department. p. 11.

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Henry Picker. 2009. *Hitlers Tischgespräche im Führerhauptquartier.* 2nd ed. pp. 42, 493.
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Redl Zipf plant. The product of the firm is known to the workers only as "liquid gas" and, based on PW's knowledge of the raw materials delivered to the plant, it would appear to be some kind of explosive… This firm, in turn, was importing large quantities of thorium from Hungary and elsewhere in the Balkans… The equipment inside the plant consists of circa 200 boilers of unusual construction in that they are completely lined with some argillaceous material and covered over on the outside with some white metal, name of which is unknown to PW, but it is supposed to be a non-magnetic substance. These boilers are situated in different compartments and are connected by a system of pipes and conduits running between the sections and through the concrete walls… The gas, or liquid, prepared was stored in large high-pressure cylinders about 3 1/2 to 4 meters in height and 1 1/2 to 2 meters in diameter. PW believes they were constructed of more than usual strength steel. They too, as well as all connections and valves, were lined with an earthenware type coating. The product, when ready for shipment, was sent to an already established munitions factory in Stadl Paura... It is noteworthy that the workers in the plant complained of loss of appetite... Peasants in the vicinity were required to make regular delivery of whole milk for the workers.

[See Forgotten Creators D.4.6 for many more.]

During the final year of the war, all of Oak Ridge (labs + town) consumed an average of 0.189 GW of electrical power.

Manhattan District History. Book I, Volume 12, Part 2, Appendix C-7.

ELECTRIC POWER CONSUMPTION AND COSTS

CLINTON ENGINEER WORKS

OCTOBER 1943 THROUGH DECEMBER 1946

Period Ending	KWH Consumed	KW Demand	Total Costs
1 November 1943	3,912,040	11,400	$ 18,834.08
1 December 1943	9,105,000	18,300	34,171.50
1 January 1944	8,365,000	18,300	33,061.50
1 February 1944	10,725,000	23,100	41,785.50
1 March 1944	17,105,000	31,200	60,103.50
1 April 1944	27,665,000	48,600	94,735.50
1 May 1944	33,970,000	64,500	121,365.00
1 June 1944	41,478,000	73,800	142,671.00
1 July 1944	39,870,000	98,200	166,611.00
1 August 1944	46,140,000	104,200	182,496.00
1 September 1944	52,610,000	125,900	215,637.00
1 October 1944	63,280,000	144,450	251,676.00
1 November 1944	77,700,000	187,760	320,080.80
1 December 1944	90,370,000	222,050	376,119.00
1 January 1945	107,010,000	236,900	417,117.00
1 February 1945	123,668,000	242,633	448,295.64
1 March 1945	117,442,000	253,047	450,203.76
1 April 1945	150,950,000	290,487	540,900.96
1 May 1945	166,170,000	263,626	534,721.08
1 June 1945	179,160,000	269,866	560,945.28
1 July 1945	184,350,000	283,840	583,822.20
1 August 1945	198,870,000	291,800	614,199.00
1 September 1945	200,000,000	298,627	623,267.16
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During the final year of the war, all of Oak Ridge (labs + town) consumed an average of 0.189 GW of electrical power.

Manhattan District History. Book I, Volume 12, Part 2, Appendix C-7.

ELECTRIC POWER CONSUMPTION AND COSTS

CLINTON ENGINEER WORKS

OCTOBER 1943 THROUGH DECEMBER 1946

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1 January 1944	8,365,000	18,300	33,061.50
1 February 1944	10,725,000	23,100	41,785.50
1 March 1944	17,105,000	31,200	60,103.50
1 April 1944	27,665,000	48,600	94,735.50
1 May 1944	33,970,000	64,500	121,365.00
1 June 1944	41,478,000	73,800	142,671.00
1 July 1944	39,870,000	98,200	166,611.00
1 August 1944	46,140,000	104,200	182,496.00
1 September 1944	52,610,000	125,900	215,637.00
1 October 1944	63,280,000	144,450	251,676.00
1 November 1944	77,700,000	187,760	320,080.80
1 December 1944	90,370,000	222,050	376,119.00
1 January 1945	107,010,000	236,900	417,117.00
1 February 1945	123,668,000	242,633	448,295.64
1 March 1945	117,442,000	253,047	450,203.76
1 April 1945	150,950,000	290,487	540,900.96
1 May 1945	166,170,000	263,626	534,721.08
1 June 1945	179,160,000	269,866	560,945.28
1 July 1945	184,350,000	283,840	583,822.20
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The Greater German Reich produced at least 22 GW of power. Including all other countries aiding Germany, the total was probably around ~44 GW.

United States Strategic Bombing Survey. 1947. *German Electric Utilities Industry Report.* p. 4.

BRIEF REVIEW OF THE ELECTRIC UTILITY INDUSTRY IN GERMANY

GENERAL.

1. Prewar Germany (including Austria and Sudeten territory) with a population according to 1939 census of 79,400,000 people and occupying an area of about 225,000 square miles, was largely industrial.

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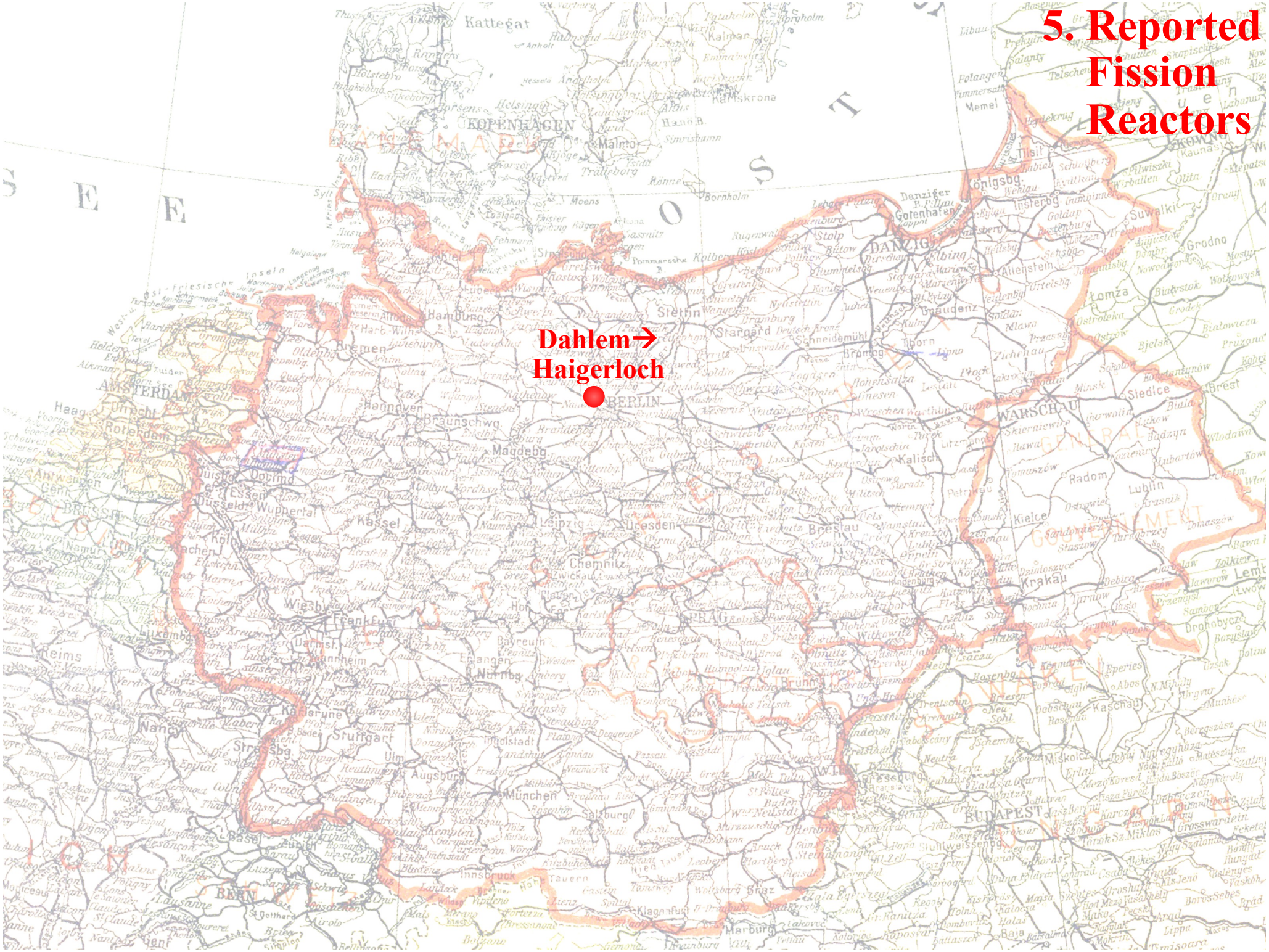
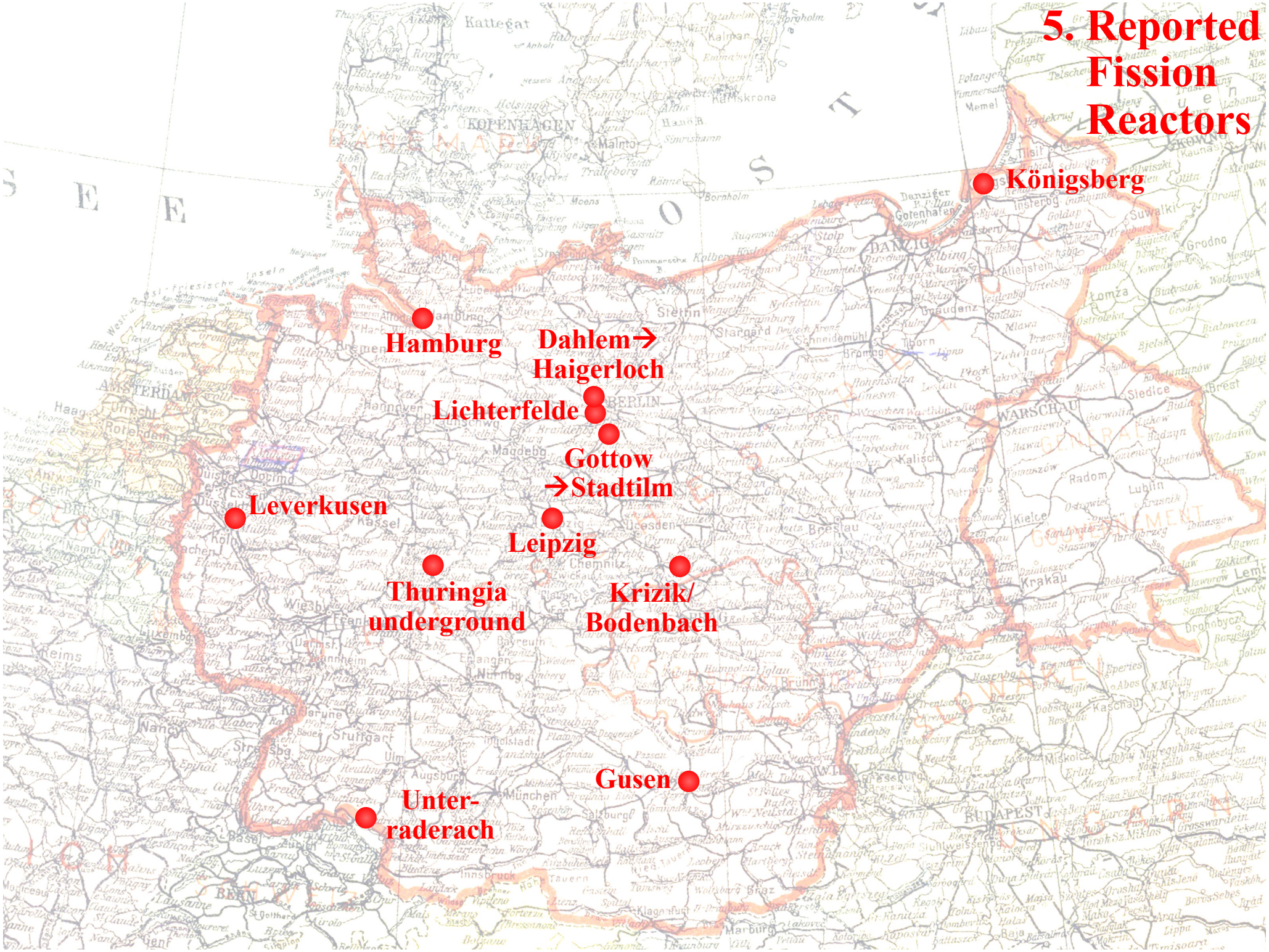
Other documents indicate that German enrichment was more efficient than Oak Ridge (centrifuges) and German bombs were more efficient than Little Boy (implosion), so Germany needed much less power than Oak Ridge.


5. Reported Fission Reactors
Dahlem→
Haigerloch


5. Reported Fission Reactors
Königsberg
Hamburg
Dahlem→ Haigerloch
Lichterfelde
Gottow →Stadtilm
Leverkusen
Leipzig
Thuringia underground
Krizik/ Bodenbach
Gusen
Unter- raderach

H. K. Calvert. 29 January 1945. NARA RG 77, Entry UD-22A, Box 171, Folder 32.7003-3 GERMANY: US Wartime Positive Int. (Nov. 44–June 45). [I. G. Farben was producing uranium hexafluoride, heavy water, graphite, aluminum, calcium, etc.]
At the LEVERKUSEN I G Farben Works, PW learned through an uncle, who is a director, that a special department has been installed in concrete structures like pillboxes, to which access is gained only through special passes, even high-ranking officers being refused admission under a special order issued 18 Nov by factory police. There is heavy A.A. defence of all calibers, and the general belief is that experiments are being made with special weapons of some kind.

Richard P. Fischer. June 1945. Report on German Supplies of Uranium-Bearing Raw Materials. NARA RG 77, Entry UD-22A, Box 163, Folder Australia.
About 50 to 60 tons of strongly radioactive "tarnsand" was delivered to the German Army… More likely the "tarnsand" was prepared from material in which the radioactivity has been artificially induced.

Leverkusen

F.A.C. Wardenburg & J.A. Lane. 5 April 1945. Interrogation of Dr. Kohl, Works Manager of Degussa Plant No. 2, Frankfurt. NARA RG 77, Entry UD-22A, Box 166, Folder 32.22-1.
Metallic uranium was mixed with coal dust (carbon?) and with Tragacanth gum as a binding material and pressed into blocks, approximately 50% by weight of coal and uranium. The blocks were approximately 5 cm x 5 cm x 6 cm. About five tons as metallic uranium in total were delivered in this form.

S. McClintic 6 Jan 1945. AFHRA A5734 p. 1092
At UNTERRADERACH, near FRIEDRICHS-HAFEN, there is a large semi-underground factory which was constructed early last winter where strange experiments were taking place. Heavy clouds of smoke filled the sky in the day and at night a red glow. The experiments caused the earth to shake. These experiments are with atoms and when the experiments proved successful the plant went into operation. Workmen were not allowed to leave the factory.

Gerhard Dessauer to Leo Szilard. 6 July 1942. NARA RG 77, Entry UD-22A, Box 171, Folder 32.7003-1 GERMANY: US Wartime Positive Int. (July 42-June 44).
I learned that the chain reaction of the uranium isotope is now successful. It is not explosive, but there is now the prospect of technical utilization.

MED Foreign Intelligence. 3 April 1944. Activities from 13 March to 31 March 1944. NARA RG 77, Entry UD-22A, Box 170, Folder 32.60-1.
Mr. Chapin reported successful detection experiments and requested aircraft study.

F. J. Smith. 30 July 1945. NARA RG 77, Entry UD-22A, Box 163, Folder Australia.
Mr. Parks, a geologist for the Engineers who has recently returned to the States, was interviewed and he stated that there was sizeable pile of material that originally came from the Belgian-Congo now at Hamburg. The material was being used by the KWI and even though we don't know his interpretation of a sizeable pile, we believe it would be worthwhile looking into.

Hamburg

Dahlem→
Haigerloch

Lichterfelde

Gottow
→Stadtilm

Leipzig

Thuringia
underground

Krizik/
Bodenbach

Gusen

Unter-
raderach

5. Reported Fission Reactors

Königsberg

Wolfgang G. Schwanitz. *H-Soz-u-Kult, H-Net Reviews.* Feb. 2009.
After 1945 the Grand Mufti said that the enemy espionage by "Jewish, English and American intelligence services" caused "the greatest damage." They were able to discover the locations of "atomic reactors" in East Prussia.

RAF Bomber Command. Campaign Diary. webarchive.nationalarchives.gov.uk/ukgwa/20070706054833/http://www.raf.mod.uk/bombercommand/aug44.html
29/30 August 1944 189 Lancasters of No 5 Group carried out one of the most successful No 5 Group attacks of the war on Königsberg at extreme range. Only 480 tons of bombs could be carried because of the range of the target but severe damage was caused around the 4 separate aiming points selected.

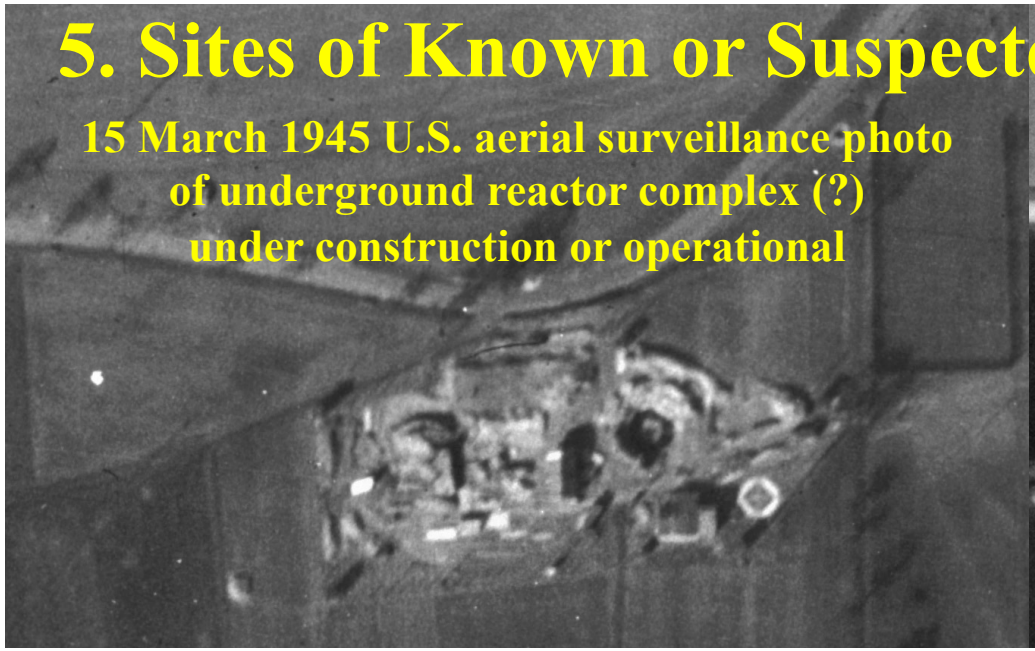
Joint Intelligence Committee. Exploitation of German Scientists and Technicians. 5 January 1946. J.I.C. 317/10. Appendix C. [NARA RG 218, Entry UD-1, Box 475, Folder CCS 471.9... (5-1-45)... Sec. 3.
Practically the entire staff of the German "URANMOTOR" Project at KRIZEK in Czechoslovakia under Prof. HUETTIG is working for the U.S.S.R.

NARA RG 319, Entry A1-134B, Folder Focke, Franz.
There was once a report of an atomic pile operated by Russians at Bodenbach, CSR…

Edward M. Pickett to Assistant Chief of Staff, G-2, USFET. 4 March 1946. Additional Supply of Uranium Oxide. NARA RG 77, Entry UD-22A, Box 169, Folder 32.32. Germ. Ind. TA.
Additional quantities of Uranium Oxide have been located in the amount of approximately five and one-half tons at Bad Tölz and Munich… Dr. Fritz REHBEIN stated during investigation that the Uranium Oxide is very active and can be extremely injurious to personnel not qualified in its handling.

E. P. Dean to W. R. Shuler. 1 April 1946. Shipment of Uranium Compounds. NARA RG 77, Entry UD-22A, Box 169, Folder 32.32. Germ. Ind. TA.
G-2 moved very slowly and we had to prod them on three successive occasions... On the other hand, G-2 moved extremely quickly re the five tons of uranium oxide recently discovered at Bad Tölz.

5. Sites of Known or Suspected Reactors: Gusen, Austria



15 March 1945 U.S. aerial surveillance photo
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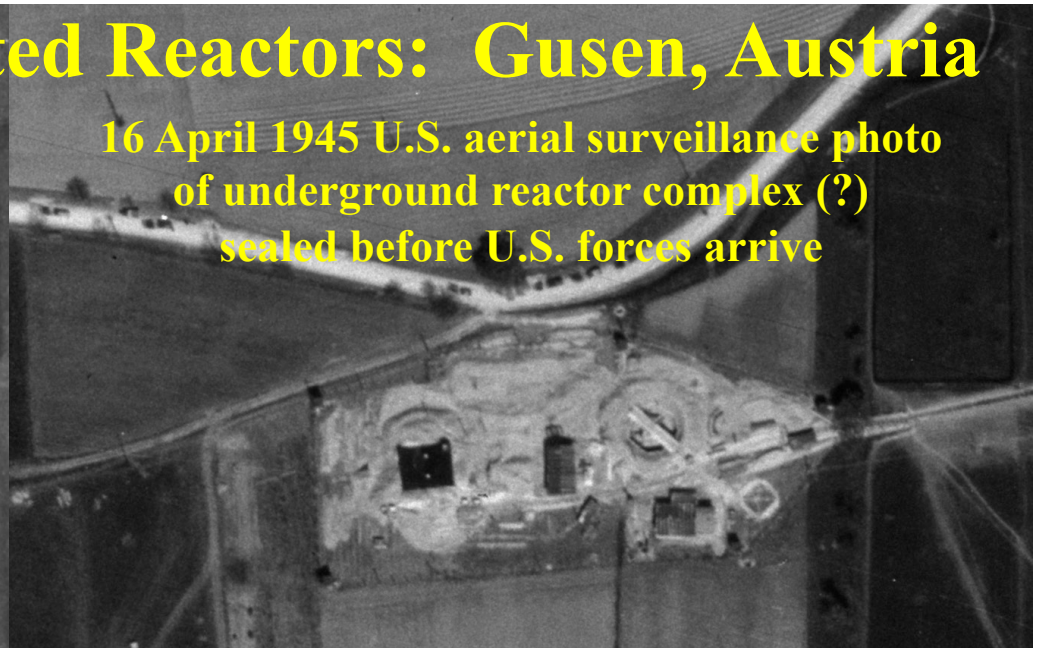
under construction or operational



16 April 1945 U.S. aerial surveillance photo
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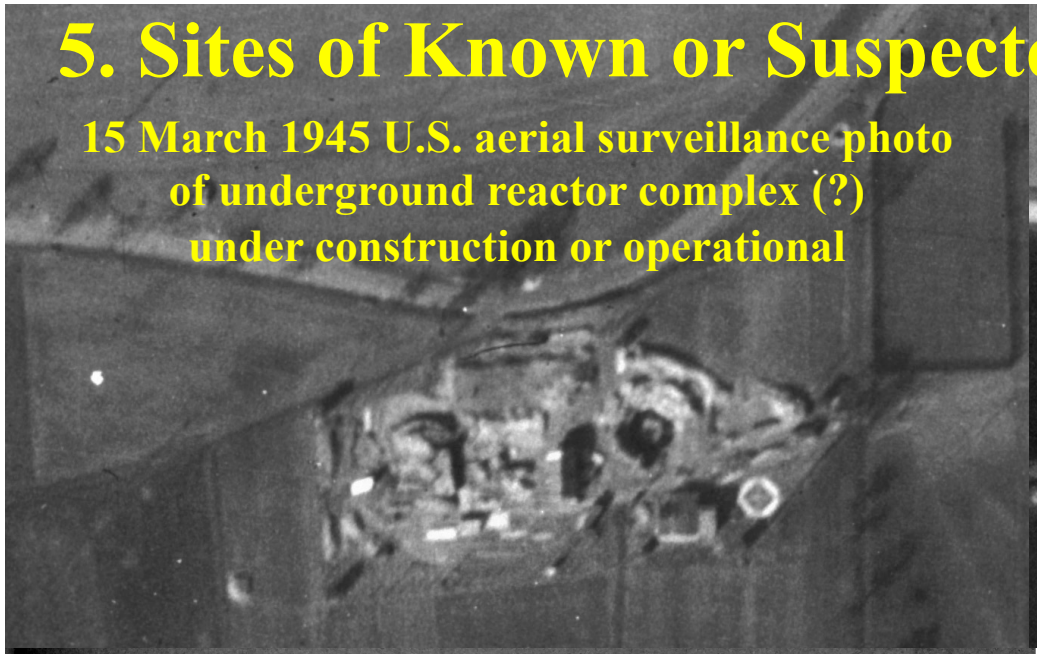

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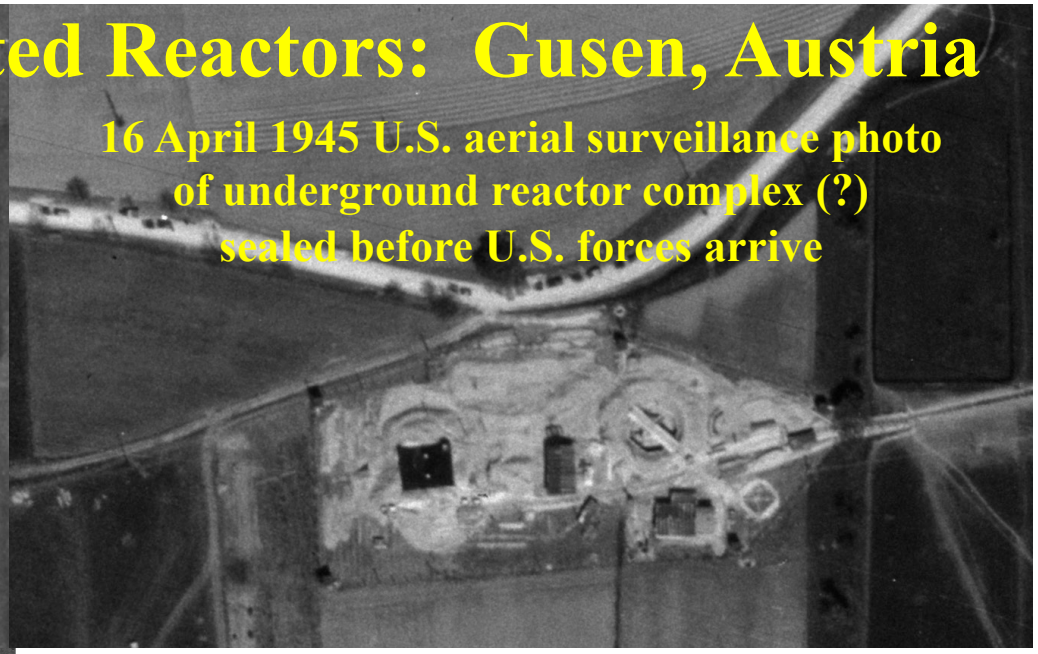

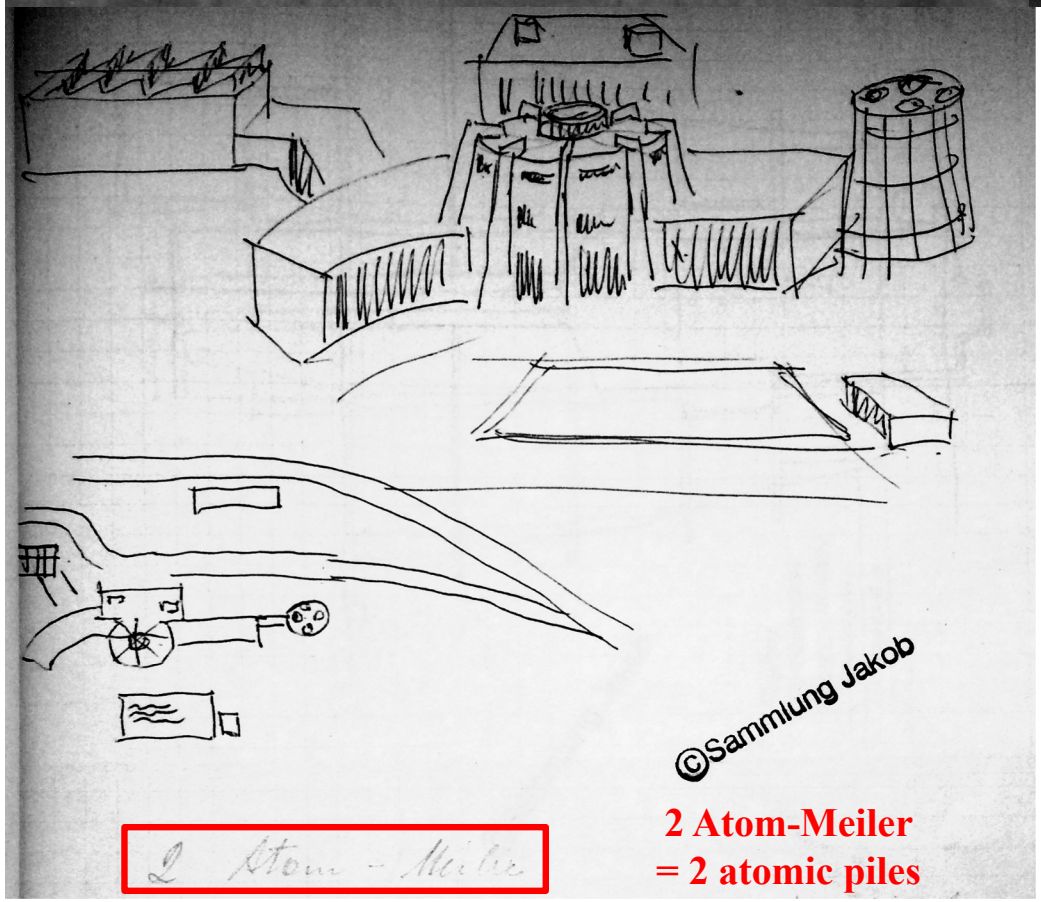

2 Atom-Meiler
= 2 atomic piles

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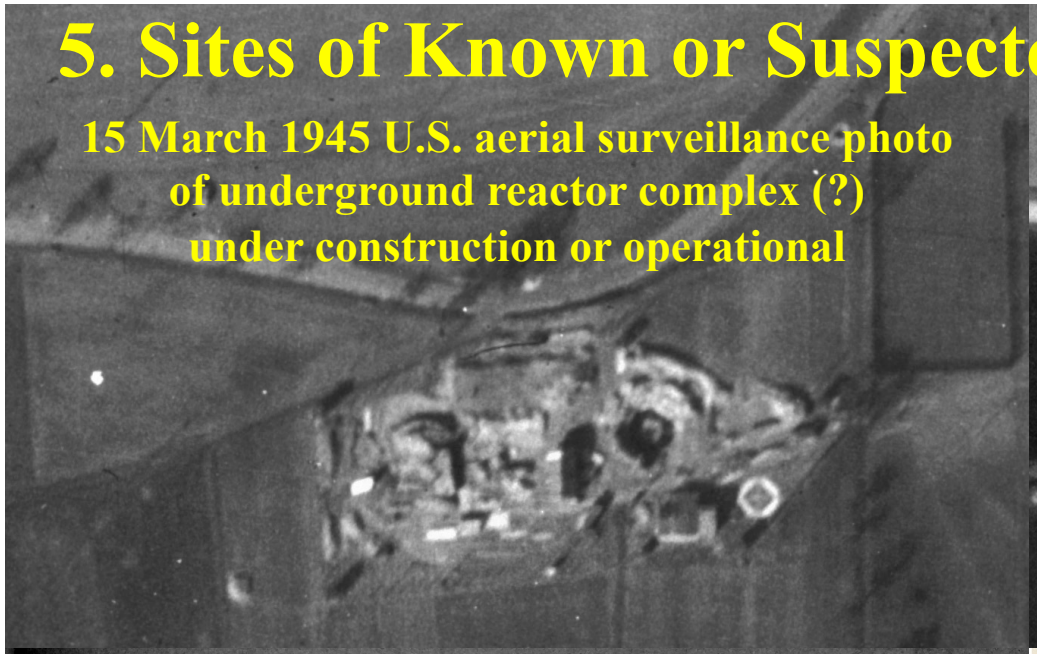

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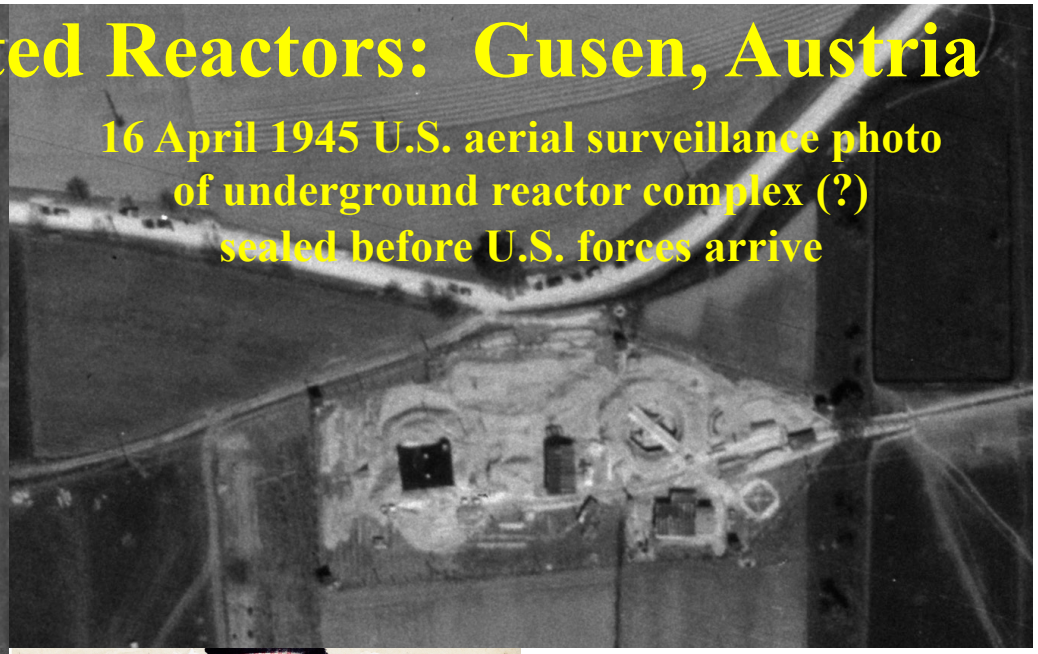

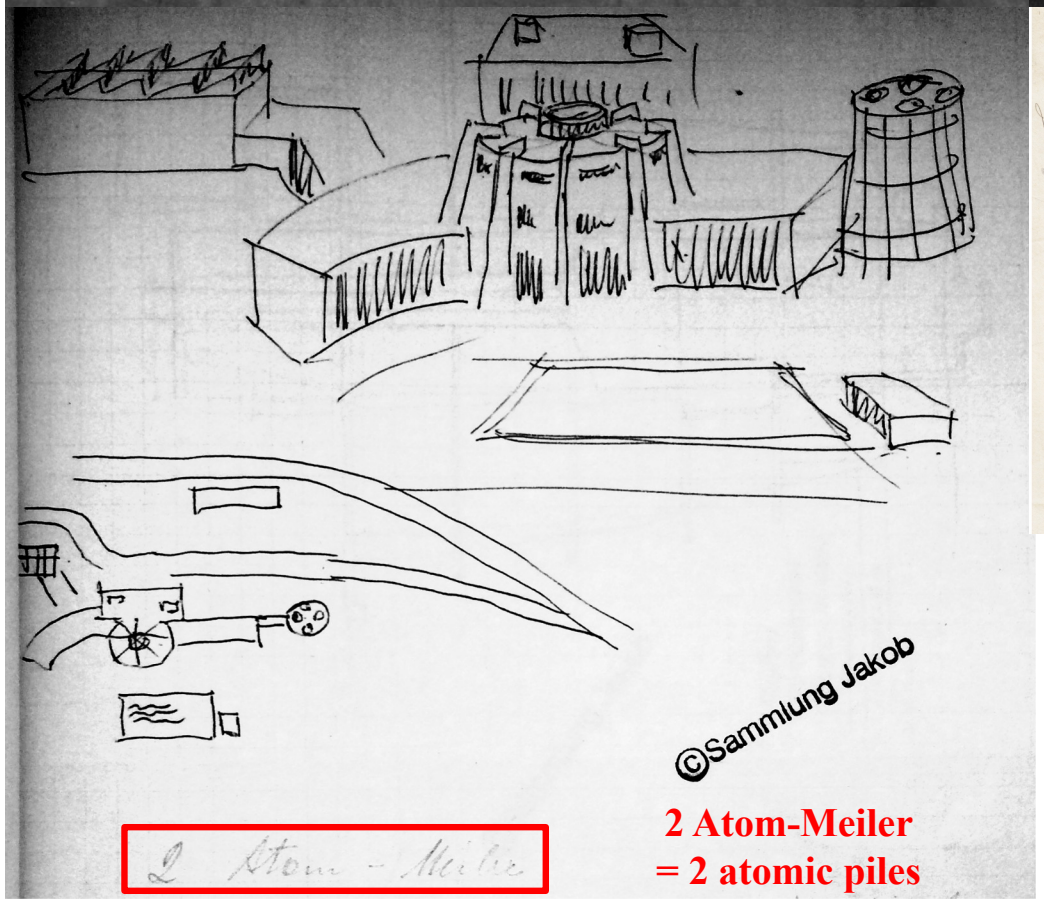

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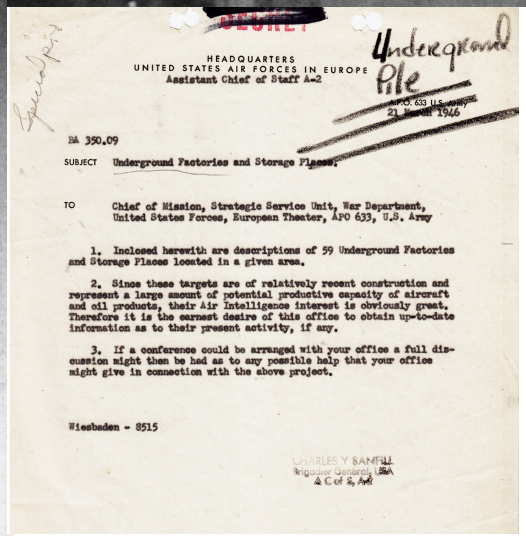

SECRET

HEADQUARTERS
UNITED STATES AIR FORCES IN EUROPE
Assistant Chief of Staff A-2

Underground Pile

APO 633 U.S. Army
21 March 1946

AA 350.09

SUBJECT Underground Factories and Storage Places.

TO Chief of Mission, Strategic Service Unit, War Department, United States Forces, European Theater, APO 633, U.S. Army

1. Inclosed herewith are descriptions of 59 Underground Factories and Storage Places located in a given area.

2. Since these targets are of relatively recent construction and represent a large amount of potential productive capacity of aircraft and oil products, their Air Intelligence interest is obviously great. Therefore it is the earnest desire of this office to obtain up-to-date information as to their present activity, if any.

3. If a conference could be arranged with your office a full discussion might then be had as to any possible help that your office might give in connection with the above project.

Wiesbaden - 8515

CHARLES Y BANFILL
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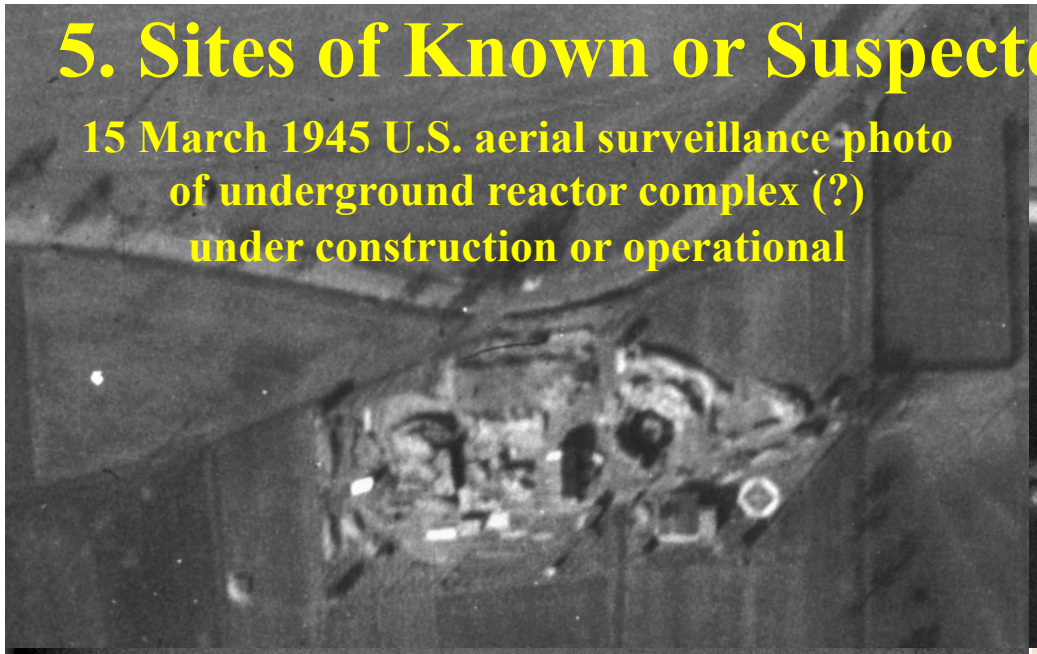

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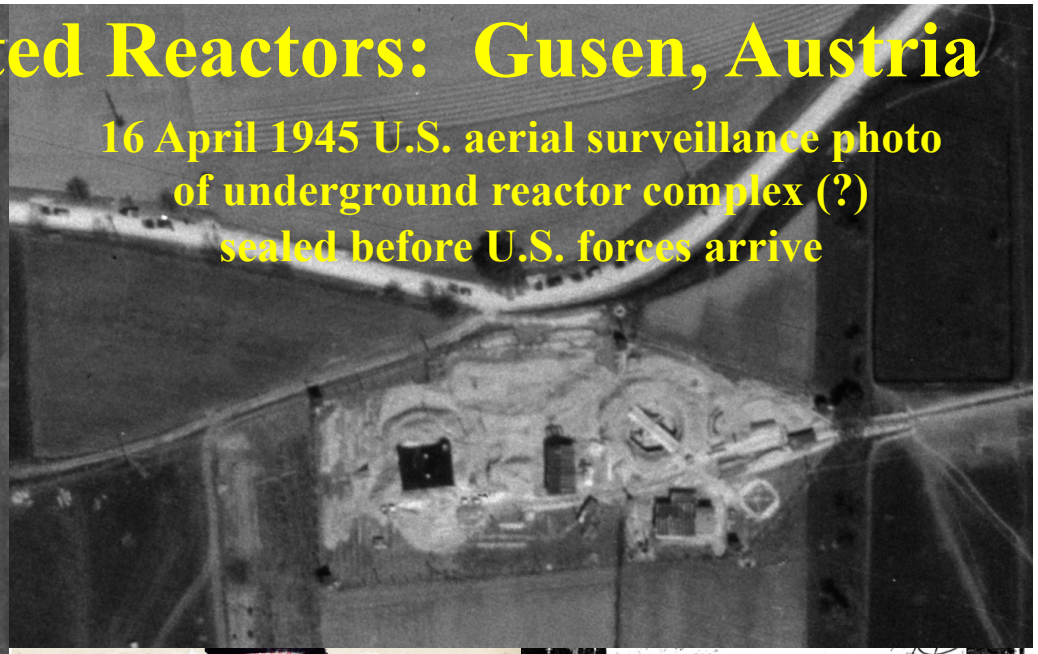

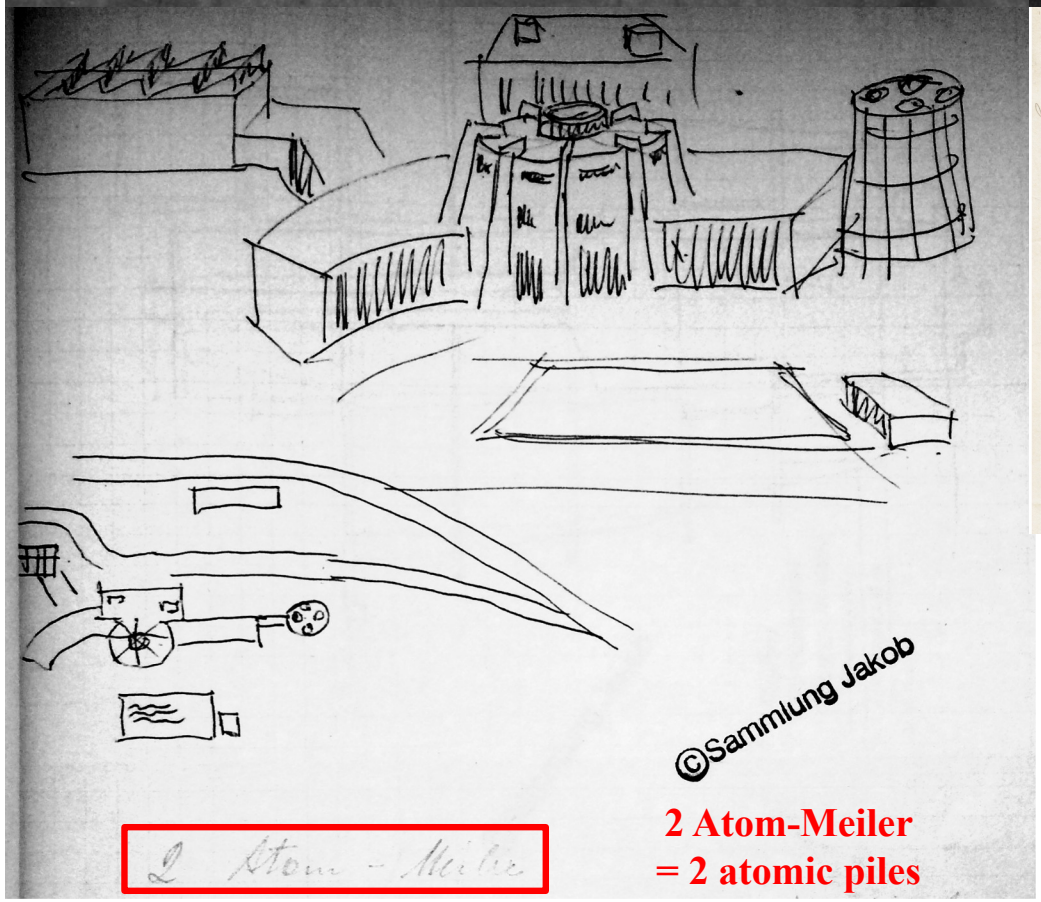

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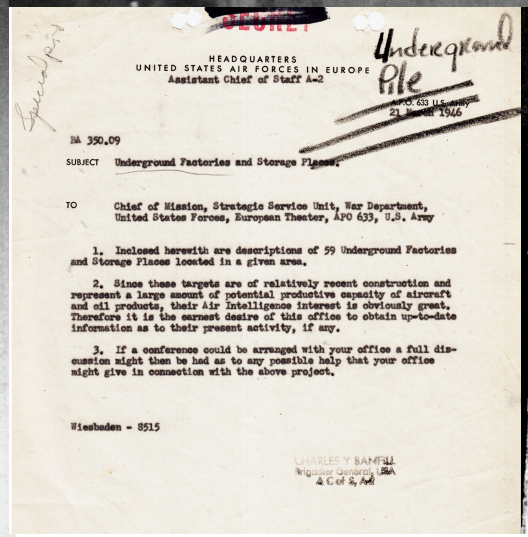

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Wagenkontrollbuch

der Güterabfertigung

begonnen am 22.2.45 1945

beendet am 28. April 1945 19

1944 Austrian train logbooks show several other nuclear sites sent regular shipments of codenamed products to Hans Kammler and Siegfried Flügge at this SS Gusen facility

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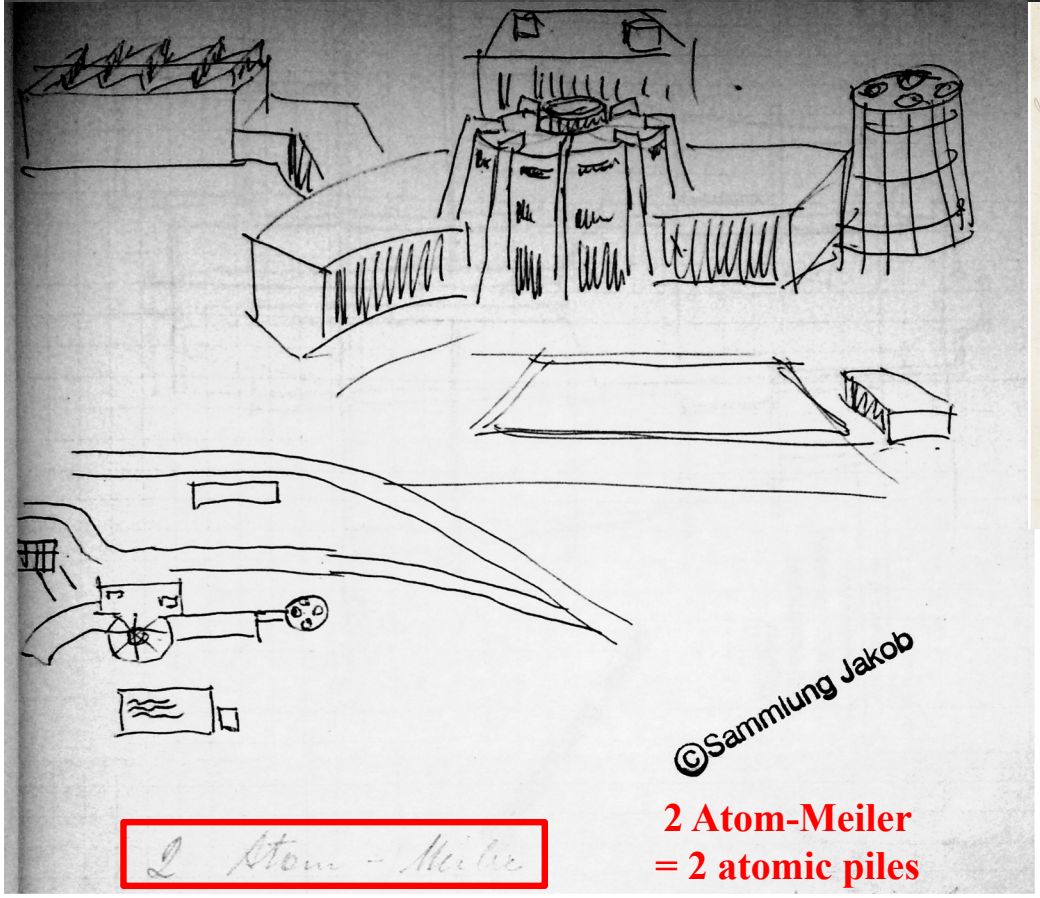

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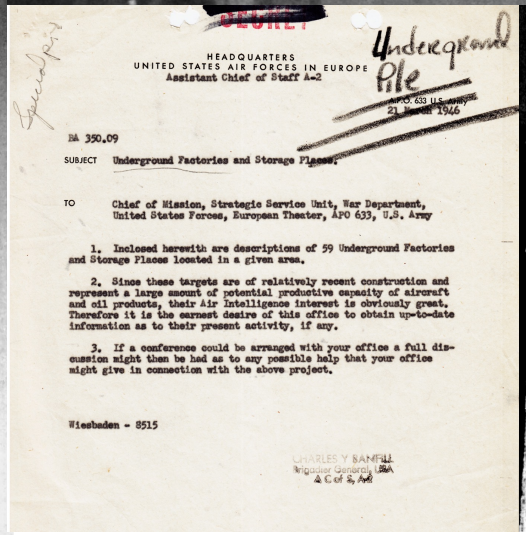

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TO: Chief of Mission, Strategic Service Unit, War Department, United States Forces, European Theater, APO 633, U.S. Army

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2. Since these targets are of relatively recent construction and represent a large amount of potential productive capacity of aircraft and all products, their Air Intelligence interest is obviously great. Therefore it is the earnest desire of this office to obtain up-to-date information as to their present activity, if any.

3. If a conference could be arranged with your office a full discussion might then be had as to any possible help that your office might give in connection with the above project.

Wiesbaden - 8515

CHARLES Y BANFILL
Brigadier General, USA
A C of S, A-2

Wagenkontrollbuch

der Güterabfertigung

begonnen am 22.2.45 1945

beendet am 28. April 1945 19

1944 Austrian train logbooks show several other nuclear sites sent regular shipments of codenamed products to Hans Kammler and Siegfried Flügge at this SS Gusen facility

Walter Chmielewski, son of Gusen commandant, 2016:
There was the precise talk of a total (of about) 30–40 kilometers of tunnels which have been created and partly in fact on two levels. This came through in talks with SS people and there is now nuclear research being carried out there. Under high pressure there is research, which could still save the nation, so to speak; the atomic bomb could be constructed, so that the initiative can be recovered again, yes. This was clearly stated in conversations in Gusen, that this research is already taking place. [Forgotten Creators D.5]

5. Requirements for a Breeder Reactor

Characteristic	Approximate value (scales linearly)
Thermal power	25 MW
Reactor core volume	100 m^3
Moderator	150 tons of graphite, or 80 tons of heavy water, or some of both
Natural uranium in reactor	25 tons
Replace uranium every	100 days
Uranium consumption rate	91 tons/year
Plutonium production rate	6.9 kg/year (~1 bomb/year)
Cost (1940s U.S. dollars)	$6,000,000

Based on: Office of Technology Assessment. 1977. Nuclear Proliferation & Safeguards. NTIS Report PB-275843. Appendix Vol. 2.

6. Breeding ^{239}Pu or ^{233}U in Electronuclear Systems

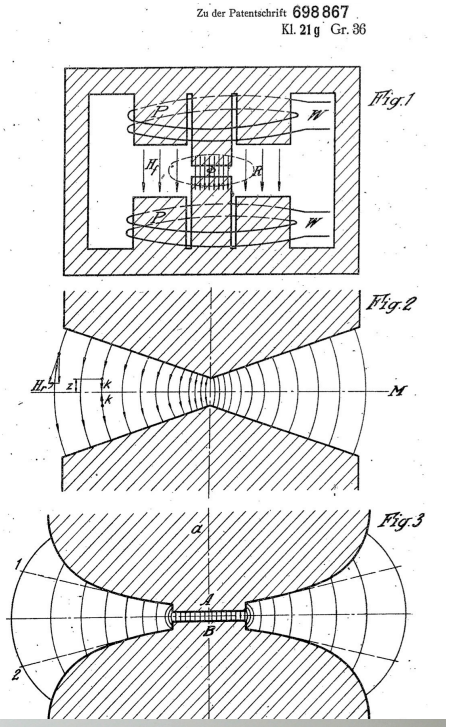
Rolf Wideröe (1902–1996)

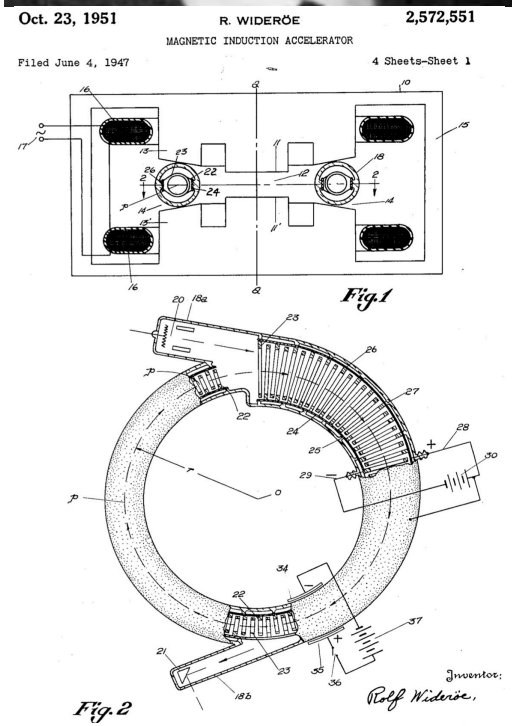
Invented & developed particle accelerators (1923–)

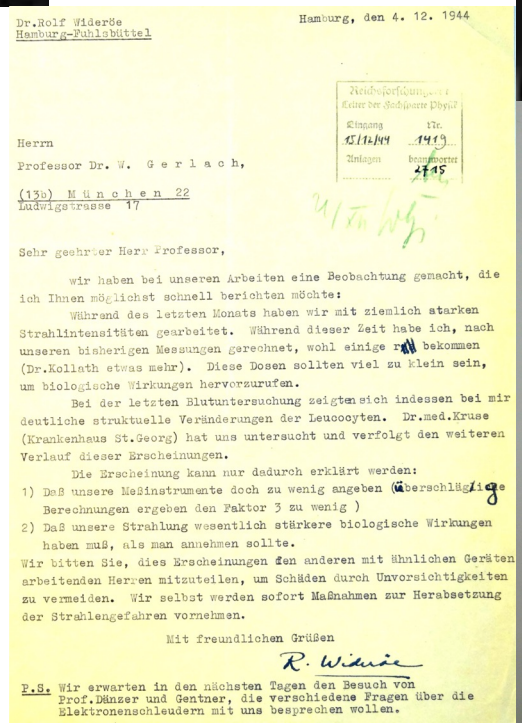
NARA RG 319 Entry NM3-82A, Box 6, Folder ALSOS G-20

DECLASSIFIED Authority NND 753001

Max Steenbeck (1904–1981)
Invented & developed particle accelerators (1927–)







Dr.Rolf Wideröe
Hamburg-Fuhlsbüttel

Hamburg, den 4. 12. 1944

Reichsforschungsrat
Leiter der Fachgruppe Physik
Eingang 15/12/44 Nr. 1919
Anlagen beantwortet 2715

Herrn
Professor Dr. W. Gerlach,

(13b) München 22
Ludwigstrasse 17

Sehr geehrter Herr Professor,

wir haben bei unseren Arbeiten eine Beobachtung gemacht, die ich Ihnen möglichst schnell berichten möchte:

Während des letzten Monats haben wir mit ziemlich starken Strahlintensitäten gearbeitet. Während dieser Zeit habe ich, nach unseren bisherigen Messungen gerechnet, wohl einige r bekommen (Dr.Kollath etwas mehr). Diese Dosen sollten viel zu klein sein, um biologische Wirkungen hervorzurufen.

Bei der letzten Blutuntersuchung zeigten sich indessen bei mir deutliche struktuelle Veränderungen der Leucocyten. Dr.med.Kruse (Krankenhaus St.Georg) hat uns untersucht und verfolgt den weiteren Verlauf dieser Erscheinungen.

Die Erscheinung kann nur dadurch erklärt werden:

1) Daß unsere Meßinstrumente doch zu wenig angeben (überschlägige Berechnungen ergeben den Faktor 3 zu wenig)
2) Daß unsere Strahlung wesentlich stärkere biologische Wirkungen haben muß, als man annehmen sollte.

Wir bitten Sie, dies Erscheinungen den anderen mit ähnlichen Geräten arbeitenden Herren mitzuteilen, um Schäden durch Unvorsichtigkeiten zu vermeiden. Wir selbst werden sofort Maßnahmen zur Herabsetzung der Strahlengefahren vornehmen.

Mit freundlichen Grüßen

R. Wideröe

P.S. Wir erwarten in den nächsten Tagen den Besuch von Prof.Dänzer und Gentner, die verschiedene Fragen über die Elektronenschleudern mit uns besprechen wollen.

6. Breeding ^{239}Pu or ^{233}U in Electronuclear Systems

Germany produced particle accelerators from the Netherlands to Czech territory for a secret, high-priority program

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Werner Grothmann, 2002, Jonastalverein Archive, Arnstadt, p. 41:

It was attempted to produce plutonium without having a reactor. […] In the summer of 1944, when the uranium program had already been developed properly, decisive measures were taken, because there was evidence that plutonium could be produced, albeit with difficulty and in very small quantities. It was Himmler who commissioned us to use our technical capabilities to build the first machines for it. The construction drawings for it were not from our [SS] people. […] In addition, the Reichspost had its own very secret research facility nearby, but I do not know anything about it. The equipment for the plutonium matter was manufactured by Austrian companies and in the [Czech] Protectorate. This was so because Austrian scientists had better contacts to their own companies, which did excellent work by the way. The operation of the facility was supposed to be organized such that we [SS] provided the facility and also the construction of the underground rooms. The technicians there should operate them for us and Ohnesorge's people would provide the technical supervision. […] After the war I heard that we had material for one or two plutonium bombs.

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Georgy Flerov, 1983 interview, www.gornictwo.walbrzych.pl/news-91-Tajemnice_kopalni_Walbrzycha.php:

Nobody knows everything, because the Germans destroyed a lot of documents and experimental materials, and the Allies, the Americans, took a lot. […] I was in Waldenburg, but just before I came back from Germany to Moscow. […] Stalin and Kurchatov sent me there. There were reports that the Germans were conducting atomic tests. I went there as a representative of the Ministry of Light Machines. It turned out on the spot that the Germans were more advanced in the tests than one could have imagined. […] I found out that in Dresden the "Service" [NKVD] had captured a German scientist, a physicist, who told me about secret experiments in Waldenburg, so I took him with me and we went there, but he knew too little. […] You see, the Germans had a lot of research groups. My German worked in an institute in Dresden that belonged to the Postal Ministry. He was in Waldenburg only one time to install equipment, because that institute belonged to the SS. […] He was there only once. The car that carried him from the railway station drove around the city for a long time until the German had forgotten the way. Then they drove into the mine and drove him underground. He sat there for two days, worked, ate, and slept underground. When he finished, the car drove him around the city again, before he reached the station. And that is why the German could not find anything with me. […] He said that when he was there for the first time he was also afraid. He said that SS people were guarding everywhere; he described them as "sharp." He said they had strange emblems on their uniforms that he had never seen before. […] He said that with his colleagues he had installed a cyclotron there, but it turned out that it was the second one, because one was already there. They installed the second one. He told us that the mine had been specially adapted. There were trolleys, tables, all the necessary equipment, and at the entrances there were locks and guards. He could not enter because he did not have a special pass.

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Air Raid, Sabotage Held Up Nazi Work on Atomic Bomb, AP 1945:

PRAGUE, Aug. 23---(AP)---A shattering American air raid, Czech sabotage and an accident frustrated German experiments in Czechoslovakia seeking to develop an atomic bomb, newspaper accounts said here today. A German engineer named [W.] Isenbeck worked with the problem of releasing atomic energy in a radio plant at Vysocany, the accounts said. A blast and fire at the plant in 1943 followed by an American raid [25 March 1945] halted work soon after the plant resumed operations. Some mysterious apparatus was dispatched to the Imperial Research Institute in Berlin, but Czech workers believed they managed to damage the delicate mechanism before it was shipped, the stories said.

Georgy Flerov, 1983 interview, www.gornictwo.walbrzych.pl/news-91-Tajemnice_kopalni_Walbrzycha.php:

Nobody knows everything, because the Germans destroyed a lot of documents and experimental materials, and the Allies, the Americans, took a lot. […] I was in Waldenburg, but just before I came back from Germany to Moscow. […] Stalin and Kurchatov sent me there. There were reports that the Germans were conducting atomic tests. I went there as a representative of the Ministry of Light Machines. It turned out on the spot that the Germans were more advanced in the tests than one could have imagined. […] I found out that in Dresden the "Service" [NKVD] had captured a German scientist, a physicist, who told me about secret experiments in Waldenburg, so I took him with me and we went there, but he knew too little. […] You see, the Germans had a lot of research groups. My German worked in an institute in Dresden that belonged to the Postal Ministry. He was in Waldenburg only one time to install equipment, because that institute belonged to the SS. […] He was there only once. The car that carried him from the railway station drove around the city for a long time until the German had forgotten the way. Then they drove into the mine and drove him underground. He sat there for two days, worked, ate, and slept underground. When he finished, the car drove him around the city again, before he reached the station. And that is why the German could not find anything with me. […] He said that when he was there for the first time he was also afraid. He said that SS people were guarding everywhere; he described them as "sharp." He said they had strange emblems on their uniforms that he had never seen before. […] He said that with his colleagues he had installed a cyclotron there, but it turned out that it was the second one, because one was already there. They installed the second one. He told us that the mine had been specially adapted. There were trolleys, tables, all the necessary equipment, and at the entrances there were locks and guards. He could not enter because he did not have a special pass.

6. Requirements for an Electronuclear Breeder

$$\text{Production rate} = 3.15\times10^{4}\ \frac{N\ I\ \eta\ A}{e\ N_A}\ \frac{\text{kg}}{\text{year}}$$

N = number of particle accelerators
I = beam current per accelerator
η = number of bred atoms per accelerated charged particle
A = atomic mass of product
$e = 1.602\times10^{-19}$ Coulombs/proton
$N_A = 6.022\times10^{23}$ Avogadro's number

$$\text{Production rate} = \begin{cases} 0.78\ \text{kg/year}\ ^{239}\text{Pu or} \\ 0.76\ \text{kg/year}\ ^{233}\text{U or} \\ 9.8\ \text{g/year tritium} \end{cases}$$

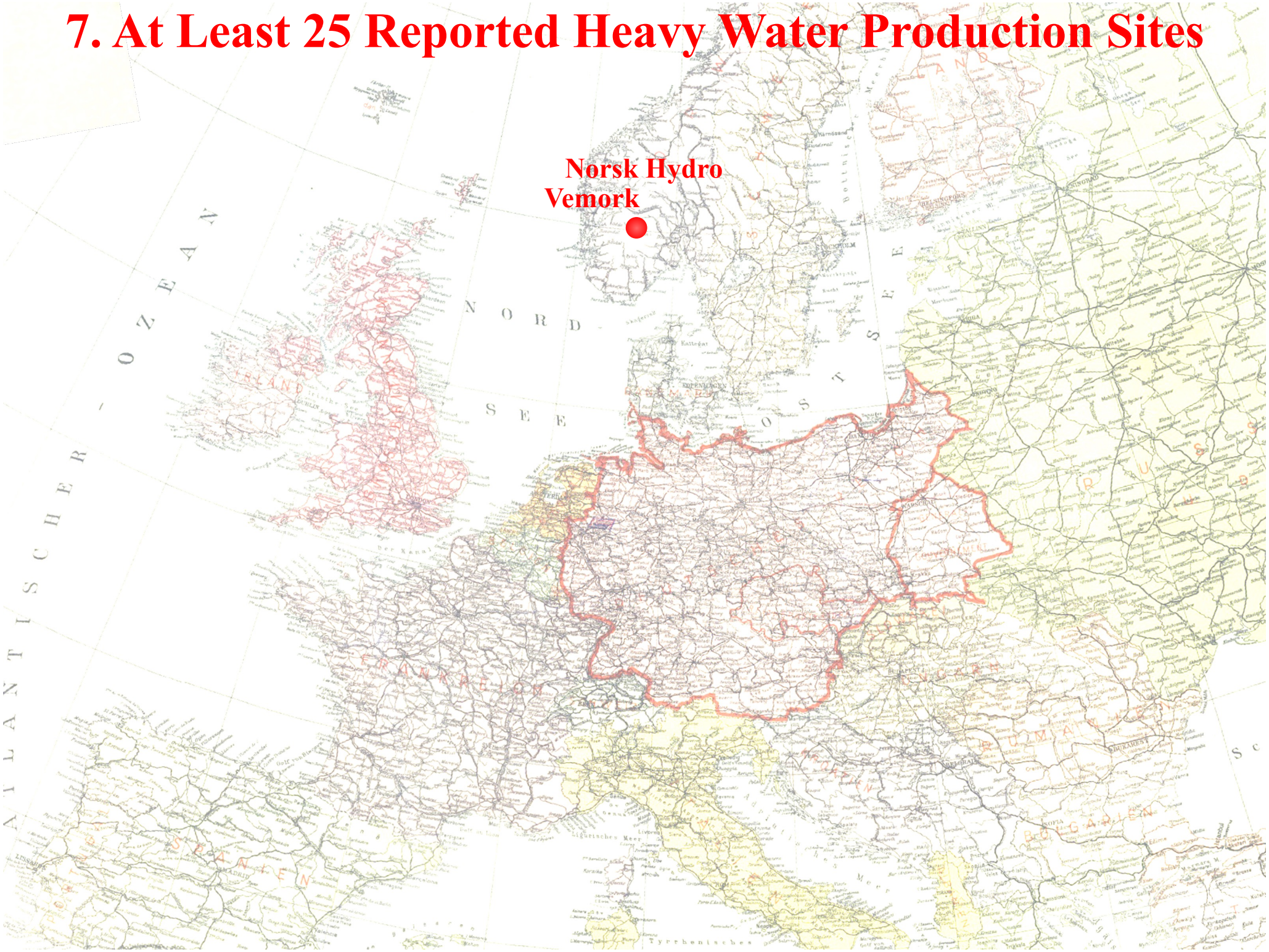
For N=10 accelerators, $I = 10^{-3}$ Amp, and η = 1 bred atom per accelerated particle

Higher production rates are possible:

- The German program could have built and operated more than 10 particle accelerators in parallel. (The United States built and operated 3120 calutron ion beams at Oak Ridge for ^{235}U enrichment.)
- Increasing the beam current by a factor of 2 or 3 would increase the amount of bred fission fuel by the same factor.
- If the accelerators began operation two years before the end of the war, twice as much fuel could have been produced.
- The efficiency could be as high as η ~ 100 by using the highest possible beam energy, using charged deuterons for the beam, and employing a neutron-multiplying target. A neutron-multiplying target would essentially be a small, subcritical fission reactor, for example chunks of unenriched uranium metal immersed in heavy water and surrounded by a beryllium reflector.

See for example: Chichester, David L. 2009. *Production and Applications of Neutrons Using Particle Accelerators.* INL/EXT-09-17312. Idaho Falls: Idaho National Laboratory. https://inldigitallibrary.inl.gov/sites/sti/sti/6302373.pdf
Kemp, R. Scott. 2005. Nuclear Proliferation with Particle Accelerators. *Science and Global Security* 13:183-207. http://scienceandglobalsecurity.org/archive/sgs13kemp.pdf

7. At Least 25 Reported Heavy Water Production Sites



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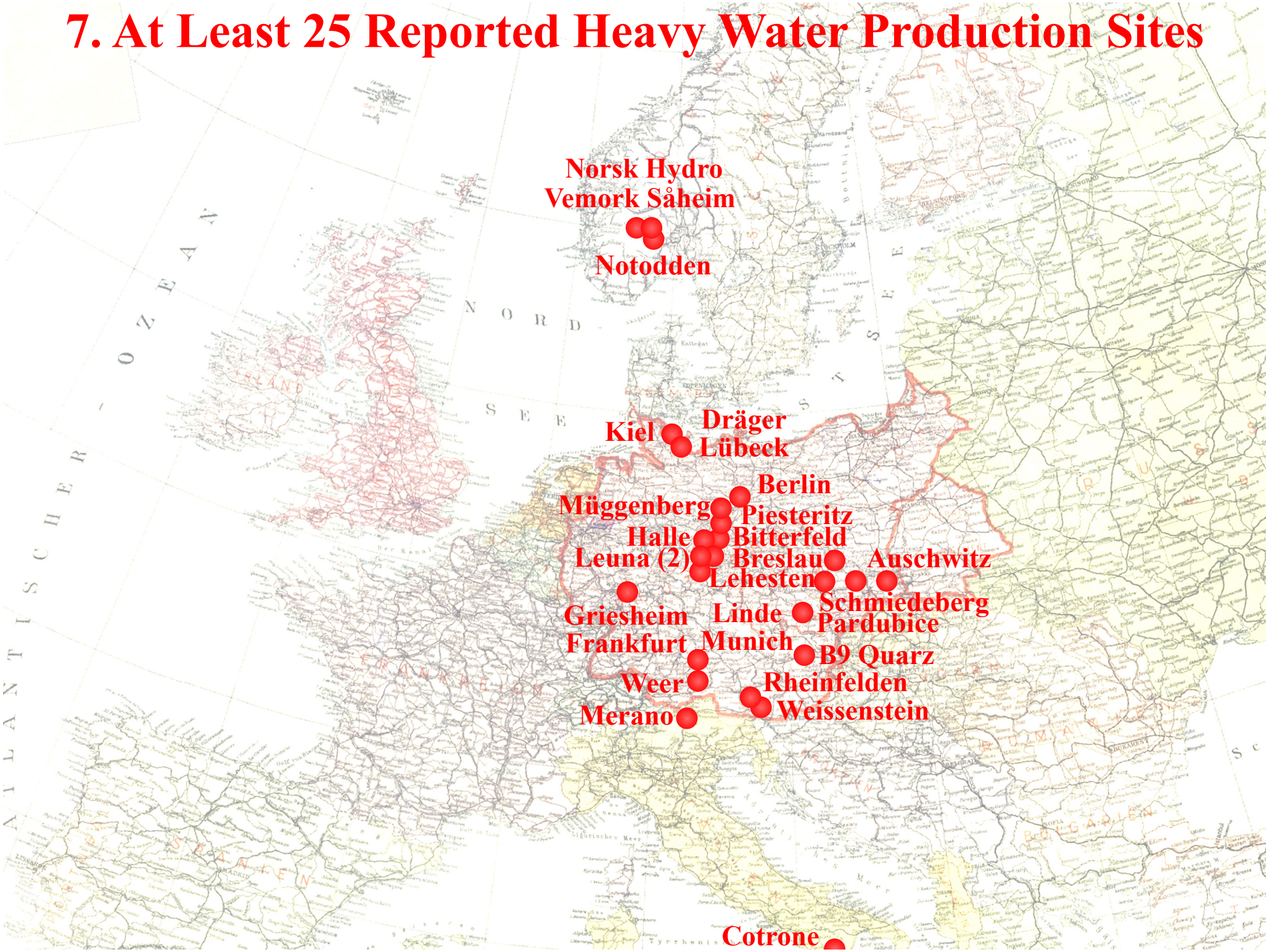

7. At Least 25 Reported Heavy Water Production Sites

C. Chamberlain. Reveal Allied Capture of Nazi Atom Factory. Chicago Daily Tribune. 9 Aug. 1945.

The largest heavy water plant in Germany, where Nazi scientists were working feverishly to perfect an atomic bomb, was captured almost intact by the allies three months ago in a heavily wooded section four miles from Kiel.

Cobwebs of plastic pipes connected eight huge vats holding thousands of gallons of plain water for processing into heavy water.

I stumbled onto the factory two weeks after it was taken over by American and British technicians. Altho they gave me freedom to roam around the grounds, I was called on the carpet the next day for entering without authority from high officials and was required to pledge not to reveal what I had seen until it was released.

https://www.cia.gov/readingroom/document/cia-rdp81-01028r000100080011-0

The dismantling of the Leuna Plant in Merseburg, Thuringia, Germany (Soviet Zone), was initiated in March 1946… 3. The following large installations were dismantled:… (j) The heavy water installation operating at atmospheric pressure was dismantled and possibly placed in a building near the Agricultural Exhibition Grounds in Moscow. (k) The heavy water installation operating at 700 atmospheres was taken to the Karpov Institute were it was being installed when we left in July 1948.

Interrogation of PW MAYER. 14 July 1944. NARA RG 77, Entry UD-22A, Box 171, Folder 32.7003-2.

PW is an educated man in his late thirties, a physical chemist by profession[...] PW believes that D2O (Heavy Hydrogen) is manufactured principally at GRIESHEIM ELEKTRON in fairly large quantities for distribution to research and scientific establishments.

B.K. Hough to L. Groves. 9 December 1943. NARA RG 77, Entry UD-22A, Box 166, Folder 32.22-1.

Dr. E. P. Wigner of Chicago mentioned to Dr. Urey that he has had reports of heavy water plants now in production in Germany.

Norsk Hydro
Vemork Såheim
Notodden

Karl Cohen to F. Smith. 23 February 1945. Subject: Status of Enemy Separation Projects. NARA RG 77, Entry UD-22A, Box 166, Folder 32.22-1.

Heavy Water Production… Factories: Rjukan (now dismantled) Müggenberg, I. G. Farben

Ferdinand Cap. 23 November 1950 report.

At the invitation of Colonel Colonel GOUSSOT, Innsbruck, I had the opportunity to visit Mr. Werd's [wartime] heavy water extraction test facility in Weer near Wattens in Tyrol on 21 November 1950.

Cotrone

OSS London. 5 December 1944. T-2805-a. NARA RG 77, Entry UD-22A, Box 171, Folder 32.7003-3

GERMANY: ATOMIC PHYSICS Heavy Water Experimental Station. Heavy water experiments are being carried out at the Dräger Werke, Lübeck, which is reported to be the largest gas factory in Germany.

Siegfried Knappe. 1992. *Soldat: Reflections of a German Soldier 1936-1949*. Orion. pp. 265-268.

Hitler had declared Breslau a fortress city, which meant that it was to be defended to the last man, even if it was surrounded and totally isolated… A factory for making heavy water for atomic experiments had been abandoned east of Breslau, and we had to plan and conduct a counterattack to destroy it and keep its secrets from falling into the hands of the Russians.

U.S. Embassy, Warsaw. 12 Aug. 1947. MIS-390731. Subject: Plants producing heavy water. NARA RG 319, Entry 85A, Box 2534, Folder 390731–390740.

It is believed that no plants designed specially for the production of heavy water exist in Poland [in 1947]. It is reliably reported that the Germans built one such plant near OSWIECIM (Auschwitz) but that it was destroyed or moved out by the SOVIETS in 1945.

R. W. Kirkman. 28 January 1944. NARA RG 77, Entry UD-22A, Box 171, Folder 32.7003-1

According to Major Furman, the substance of the conversation referred to was to the effect that Degussa was producing heavy water at two plants located at Rheinfelden and Weissenstein on the Drau River, Austria.

7. At Least 25 Reported Heavy Water Production Sites

- **Why were at least 25 plants reportedly producing D_2O, despite other urgent wartime needs?**

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- **Was that D_2O needed for breeder reactors, electronuclear breeders, fusion fuel, etc.?**

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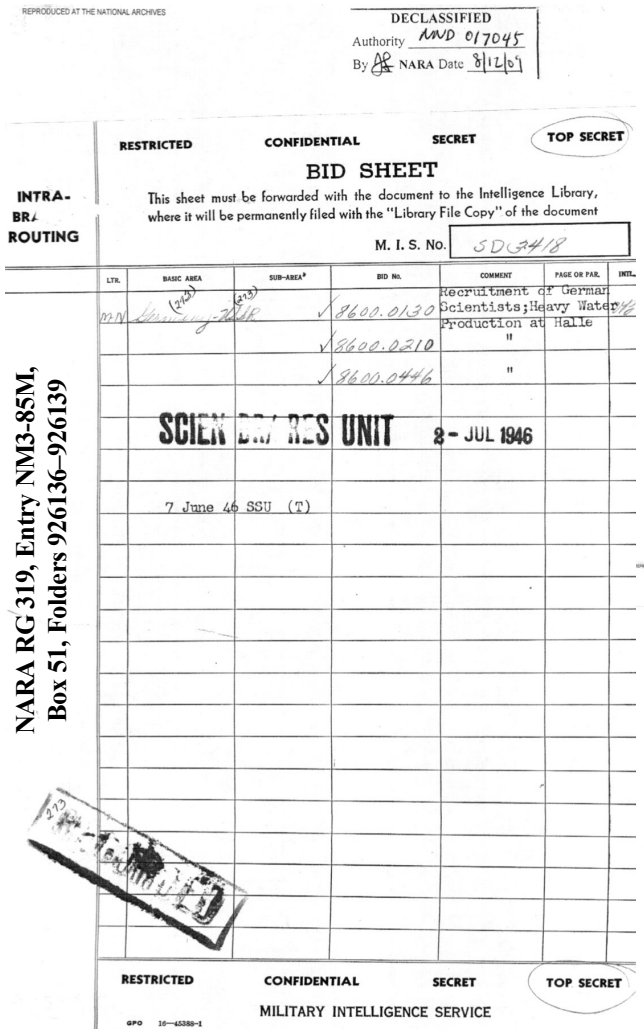
- **Why were at least 25 plants reportedly producing D_2O, despite other urgent wartime needs?**
- **Was that D_2O needed for breeder reactors, electronuclear breeders, fusion fuel, etc.?**
- **Why are Allied reports on those plants still classified, or entirely missing from archives?**

NARA RG 319, Entry NM3-85M, Box 51, Folders 926136–926139



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INTRA-BRANCH ROUTING

LTR.	BASIC AREA	SUB-AREA	BID No.	COMMENT	PAGE OR PAR.	INT.
MN	Heavy Water		✓8600.0130	Recruitment of German Scientists; Heavy Water Production at Halle		
			✓8600.0210	"		
			✓8600.0446	"		

SCIEN BR/ RES UNIT 8 - JUL 1946

7 June 46 SSU (T)

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MILITARY INTELLIGENCE SERVICE

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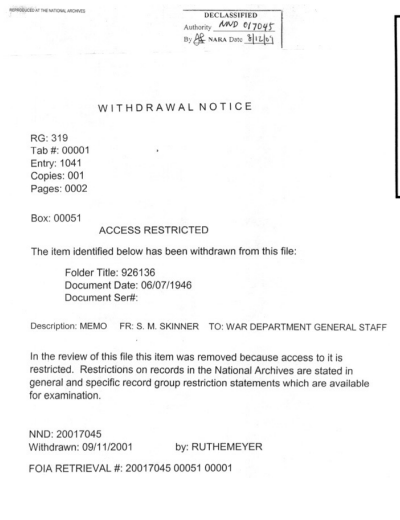
MILITARY INTELLIGENCE SERVICE



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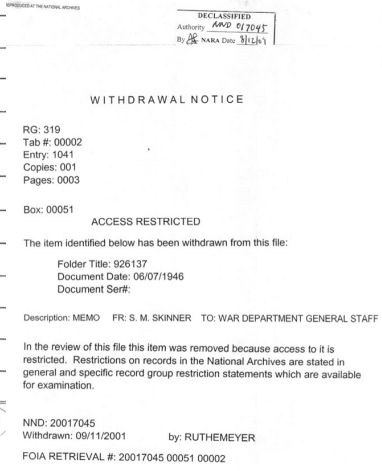

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Pages: 0003

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Withdrawn: 09/11/2001 by: RUTHEMEYER

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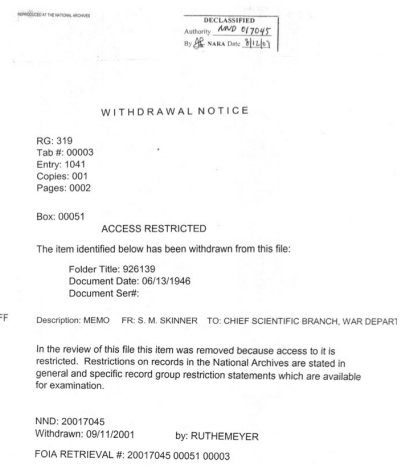

DECLASSIFIED Authority NND 017045 By NARA Date 8/12/07

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Tab #: 00003
Entry: 1041
Copies: 001
Pages: 0002

Box: 00051

ACCESS RESTRICTED

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Folder Title: 926139
Document Date: 06/13/1946
Document Ser#:

Description: MEMO FR: S. M. SKINNER TO: CHIEF SCIENTIFIC BRANCH, WAR DEPART

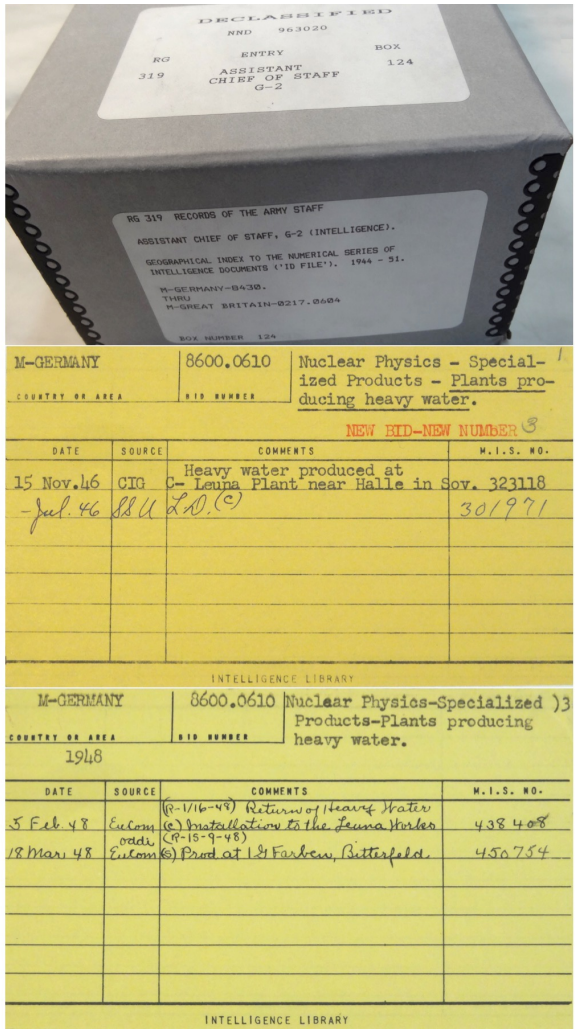
In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination.

NND: 20017045
Withdrawn: 09/11/2001 by: RUTHEMEYER

FOIA RETRIEVAL #: 20017045 00051 00003

DECLASSIFIED Authority NND 963020

NARA RG 319, Entry A1-84E, Box 124



M-GERMANY (COUNTRY OR AREA)	8600.0610 (BID NUMBER)	Nuclear Physics - Specialized Products - Plants producing heavy water. NEW BID-NEW NUMBER 3

DATE	SOURCE	COMMENTS	M.I.S. NO.
15 Nov. 46 - Jul. 46	CIG SSU	Heavy water produced at C- Leuna Plant near Halle in LD.(C)	Sov. 323118 301971

INTELLIGENCE LIBRARY

M-GERMANY (COUNTRY OR AREA)	8600.0610 (BID NUMBER)	Nuclear Physics-Specialized Products-Plants producing heavy water. 1948

DATE	SOURCE	COMMENTS	M.I.S. NO.
3 Feb 48	Eucom	(R-1/16-48) Return of Heavy Water (C) Installation to the Leuna Works (R-15-9-48)	438408
18 Mar 48	Eucom oddi	(S) Prod at I.G. Farben, Bitterfeld.	450754

INTELLIGENCE LIBRARY

For more information, see *Forgotten Creators* D.7

7. Production of Other Potentially Nuclear-Related Materials

Material	Non-nuclear applications	Nuclear applications	Wartime production
Deuterium/ heavy water	Isotope labeling of molecules	Producing tritium, neutrons, fusion; neutron moderator for reactor	At least 25 reported production plants
Lithium	Glass, ceramics, metals	Producing tritium, neutrons, fusion	Hundreds of tons
Beryllium	Metal alloys	Neutron production/reflection	Tons
Boron	Glass, ceramics, metals	Neutron absorber	Large quantities
Graphite	Rocket rudders	Neutron moderator for reactor	Tens of thousands of tons
Fluorine	Industrial production	U hexafluoride for enrichment	Thousands of tons
Aluminum	Metal structures, packaging	Reactor fuel cladding, bomb casings	Thousands of tons
Calcium	Metal alloys	Th/U/Pu purification	Thousands of tons
Nickel	Batteries, alloys	Resists corrosion by U hexafluoride	Thousands of tons
Zirconium	High-temp. metals, ceramics	Reactor fuel cladding	Tons
Cadmium	Nickel-cadmium batteries	Neutron absorber	Thousands of tons

Archival documents in *Forgotten Creators* D.7

7. Production of Other Potentially Nuclear-Related Materials

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Deuterium/ heavy water	Isotope labeling of molecules	Producing tritium, neutrons, fusion; neutron moderator for reactor	At least 25 reported production plants
Lithium	Glass, ceramics, metals	Producing tritium, neutrons, fusion	Hundreds of tons
Beryllium	Metal alloys	Neutron production/reflection	Tons
Boron	Glass, ceramics, metals	Neutron absorber	Large quantities
Graphite	Rocket rudders	Neutron moderator for reactor	Tens of thousands of tons
Fluorine	Industrial production	U hexafluoride for enrichment	Thousands of tons
Aluminum	Metal structures, packaging	Reactor fuel cladding, bomb casings	Thousands of tons
Calcium	Metal alloys	Th/U/Pu purification	Thousands of tons
Nickel	Batteries, alloys	Resists corrosion by U hexafluoride	Thousands of tons
Zirconium	High-temp. metals, ceramics	Reactor fuel cladding	Tons
Cadmium	Nickel-cadmium batteries	Neutron absorber	Thousands of tons

Some sites were producing multiple nuclear-related materials. I.G. Farben's Bitterfeld facility was producing heavy water, graphite, aluminum, and calcium, and perhaps other relevant materials.

Archival documents in *Forgotten Creators* D.7

7. Production of Other Potentially Nuclear-Related Materials

Material	Non-nuclear applications	Nuclear applications	Wartime production
Deuterium/ heavy water	Isotope labeling of molecules	Producing tritium, neutrons, fusion; neutron moderator for reactor	At least 25 reported production plants
Lithium	Glass, ceramics, metals	Producing tritium, neutrons, fusion	Hundreds of tons
Beryllium	Metal alloys	Neutron production/reflection	Tons
Boron	Glass, ceramics, metals	Neutron absorber	Large quantities
Graphite	Rocket rudders	Neutron moderator for reactor	Tens of thousands of tons
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Nickel	Batteries, alloys	Resists corrosion by U hexafluoride	Thousands of tons
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Cadmium	Nickel-cadmium batteries	Neutron absorber	Thousands of tons

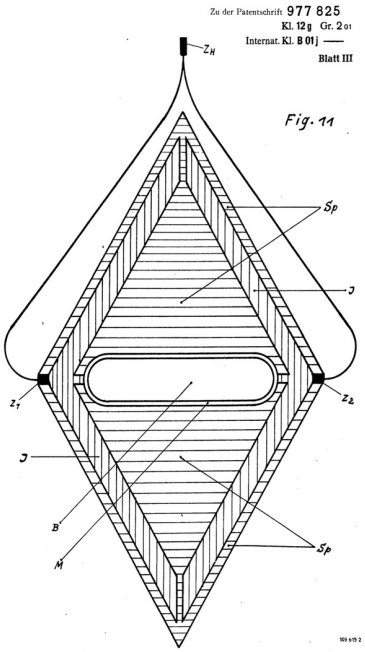
Some sites were producing multiple nuclear-related materials. I.G. Farben's Bitterfeld facility was producing heavy water, graphite, aluminum, and calcium, and perhaps other relevant materials.

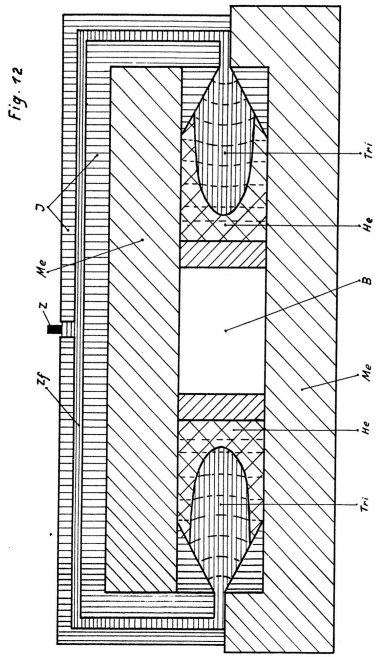
Significant quantities of many of these nuclear-related materials were also shipped to Japan, along with at least 560 kg of (possibly enriched) uranium and other cutting-edge military technologies.

Archival documents in *Forgotten Creators* D.7

8. Fission Bomb, Mass ~300 kg, Yield <1 kT, Tested 1944-45?

Erich Schumann and Walter Trinks. DE977825.





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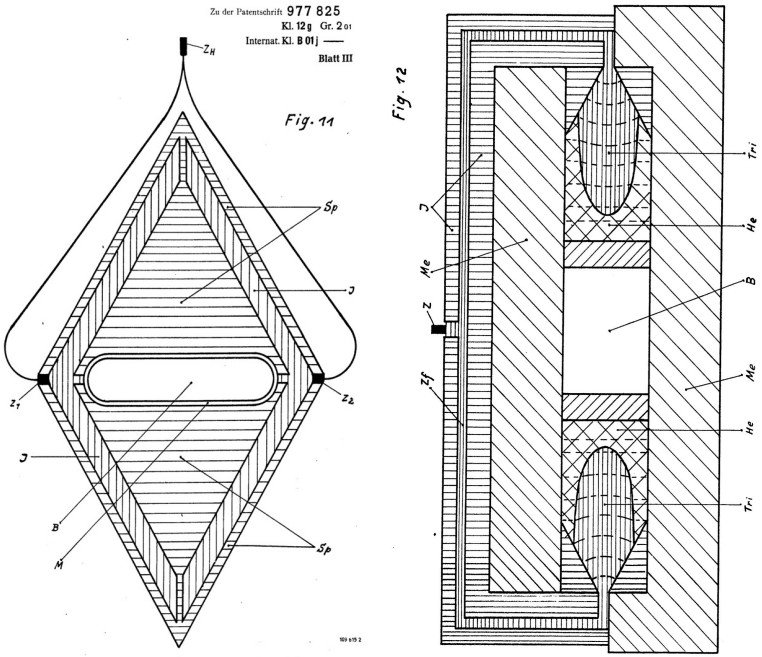

T. J. Betts and R. P. Linstead. 15 Sept. 1945. AFHRA A5186 pp. 904–1026.

Certain items have been omitted because of security considerations… Of particular significance were the statements, made by German experts in the rocket and controlled missile field, that much of the priority accorded their work by the German High Command was in anticipation of the use of atomic explosives. These authorities stated that KWI had repeatedly assured Hitler that an atomic explosive would be available for use within a comparatively short time. During the last months of work by the Peenemünde staff, V-weapons were designed with much smaller war-heads. Quite possibly this trend was in anticipation of the successful development of a German atomic explosive.

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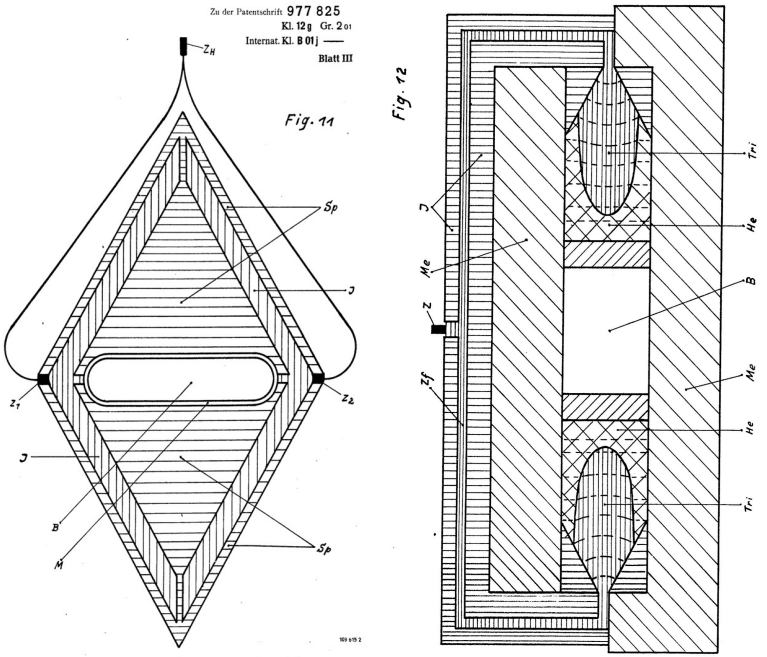

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Werner Grothmann, 2002, pp. 9, 18.

What I know is the actual preparation for the prototype production of the two fully constructed atomic bomb types for uranium and plutonium… I was not allowed to know anything about it, so I can only say that there were two standard types for use against cities and two more of a different size, which were supposed to be tactical and contain smaller charges. I learned only after the war that one of the two smaller ones would have had a charge equivalent, that is a comparable explosive material quantity, of I believe 130 tons. This was supposed to be used against railway tunnels, port facilities and military installations. The point was that the small weapons required only very little material, which overcame first of all the shortage [of fission fuel]… I know that the smaller was about the size of the SC 250, but the weight was higher.

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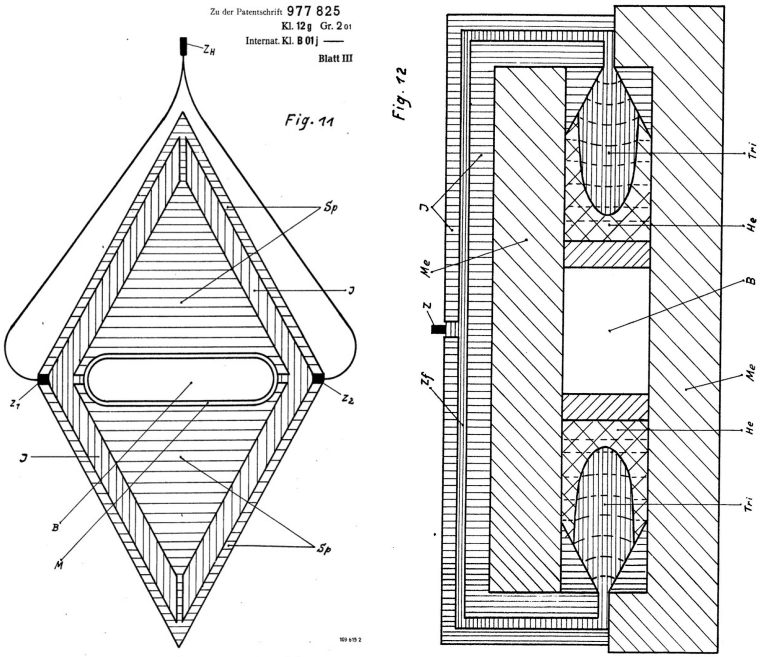

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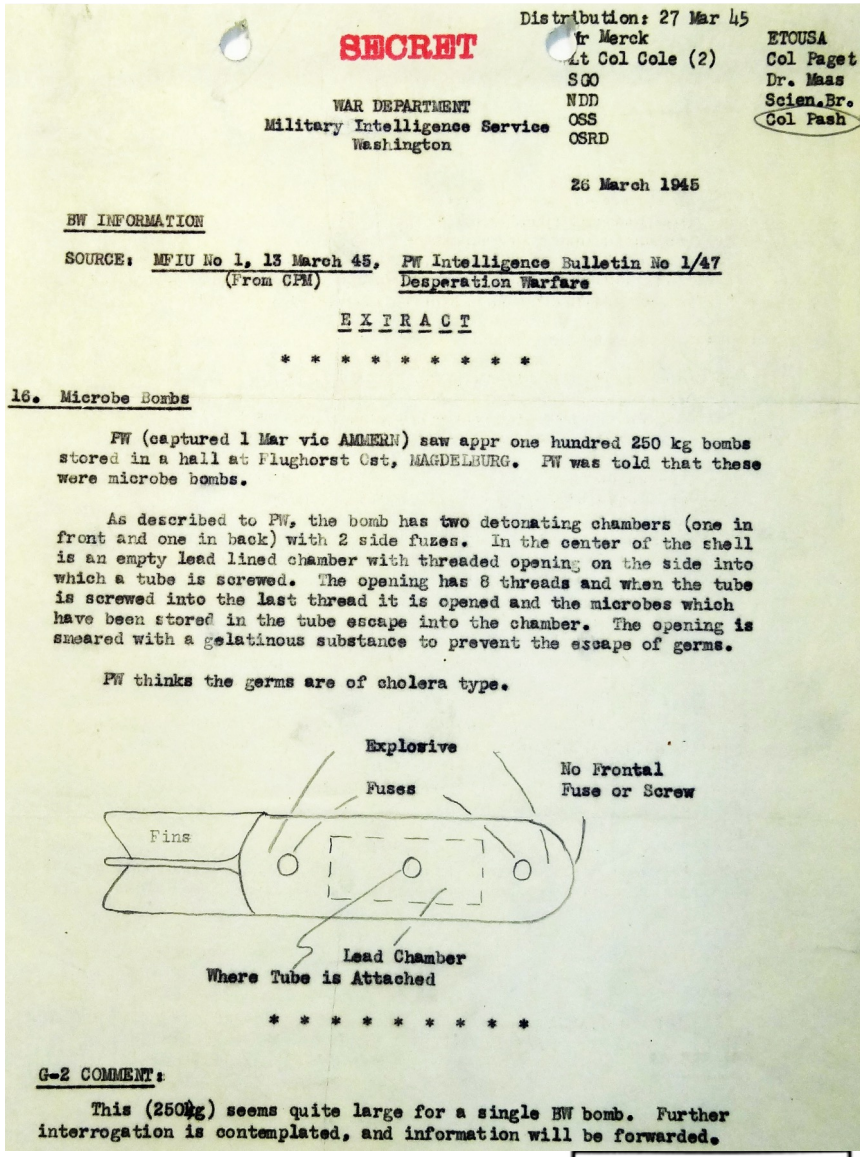

SECRET

Distribution: 27 Mar 45
fr Merck
Lt Col Cole (2)
SGO
NDD
OSS
OSRD
ETOUSA
Col Paget
Dr. Maas
Scien.Br.
Col Pash

WAR DEPARTMENT
Military Intelligence Service
Washington

26 March 1945

BW INFORMATION

SOURCE: MFIU No 1, 13 March 45, (From CPM) PW Intelligence Bulletin No 1/47 Desperation Warfare

EXTRACT

* * * * * * * * *

16. Microbe Bombs

PW (captured 1 Mar vic AMMERN) saw appr one hundred 250 kg bombs stored in a hall at Flughorst Ost, MAGDELBURG. PW was told that these were microbe bombs.

As described to PW, the bomb has two detonating chambers (one in front and one in back) with 2 side fuzes. In the center of the shell is an empty lead lined chamber with threaded opening on the side into which a tube is screwed. The opening has 8 threads and when the tube is screwed into the last thread it is opened and the microbes which have been stored in the tube escape into the chamber. The opening is smeared with a gelatinous substance to prevent the escape of germs.

PW thinks the germs are of cholera type.

* * * * * * * * *

G-2 COMMENT:

This (250kg) seems quite large for a single BW bomb. Further interrogation is contemplated, and information will be forwarded.

NARA RG 165, Entry NM84-187, Box 137, Folder BW 55

DECLASSIFIED
Authority NND 750122

Small prolate warhead with two-point ignition, similar to (but less powerful than) postwar U.S. designs such as W45.

For more information, see *Forgotten Creators* D.8, D.15.

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OSS. 19 September 1943. NARA RG 226, Entry 125, Box 6, Folder 78.

Our sources claim that there are large explosive factories in Hiltersheim, Magdeburg district. These factories are said to have been moved here from Ludwigshafen. They are in underground, bomb-proof spaces. They are making a high-density explosive here that is supposed to have an enormous explosive effect. […] With one kilogram, everything should be literally razed away, or disintegrated to dust and ashes, within a radius of approximately four kilometers.

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So gross wie eine Ananas... *Der Spiegel*, 4 June 1967, pp. 80--93.

[O]n 4 June 1942 Heisenberg was summoned to Berlin for the crucial secret meeting of the German atomic body[….] So Heisenberg immediately turned to the military applications of nuclear fission—to uranium-235 and to plutonium. When he had finished his paper, a brief dialogue ensued that has been vividly remembered by all present. Milch inquired about the size of a bomb whose effect would be enough to destroy a large city. Heisenberg: "About the size of a pineapple." He referred to the [fissile] explosive charge and demonstrated its size with his hands.

A.P.W.I.U. (Ninth Air Force) 96/1945. 19 August 1945. Investigations, Research, Developments, and Practical Use of the German Atomic Bomb. AFHRA B-5737, pp. 340-345.

2. Dr. EDSE, well known chemist, wrote: At the Institute for Physical Chemistry of the Hamburg University I worked on problems concerning nuclear physics under the direction of Prof. Dr. P. HARTECK. […] The disintegration of one kg ^{235}U delivers an amount of energy of (1000/235) x 160 x $23x10^6$ kg cal = $1.6x10^{10}$ kg cal, whereas one kg of TNT only delivers 1000 kg cal when detonating. Out of this follows that an atomic bomb of 3 lbs ^{235}U has the same effect as a bomb of 20,000 tons of TNT.

OSS. 19 September 1943. NARA RG 226, Entry 125, Box 6, Folder 78.

Our sources claim that there are large explosive factories in Hiltersheim, Magdeburg district. These factories are said to have been moved here from Ludwigshafen. They are in underground, bomb-proof spaces. They are making a high-density explosive here that is supposed to have an enormous explosive effect. […] With one kilogram, everything should be literally razed away, or disintegrated to dust and ashes, within a radius of approximately four kilometers.

Erich Rundnagel, in: Gerhardt Remdt and Gunter Wermusch. 2006. Rätsel Jonastal. 2nd ed. Meiningen: Heinrich Jung. pp. 125-126.

I was mainly involved with Dr. Rehbein and engineer Rackwitz, with whom I came into a kind of relationship of trust. […] Then he told me that something was being developed here that had a greater explosive power than anything I could imagine as an old pioneer. Rehbein just smiled and said the whole bomb was only a few decimeters tall, but weighs about eight kilograms. When I asked him if I could see the thing, he waved it off: "That could cost us both our heads."

8. Fission Bomb, Mass 2000 kg, Yield 10s of kT, Tested 1944-45

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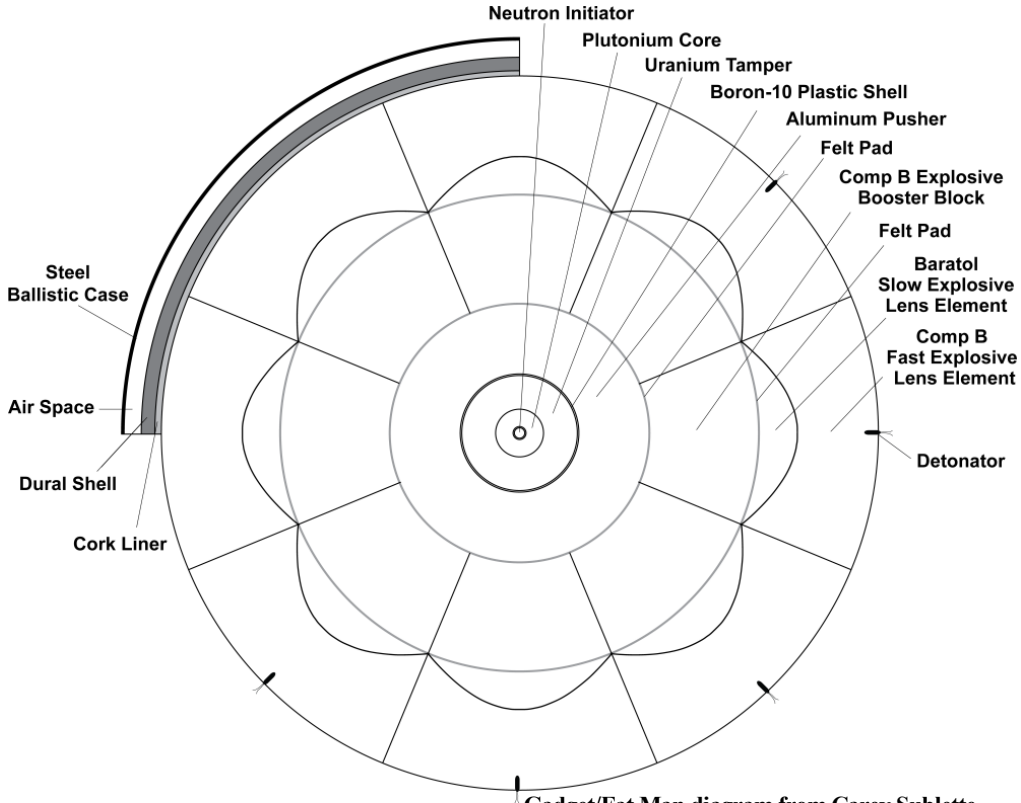

Gadget/Fat Man diagram from Carey Sublette nuclearweaponarchive.org/Nwfaq/Gadget2_sm.png

Component	Gadget/Fat Man
Neutron initiator	$\sim$ 7 g beryllium/polonium-210 "urchin" 1.25 cm radius
Pit	6.2 kg ^{239}Pu 4.6 cm radius
Tamper/ reflector	108 kg natural U 11.1 cm radius
Neutron absorber	Boron-10 plastic 3.2 mm thick
Pusher	130 kg aluminum 23.5 cm radius
Explosive	Composition B and baratol 2500 kg, segmented $\sim$ 70 cm radius
Explosive case	$\sim$ 180 kg aluminum 72.5 cm radius
Ballistic case	Steel 4.5 mm thick 75 cm radius
Overall radius	75 cm
Total mass	3000 kg (bomb only) 4670 kg (with shell and fins)
Delivery system	Boeing B-29 heavy bomber
Explosive yield	20 kilotons

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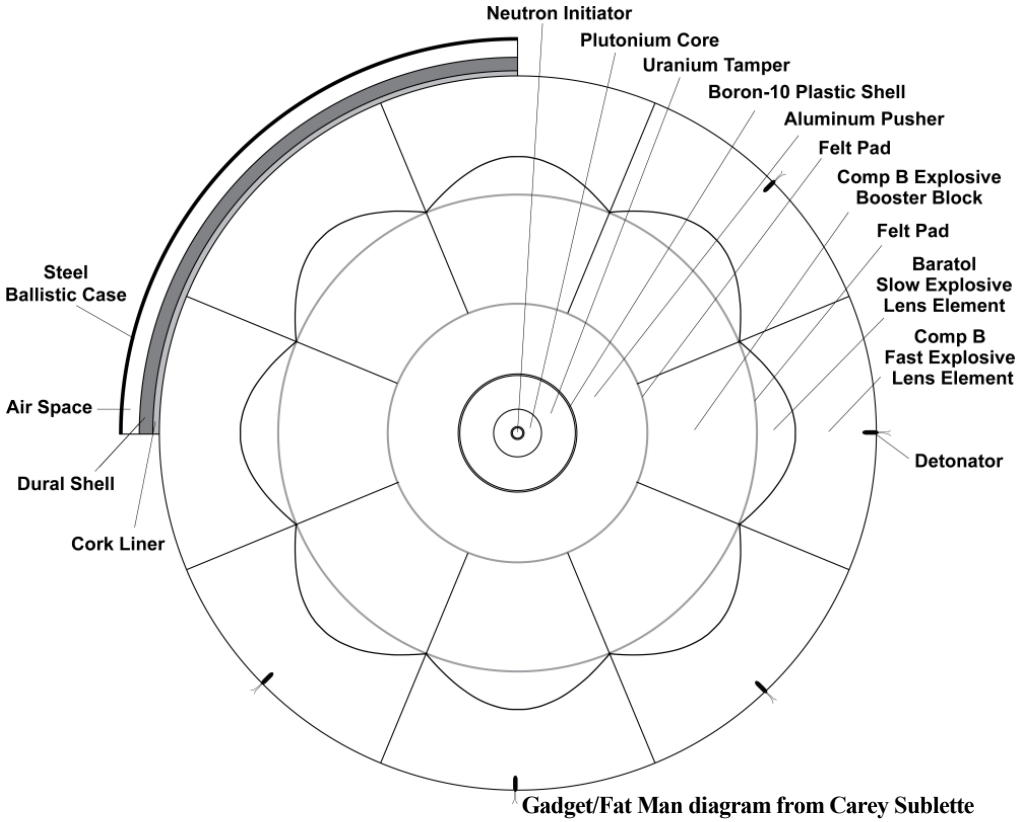

Gadget/Fat Man diagram from Carey Sublette nuclearweaponarchive.org/Nwfaq/Gadget2_sm.png

Component	Gadget/Fat Man	Thuringian Device
Neutron initiator	~ 7 g beryllium/polonium-210 "urchin" 1.25 cm radius	Deuterium + lithium with high voltage ~ 1.25 cm radius and/or external 6 MeV betatron
Pit	6.2 kg ^{239}Pu 4.6 cm radius	**For test:** <1 kg inner layer of ^{235}U with ~ 5–10 kg natural or low-enriched U outer layer **For deployment:** ~ 5–10 kg ^{235}U ~ 5 cm radius
Tamper/ reflector	108 kg natural U 11.1 cm radius	~ 100 kg natural U ~ 11 cm radius
Neutron absorber	Boron-10 plastic 3.2 mm thick	~ 1.3 kg cadmium ~ 1 mm thick
Pusher	130 kg aluminum 23.5 cm radius	~ 130 kg aluminum ~ 23 cm radius
Explosive	Composition B and baratol 2500 kg, segmented ~ 70 cm radius	TNT, RDX, and liquid oxygen ~ 1400 kg, segmented ~ 63 cm radius
Explosive case	~ 180 kg aluminum 72.5 cm radius	~ 140 kg aluminum ~ 64 cm radius
Ballistic case	Steel 4.5 mm thick 75 cm radius	~ 190 kg steel ~ 4.5 mm thick 65 cm radius
Overall radius	75 cm	~ 65 cm
Total mass	3000 kg (bomb only) 4670 kg (with shell and fins)	~ 2000 kg
Delivery system	Boeing B-29 heavy bomber	A-4, A-9, or A-9/A-10 ballistic missile
Explosive yield	20 kilotons	**For test:** < 1 kiloton **For deployment:** ~ 5–100 kilotons

Sources:

J. C. Clark. 18 September 1945. KO-29365. NARA RG 77, Entry UD-22A, Box 165, Alsos Material.
Kurt Diebner. Patent GB 841,387. 30 November 1956.
Kurt Diebner. 1962. *Kerntechnik* 4:3:89-93.
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Ivan Ilyichev. 15 November 1944. GARF, Fund 93, Division 81 (45), List 37.
Ivan Ilyichev. 23 March 1945. GARF, Fund 93, Division 81 (45), List 37.
Irene König. 16 July 2004 interview by Heiko Petermann.
Igor Kurchatov. 30 March 1945. GARF, Fund 93, Division 81 (45), List 24-25.
Frederick Loofbourow. 28 Oct. 1943. NARA RG 226, Entry 125, Box 6, Folder 78.
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Erwin Respondek. 6 November 1945. NARA RG 226, Entry A1-210, Box 447, Folder WN 16162-16171.
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Erich Schumann. 1943. HEC 5919. Imperial War Museum Duxford Archive.
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Erich Schumann to Ernst Telschow. 2 April 1948. AMPG, Abt. III, Rep. 83, Nr. 286.
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Walter Trinks. Patent DE977862. 13 August 1952.
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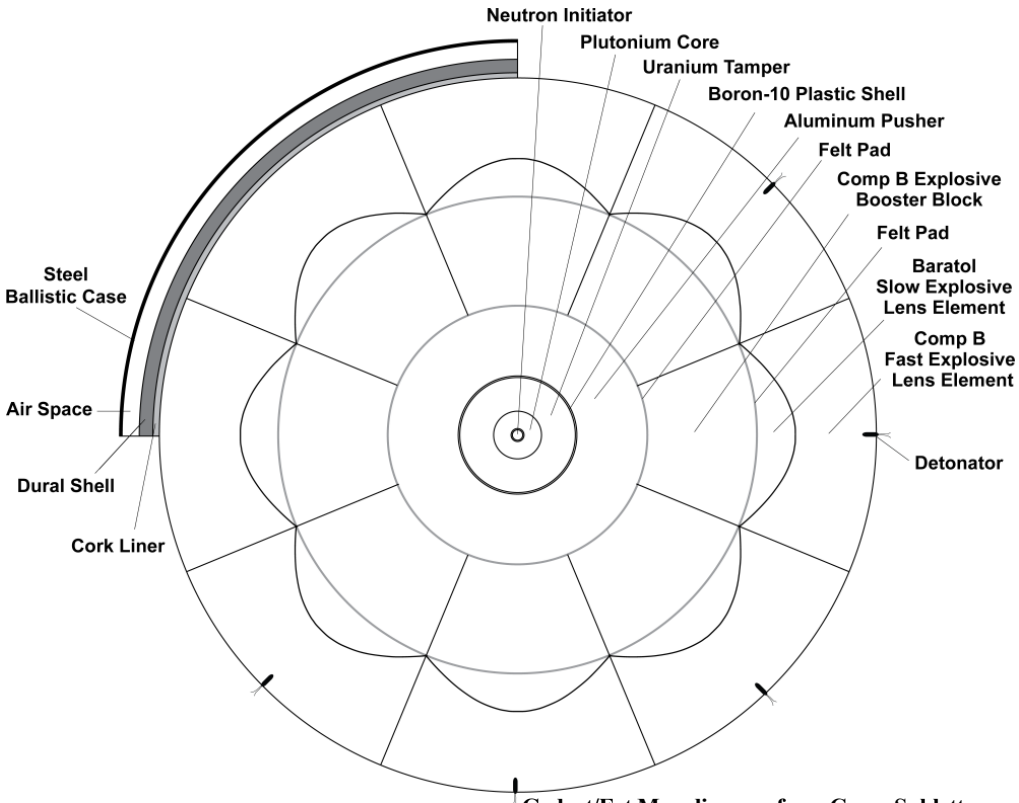

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Delivery system	Boeing B-29 heavy bomber	A-4, A-9, or A-9/A-10 ballistic missile
Explosive yield	20 kilotons	**For test:** < 1 kiloton **For deployment:** ~ 5–100 kilotons

A number of sources reported at least four successful test explosions from October 1944 to March 1945.

Test explosions were likely kept as small as possible by using just enough fuel to briefly achieve criticality, both to conserve weapons-grade fuel and to minimize the mess made in German territory.

With enough fuel, fielded versions could have had larger explosive yields than the first U.S. fission bombs.

For more information, see *Forgotten Creators* D.8 and D.15.

Sources:

J. C. Clark. 18 September 1945. KO-29365. NARA RG 77, Entry UD-22A, Box 165, Alsos Material.
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8. Some Manufacturers of Suitable Bomb Components

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D+Li fusion neutron initiator: **C.H.F. Müller (Hamburg) and other suppliers**

CIOS XXVIII-31

Prof. Bierman of A.E.G., in Berlin, was reported to be working on the design of a 20 megavolt betatron.

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The Phillips "cascade" circuit was used for these neutron generators. Although the electrical output of these generators could be as high as 5 ma., the ion source limited this equipment to 0.8 ma. for continuous operation, regardless of voltage.

At 0.8 ma. the ripple was about 1%, at 5 ma., about 5%.

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D+Li fusion neutron initiator: C.H.F. Müller (Hamburg) and other suppliers

Betatron ($e^- \rightarrow \gamma \rightarrow n$) initiator: Siemens-Reiniger (Erlangen) and other suppliers

C. H. F. Muller A.-G., working in cooperation with, and under the direction of, the M. V. Research Association (M. V. Forschungs-Vereign), at Wrist, completed the construction of a 15 megavolt betatron about the first of this year. This betatron operates on 50 cycles. The average current of the high voltage electron beam is approximately .03 microamperes. The output of gamma radiation was reported to be approximately equivalent to one kilogram of radium. This betatron is now installed at Wrist.

In December, 1944, the M. V. Research Association completed the calculations and layouts of a 200 megavolt betatron, to operate on 50 cycles. It was estimated that the average electron beam current of this betatron would be in the order of one milliampere. The total weight was expected to be approximately 30 tons. This betatron was to be constructed by Brown Boveri and Cie A.-G. in Heidelberg. It is understood that Brown Boveri completed detailed construction drawings of this betatron about the first of March of this year.

Dr. W. Müller, of C. H. F. Müller, recently constructed a very small 2 megavolt betatron which weighed less than 100 pounds. This betatron operated on 50 cycles and had a sealed off tube but the output was only sufficient to increase a Geiger counter to about three times its normal rate.

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Uranium-235 fission pit: **SS-controlled enrichment sites (discussed earlier)**

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BIOS 1615

(A) Plating on Aluminium and its Alloys

Although aluminium is widely used in Germany, no actual samples of nickel plus chromium plated aluminium were seen. Samples of lead plated battery lugs were encountered at Robert Bosch, Stuttgart and direct chromium plated aluminium at Blasberg's, Solingen. Numerous references are made to the plating of aluminium and its alloys, however, and the most popular treatment for plating on this metal appears to be a primary application of a zincate dip followed by either a copper or brass deposit and then final plating.

(B) Testing of Plated Coatings, etc.

The testing of the plated coating for thickness, porosity, corrosion resistance etc., was apparently seldom done and the platers seemed to be little concerned about these points. Testing of solutions was equally haphazard. pH was rarely controlled except by litmus and pH papers; comparators were

B. CADMIUM

I. Firm: KAMPSCHULTE.

Solution:	47.5 g/litre	Cadmium Cyanide
	42.5 g/litre	Sodium Cyanide
	5.0 g/litre	Sodium Chloride
	5.0 g/litre	Turkey Red Oil

Operating Conditions

Temperature:	25 - 30°C.
Current Density:	10 amps/dm²
Voltage:	Not given

II. Firm: BLASBERG.

Solution:	50 - 120 g/litre	Sodium Cadmium Cyanide
	20 - 60 g/litre	Sodium Cyanide
	10 - 30 g/litre	Sodium Hydroxide

Nickel Salts as bright addition agents.

Operating Conditions

Temperature:	20 - 35°C.
Current Density:	0.5 - 1.2 amps/dm²
Voltage:	Not given
Time:	10 - 60 minutes
pH:	12 - 13.5

8. Some Manufacturers of Suitable Bomb Components

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CIOS XXVIII-31

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Operating Conditions

Temperature:	25 - 30°C.
Current Density:	10 amps/dm²
Voltage:	Not given

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Solution:	50 - 120 g/litre	Sodium Cadmium Cyanide
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	10 - 30 g/litre	Sodium Hydroxide

Nickel Salts as bright addition agents.

Operating Conditions

Temperature:	20 - 35°C.
Current Density:	0.5 - 1.2 amps/dm²
Voltage:	Not given
Time:	10 - 60 minutes
pH:	12 - 13.5

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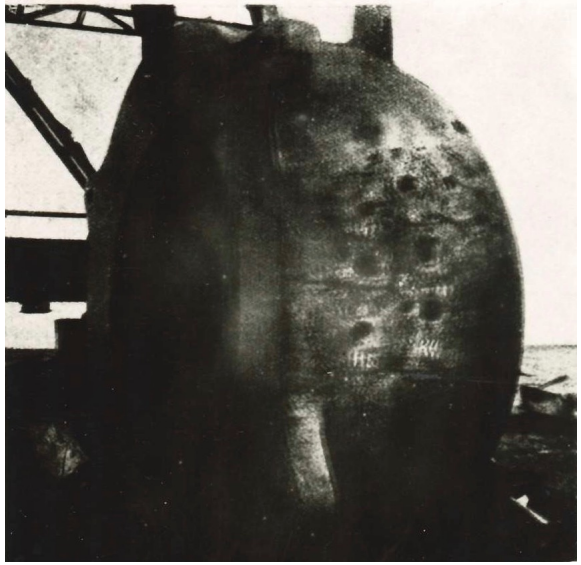

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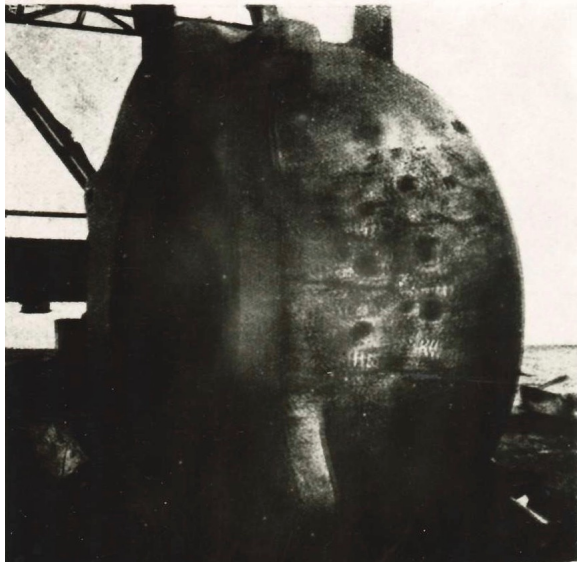

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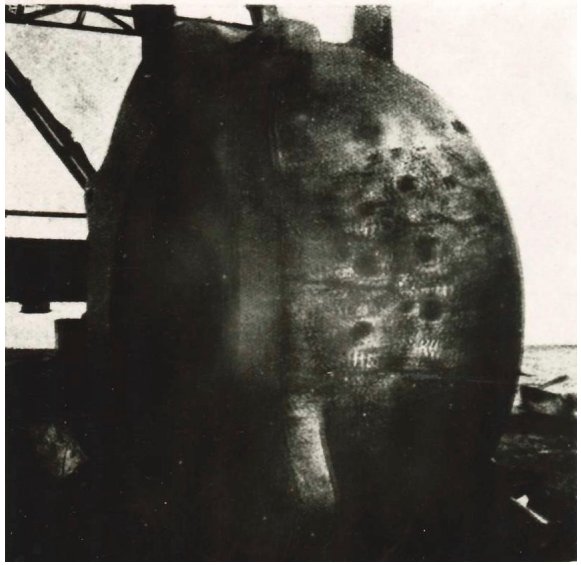

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9. Over 30 Sources: LiD H-Bomb with Fission Primary, Radiation Implosion, Total Mass 6000 kg, ~1.6 Megaton Yield, Expected Test 1945-46

Werner Grothmann, 2002: "The hydrogen bomb. That was also worked on… Himmler once mentioned in a small circle that the first prototype of this could come at the earliest between June and October 1946… It must have looked like a swollen bomb… By the way, what the physicists told Himmler in their private lecture on the hydrogen bomb had really electrified him, because he heard that the explosive effect would be a hundred times greater than that of the uranium bomb."

Wolfgang Ferrant, 1945: "Our purpose was to produce, within an extensive reaction area which contains a very large number of atoms capable of reacting, a temperature or an almost entirely uncoordinated heat motion, such as prevails on the stars. At the same time, the density of the reacting material should be as great as possible. Under these circumstances atomic reactions will occur... Lithium D hydride is well suited as the choice of substance… Our method, therefore, results directly in the creation of a source of neutrons of greatest intensity… If the purpose is to obtain energy alone, the neutrons formed will be utilized in splitting the uranium atom; and in that manner extraordinary amounts of energy will be liberated, as a first product, by way of the neutrons. The lithium-D-hydride, recipient, therefore, will be surrounded by a coat of uranium. Quite possibly a special advantage could be obtained by adding a quantity of uranium D compound to the ``large particles" and to the recipient mass; because in this manner a considerable amount of energy will be given off by uranium fragments located within the reaction area, and this state of affairs might possibly result in further increases of temperature within the reaction area. ... There will result an explosion of the entire LiD mass, since the external reaction zone is capable of enlarging itself on the strength of its own energy production."

Hans Thirring, 1946: "In a 'super atom bomb' it would be possible to use on the order of tons of lithium hydride compared to kilograms of plutonium [for fission], in such a way as to produce an effect several thousand times as large as before. God have mercy on the country over which a six-ton bomb of lithium hydride is made to explode! If the idea is realizable at all, the former uranium bomb or plutonium bomb would only play the role of a sparkplug in such a super atom bomb."

Heiko Petermann, discussion notes with Alfred Klemm, 5 March 2004: "Main focus of the work was the production of Li6 by separation of Li7. This was achieved very well in the electrolytic process. From 1942--43. Klemm pointed out that he was probably the first to achieve the separation by means of electrolysis… He also confirmed that the tritium problem (disintegration of Li6 into tritium) was already discussed before 1945."

Immigration of Austrian Scientists to Soviet Zone, ca. 1949: "SCHINTLMEISTER, Dr Josef Peter… During war, succeeded in isolating Transuranen to Transuranen 104… In September 1948 he reportedly contacted JOLIOT CURIE on problem of extracting plutonium. Censorship intercept indicates subject is currently interested in lithium hydride bombs, originally begun with STETTER."

U.S. Army CIC, 29 September 1953: "Karl Lintner… was Dr. Georg STETTER's assistant in the Second Physical Institute during World War II, when STETTER was working on the splitting of the lithium nucleus... All of STETTER's research material and notes fell into the hands of the Soviets in 1945..."

Assistant Chief of Staff, US Army G-2, 6 April 1954: "During the war, the nuclear physicists of the Second Institute of Physics in Vienna engaged in a research project of releasing high amounts of energy through nuclear reactions of the lithium hydride crystal *Li H*. The research was carried out mainly by Dr. Karl LINTNER under the supervision of Prof. Dr. Georg K. F. STETTER."

Air Intelligence Report, 15 June 1946: "Heavy Hydrogen Bomb. In Germany a letter was picked up by the American censors. It had been written by a German desirous of exchanging information for an opportunity to go to the United States. The writer professed knowledge of 'heavy water' research in Germany and of an 'even more deadly weapon than the atomic bomb'."

For complete quotes and sources, please see *Forgotten Creators* D.9 and D.14.

9. Over 30 Sources: LiD H-Bomb with Fission Primary, Radiation Implosion, Total Mass 6000 kg, ~1.6 Megaton Yield, Expected Test 1945-46

Edmund Tilley, 13 July 1946: "KÄSTNER told Lt. GUTMANN of a new radio-active bomb, weighing six tons. This bomb has no fins and is lowered by parachute… In July 1944 a small group of the Forschungsstaffel was sent to Northern Finland [to map a test site]…"

Eugen Sänger and Irene Bredt, 1944: "As an example of area attack with single propulsion and full turn, we use the attack on New York at a range of 6500 km. For c=4000 m/sec, the bomb load is 6 tons, and the detailed attack runs as follows…"

New York Times, 4 December 1946: "Wernher von Braun… revealed today that before the war ended the Nazis were building a 100-ton rocket to strike at the United States… He said it would have carried a 'pay-load' of six tons and would have traveled thousands of miles to strike the United States."

Hermann Zumpe, 7 November, 1946: "…the maximum weight allowable for the motor, fuels, and shell was 20 tons, leaving 6 tons for the warhead."

Allen Dulles, 14 March 1944: "Length 15 to 17 meters, weight of explosive 4 to 6 tons. Rocket consists of over 1000 parts…"

Gordon Gaskill, March 1945: "The leading V-2 authority for the United States Strategic Air Forces in Europe [Donald Putt]… has calculated for me approximately what kind of rocket might hit New York. Leaving Germany, it would weigh 63 tons, mostly fuel. Its war head would be 7 tons of high explosive."

Charles Chamberlain, 9 February 1946: "Another atom scientist in the British occupation zone of Germany---Prof. Paul Harteck of the Kaiser Wilhelm institute of physics in Berlin---said that the light rays thrown out during the enormous explosion of an atomic bomb added greatly to the destructive force… This frees an amount of light which is beyond the visible spectrum. Only a few people know that the reflection of beams of light on solid bodies also exerts a mechanical pressure. This pressure is so small where our normal light is concerned that it is not noticed. The amount of light freed by an atomic bomb is so great it destroys walls."

Rodolfo Graziani, 1948: "Everybody can say what they want about the matter of secret weapons; but the fact is that secret weapons in Germany were there: they were there in the most absolute way… There was the V-1 and there was the V-2, but it went all the way up to the V-10 which destroyed within a ten-kilometer radius every element of life."

Pittsburgh Press, 7 August 1945: "21ST ARMY GROUP HEADQUARTERS, Germany, Aug. 7 (UP)… The bomb, it was calculated, would wipe out everything within a radius of six miles. A famous German research scientist [Wilhelm Groth, in] charge of the experiments was flown immediately to Britain at the time. He estimated his work would have been completed by October [1945]."

Daily Mail, 30 October 1944: "Immense concrete works on top of a hill in Artois, near Saint Omer, were intended as a launching place for flying bombs, which, the Germans boasted, would wreck New York… German engineers told local French people that when the vast machinery was installed and ready to fire, the district would have to be evacuated for six miles around."

Goffredo Coppola, 16 February 1945: "The Germans have found the means to disintegrate the atom… The disintegration occurs in successive cycles and covers vast areas of tens of kilometers. In the laboratories work is at full capacity."

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What Design Did the 6-Ton German H-Bomb Use?

Was it a sloika design?

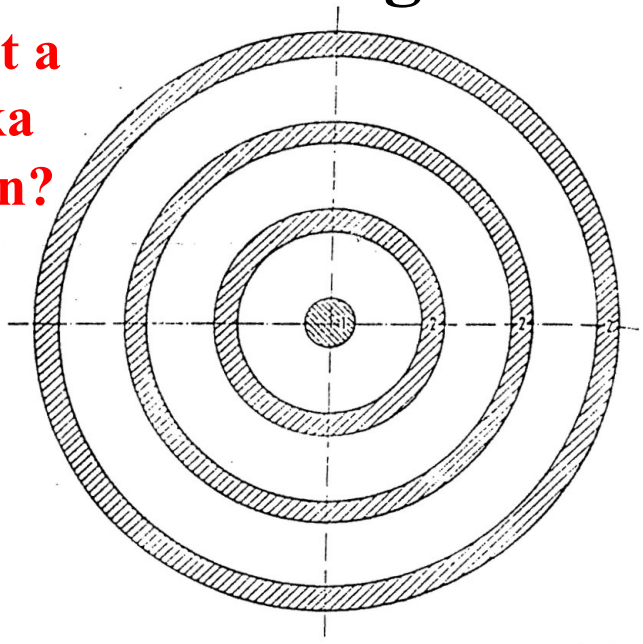


Abb. 3: Eine der Abb. 2 entsprechende schematische Anordnung mit einer Folge von ineinandergefügten Sprengstoffschalen (2) zur Verstärkung des Effektes; (1) bedeutet wieder den Fusionsreaktionsraum

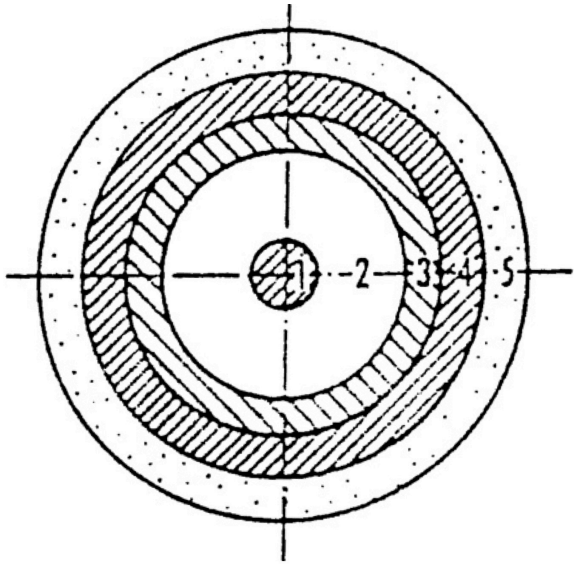
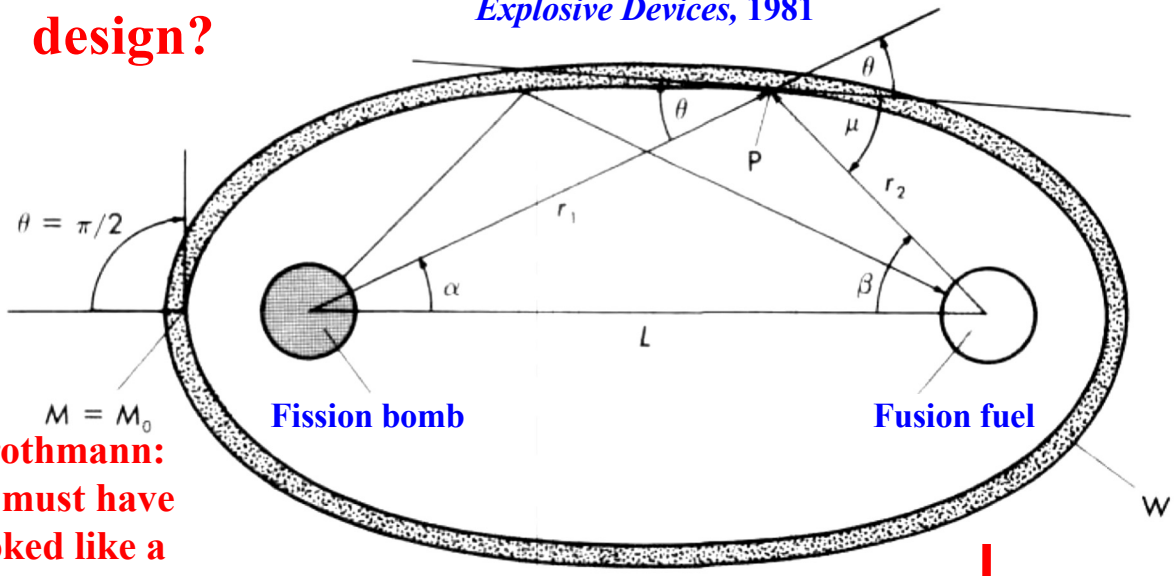


Abb. 5: Kugelschalenanordnung von Kernspaltstoff (3) und gewöhnlichem Sprengstoff (4), die in einer Verdämmung (5) eingeschlossen sind. Im Hohlraum (2) der Schichtfolge befindet sich gasförmiges Deuterium bzw. ein Deuterium-Tritium-Gemisch. Das Reaktionsvolumen der Stoßwelle ist wieder (1). Die Schale (3) ist so dimensioniert, daß der Kernspaltstoff erst dann eine kritische Anordnung darstellt, wenn durch Detonation der Schale (4) eine Stoßwelle die Hohlkugel in der Nähe des Konvergenzzentrums zu einem kompakten Gebilde zusammenschiebt

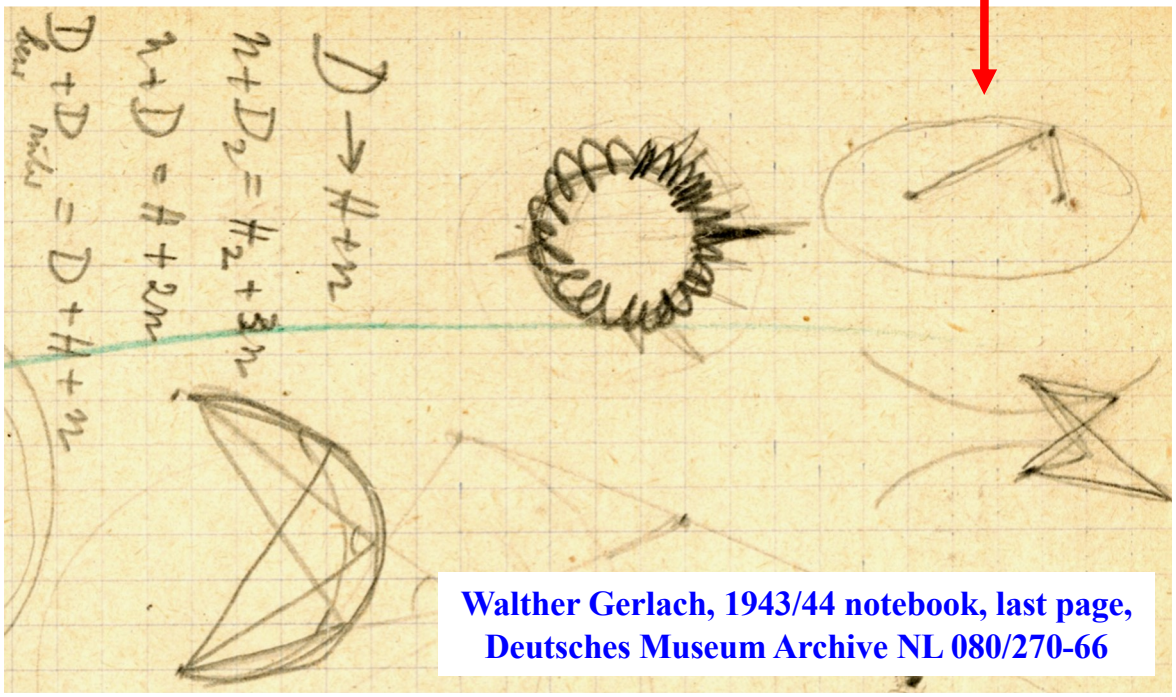
Kurt Diebner, 1962, *Kerntechnik* 4:3:89–93

Was it a two-stage design?

Kurt Diebner's student Friedwardt Winterberg, *The Physical Principles of Thermonuclear Explosive Devices*, 1981



Grothmann: "It must have looked like a swollen bomb."



Walther Gerlach, 1943/44 notebook, last page, Deutsches Museum Archive NL 080/270-66

10. Reported October 1944 Test Explosion on Baltic Coast

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A.P.W.I.U. (Ninth Air Force) 96/1945. 19 August 1945. Investigations, Research, Developments, and Practical Use of the German Atomic Bomb. NARA RG 38, Entry 98C, Box 9, Folder TSC # 2601--2700. Upgraded from Secret to Top Secret in October 1945.
47. A man named ZINSSER, a Flak rocket expert, mentioned what he noticed one day: In the beginning of Oct. 1944 I flew from Ludwigslust (south of Lübeck), about 12 to 15 km from an atomic bomb test station, when I noticed a strong, bright illumination of the whole atmosphere, lasting about 2 seconds. 48. The clearly visible pressure wave escaped the approaching and following cloud formed by the explosion. This wave had a diameter of about 1 km when it became visible and the color of the cloud changed frequently. It became dotted after a short period of darkness with all sorts of light spots, which were, in contrast to normal explosions, of a pale blue color. 49. After about 10 seconds the sharp outlines of the explosion cloud disappeared, then the cloud began to take on a lighter color against the sky covered with a gray overcast. The diameter of the still visible pressure wave was at least 9000 meters while remaining visible for at least 15 seconds. 50. Personal observations of the colors of the explosion cloud found an almost blue-violet shade. During this manifestation reddish-colored rims were to be seen, changing to a dirty-like shade in very rapid succession. 51. The combustion was lightly felt from my observation plane in the form of pulling and pushing. The appearance of atmospheric disturbance lasted about 10 seconds without noticeable climax. 52. About one hour later I started with an He 111 from the A/D [aerodrome] at Ludwigslust and flew in an easterly direction. Shortly after the start I passed through the almost complete overcast (between 3000 and 4000 meter altitude). A cloud shaped like a mushroom with turbulent, billowing sections (at about 7000 meter altitude) stood, without any seeming connections, over the spot where the explosion took place. Strong electrical disturbances and the impossibility to continue radio communication as by lightning, turned up. 53. Because of the P-38s operating in the area Wittenberg-Merseburg I had to turn to the north but observed a better visibility at the bottom of the cloud where the explosion occurred.

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The Germans are at present working on an extremely secret explosive. Informant knows very little about it and states that it has something to do with "Heavy Water" (Schweres Wasser). Experiments are conducted on an estate in Pomerania and it is alleged that this explosive is capable of destroying everything in a radius of several kilometers.

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I left Berlin on the night of the 11th [October 1944] by car; two officers accompanied me… Rügen was an experimental center where the new German weapons were tested. Special units of assault troops protected the island and restricted access. To travel to [part of] Rügen required a safe-conduct pass signed by the Wehrmacht's chief of staff. We immediately went to an area thick with trees where we found other officers and some technicians. Concrete shelters and small brick buildings had been built in the woods. We entered an armored, half-buried turret through a small metal door that was closed with every precaution. Inside there were four of us: the two officers who had accompanied me, another man dressed in a suit, and me. I waited for noon with my heart in my throat. At noon, according to what the man in the suit had said, there would be the test of the "disintegration bomb." The bomb was to explode on the ground, about two kilometers from our armored observatory… They warned that the test had been brought forward to 11:45 a.m…. I barely had time to consult the clock when I heard a tremendous roar. The floor rocked under my feet, and for an instant it seemed to me as if the walls of the shelter were falling in. In front I could see nothing but smoke, a whitish, woolly smoke that bubbled up like slime spewed from a sewer. More bursts were heard followed by blinding flashes. The sky, bleak and closed, was ripped apart by the whitest flashes of lightning. I ran a hand over my face; I was sweating. No one opened their mouth. The roar just then was followed by a chilling silence. It was the man in the suit who spoke first. He was a colonel in the "Heereswaffenamt," the body in charge of developing weapons. "What we witness today--he said--is of paramount importance. When we can drop our bomb on invading troops or on an enemy city, the Anglo-Americans will be forced to decide whether it is worth continuing the war or ending it reasonably. We have been working for years. We have finally achieved our objective." … We left the bunker around 5:00 p.m., after some men dressed in monstrous suits had arrived; on their heads they wore a helmet like that of a diving suit, only it was floppy and had no screws. We, too, wore a strange smock of rough, off-white cloth and pants of the same fabric. We walked ahead of the soldiers. As we advanced, the land appeared to have been shocked, plowed, torn apart by fearful chasms. It was cold and yet everything was scorched as if a blast of fire had passed over the island. The trees no longer had foliage or branches; they were reduced to burnt trunks. My foot bumped into something; I bent down and saw a charred goat. You could tell it was a goat because tufts of hair could be seen on the streaked flesh; its head was crushed, as if it had been pounded with a hammer. The little stone buildings were piles of rubble… At the end of October I saw Goebbels... I learned that there were two types of rockets, the "A-4" and the "A-9,"… equipped with atomic warheads, with a fantastic range.

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The Germans have completed a weapon which is founded on the principle of the disintegration of matter (Atomzertruemmerung). Experiments have been performed which have proved conclusive. The effect of this weapon is like that of a thunderbolt, naturally much magnified. The radius of action is supposed to be about three kilometers.

Summary of 5 October 2004 interview with Elisabeth Mestlin. Rainer Karlsch and Heiko Petermann 2007. *Für und Wider "Hitlers Bombe".* Münster: Waxmann. p. 163.
She remembered the extraordinary event because of credible circumstances. After the bombardment of Stralsund on 6 October 1944, Ms. Mestlin went to see her children in Vitte on the island of Hiddensee. On the island of Hiddensee on 12 October 1944, she heard a violent explosion and saw a large cloud of dust on the southern tip of the Bug peninsula.

Werner Grothmann. 2002 interview. Jonastalverein Archive, Arnstadt. pp. 13, 31.
When, in October 1944, it was clear that the theory of the atomic bomb was in principle correct, various circles had, of course, also been thinking about what should be done to end the war as quickly as possible… It is known to me that there were four atomic tests. The first still in 1943 in the autumn in the North Sea, which failed. Then two in 1944 in the autumn and the late autumn. One of them on the ground, that is on a small stand, the later one in the atmosphere on a parachute... Where the tests were I would like to not say now, because otherwise the population would be unnecessarily upset.

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Heavy water experiments are being carried out at the Dräger Werke, Lübeck, which is reported to be the largest gas factory in Germany.

Headquarters, U.S. Strategic Air Forces in Europe. 19 Jan. 1945. AFHRA A5729 p. 255 ff.
In the following paragraphs are listed the actual or potential weapons which the Germans may use against USSTAF operations in 1945… No consideration is given to those for which there is lacking evidence of possible use for some time to come… ATOMIC BOMB: Close check of every report, and close surveillance of the area in which tests are alleged to have taken place lead to the conclusion that such bombs are not a likelihood in 1945.

[For more information see Forgotten Creators D.10.]

11. Reported ~November 1944 Test Explosion in Poland

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Robert Jackson to Albert Speer. 21 June 1946. avalon.law.yale.edu/imt/06-21-46.asp

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Kriminalrat Obersturmfuehrer Göring… said that a village had been built near Auschwitz for experimental purposes. They wanted to "try out" the new weapon. For the purpose, twenty thousand Jewish men, women, and children had been brought to live in this village. A single shell had been fired on the settlement. It had caused six thousand degrees of heat, and the whole village--houses, human beings, and animals included--was burnt to ashes. Obviously, as I see it now in retrospect, the Germans had nearly completed their atomic bomb and were almost ready to use it on the enemy when the encirclement of Berlin was complete.

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[Himmler] went on to talk about a quite different missile, one of incredible power. Cities like New York and London, he said, could be wiped off the face of the earth with the help of this new weapon… What he had told me was basically true, for work was already being done on the German atom bomb at the time. Franz Göring also told me that the new missiles had been tested. According to him, a large town was especially built near Auschwitz concentration camp and some 20,000 Jews, mostly women and children, were sent to live in it. A single missile was then fired into the settlement. In the ensuing explosion, which developed a heat output of 6,000° C at its center, the whole town and the entire population were burned to cinders in a flash.

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DI 092.-76 FIAT. Periodic Intelligence Report 1. 2 August 1946. TNA FO 1031/59.
Completely unreliable source described the following: ARDENNE made experiments with an atom gun (Atomkanone). About Christmas 1944, successful experiments were conducted in Pomerania with V-1 and atomic warheads, radio directed. The ensuing crater was 2 km in diameter. Because the time for developments was too short nothing more came of it. Source has heard this from a man who participated in experiments but inconsiderately died in winter of 1945. It has not been possible to verify this statement from any other source although rumours to this effect, although with different names, have been persistent.

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Edmund Tilley. 19 Aug. 1947. NARA RG 319, Entry A1-134A, Box 29, Operation Oberjoch
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From the bare records available, 300,000 concentration camp workers passed through I.G. Auschwitz of whom at least 25,000 were worked to death. The plants when completed were so enormous that they used more electricity than the entire city of Berlin… Despite the investment of almost 900 million Reichsmarks and thousands of lives, only a modest stream of fuel and not a single pound of Buna rubber was ever produced.

Edmund Tilley. 19 Aug. 1947. NARA RG 319, Entry A1-134A, Box 29, Operation Oberjoch
Prof. Dr. NIELS [Walter Nielsch?], now said to be in the United States, was, according to [censored,] concerned with chemical and atomic problems at TUCHELER HEIDE and produced a number of atomic bombs, weighing from 1 to 5 kilograms. NIELS should be traced and questioned in detail.

Top Secret Cable from Warsaw to Secretary of State. 7 March 1946. NARA RG 77, Entry UD-22A, Box 160, Folder 205.2 Cables Incoming, Top Secret.
Information has been given this Embassy by a capable young engineer working in the zinc industry, that one of the best if not the only material for atomic bomb containers is cadmium. According to the informant the cadmium output of Poland in 1945 amounted to 49.15 tons, and in January of 1946 to 10.9 tons. In 1945 there was exported to Russia the total Polish cadmium output. End ACTION: General Groves

11. Reported ~November 1944 Test Explosion in Poland

Robert Jackson to Albert Speer. 21 June 1946. avalon.law.yale.edu/imt/06-21-46.asp
And certain experiments were also conducted and certain researches conducted in atomic energy, were they not?... Now, I have certain information, which was placed in my hands, of an experiment which was carried out near Auschwitz and I would like to ask you if you heard about it or knew about it. The purpose of the experiment was to find a quick and complete way of destroying people without the delay and trouble of shooting and gassing and burning, as it had been carried out, and this is the experiment, as I am advised. A village, a small village was provisionally erected, with temporary structures, and in it approximately 20,000 Jews were put. By means of this newly invented weapon of destruction, these 20,000 people were eradicated almost instantaneously, and in such a way that there was no trace left of them; that it developed, the explosive developed, temperatures of from 400[0] to 500[0] centigrade and destroyed them without leaving any trace at all. Do you know about that experiment?

Felix Kersten. 1947. *Memoirs of Doctor Felix Kersten*. Doubleday. pp. 256-258.
Kriminalrat Obersturmfuehrer Göring… said that a village had been built near Auschwitz for experimental purposes. They wanted to "try out" the new weapon. For the purpose, twenty thousand Jewish men, women, and children had been brought to live in this village. A single shell had been fired on the settlement. It had caused six thousand degrees of heat, and the whole village--houses, human beings, and animals included--was burnt to ashes. Obviously, as I see it now in retrospect, the Germans had nearly completed their atomic bomb and were almost ready to use it on the enemy when the encirclement of Berlin was complete.

Wilhelm Wulff. 1973. *Zodiac and Swastika*. Coward McCann & Geoghegan. pp. 160-161.
[Himmler] went on to talk about a quite different missile, one of incredible power. Cities like New York and London, he said, could be wiped off the face of the earth with the help of this new weapon… What he had told me was basically true, for work was already being done on the German atom bomb at the time. Franz Göring also told me that the new missiles had been tested. According to him, a large town was especially built near Auschwitz concentration camp and some 20,000 Jews, mostly women and children, were sent to live in it. A single missile was then fired into the settlement. In the ensuing explosion, which developed a heat output of 6,000° C at its center, the whole town and the entire population were burned to cinders in a flash.

Werner Grothmann. 2002 interview. Jonastalverein Archive, Arnstadt. p. 31.
Well, it is so: It is known to me that there were four atomic tests. The first still in 1943 in the autumn in the North Sea, which failed. Then two in 1944 in the autumn and the late autumn. One of them on the ground, that is on a small stand, the later one in the atmosphere on a parachute. That one in winter 1944 in the air was highly explosive and the charge [fuel] was also larger. That could have been in November. The last test was then again with a small charge in March 1945. Where the tests were I would like to not say now, because otherwise the population would be unnecessarily upset.

DI 092.-76 FIAT. Periodic Intelligence Report 1. 2 August 1946. TNA FO 1031/59.
Completely unreliable source described the following: ARDENNE made experiments with an atom gun (Atomkanone). About Christmas 1944, successful experiments were conducted in Pomerania with V-1 and atomic warheads, radio directed. The ensuing crater was 2 km in diameter. Because the time for developments was too short nothing more came of it. Source has heard this from a man who participated in experiments but inconsiderately died in winter of 1945. It has not been possible to verify this statement from any other source although rumours to this effect, although with different names, have been persistent.

Gezo Mansfeldt to Hans Münch. 5 December 1946. US Holocaust Memorial Museum, RG-15.169M (1998.A.0247) microfilm reel 8.
The next day was uneventful, and on 27 January [1945], 4:00 in the afternoon the first Russian vanguard marched through the Auschwitz camp. Thus we approximately 3,000 men—physicians, nurses, and patients—were free… I was the only living witness who knew about the Hygiene Institute information and so I was at least 2–3 times weekly interviewed and had to drive to Raisko several times, but now in the fine car, and show everything there. The various scientific commissions were difficult to convince that poison gas and the like was not produced there, and what was actually suspected was clear to me only much later, when I learned of the atomic bomb tests.

U.S. Embassy Warsaw. 12 Aug. 1947. MIS-390731. Subject: Plants producing heavy water. NARA RG 319, Entry 85A, Box 2534, Folder 390731–390740.
It is believed that no plants designed specially for the production of heavy water exist in Poland [in 1947]. It is reliably reported that the Germans built one such plant near OSWIECIM (Auschwitz) but that it was destroyed or moved out by the SOVIETS in 1945.

PW Intelligence Bulletin No. 2/25. 9 January 1945. AFHRA A5186, frames 0023-0027.
Location. The factory, commonly known as Bunawerke MONOWITZ, houses the two firms BUNA and IG FARBEN. Completely underground, it can nevertheless be located easily by six large wooden barracks, used as quarters for foremen and head mechanics, and situated atop a hill. Personnel. Employed in the factory are appr 30,000 workers, all political prisoners whose work is supervised by SS guards. The workers--Poles, Russians, Czechs, and Jews--march to and from the factory from the nearby concentration camp at AUSCHWITZ, where a total of 680,000 prisoners are detained.

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R. W. Shaw to L. E. Seeman. 5 December 1946. NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2 Germany: Summary Reports (1945-1946).
[Otto] Hahn said that a rumour which went the rounds in Germany about six months before the capitulation was equally untrue. According to this rumour, atom bomb tests had been carried out in Poland during the last year of the war which were supposed to have had an effect similar to the first atom bomb dropped on Hiroshima though on a considerably smaller scale.

[For more information see Forgotten Creators D.11.]

12. Reported March 1945 Test Explosions in Thuringia

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Our trustworthy source in Germany reports: "The Germans are preparing to conduct tests of a new secret weapon, which has a large destructive power. The test explosion of a bomb of unusual construction is being prepared under highest secrecy in Thuringia. For the preparations of the tests the local residents are supposed to be transported away by an SS detail; the whole operation is reported to be undertaken in strictest secrecy. The explosions are supposed to take place in a wooded area. For that, special roads to the presumptive test site are being created. The bomb to be tested has a diameter of one and a half meters. It consists of several hollow spheres that nest inside each other. It will be brought to the explosion place with a transporter specially constructed for it. It is still unclear when the test is supposed to take place, but the preparations are going at the maximum fastest pace. CONCLUSION. In the last months our source has reported more and more often about the feverish efforts of the Germans to test ever more powerful weapons and their means of delivery. Probably these experiments lead directly to an attempt of the Germans to actually carry out tests of atom bombs, about whose existence we have only incomplete, scanty information."

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Today or tomorrow we are going to fly in the direction that you know. I am taking with me Dubovsky's [Geiger] instrument, but its sensitivity is probably too low. If we determine on site that there are objects of interest for examination and sensitivity of the instrument is the issue, I'll send you a cable. You will have to assign Stoljarenko or Davidenko (if he gets back by then) to this work. Instruct them to assemble the instrument in the lightweight option: powered from the mains by 220 volts... Along with the instrument, let them pack the tables for finding the appropriate half lives...

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Possibly, you can send somebody from the staff to help me. I think that as a result of such search we will be able to find what we need--a person who happened to be there nearby, as there were a lot of escapees wandering through forests at the time. If successful, we will get objective confirmation of the fact, tantamount to as if we personally had been at that site. This must be done right here and right now, because afterwards all people crossing the border are dispersed through camps in Germany and then are transferred to the Soviet Union, and then even such an enthusiast as myself would question our ability to catch the right people… The second direction is connected to what I wrote you in the previous letter. In order to determine finally what was really tested there, we shall of course look after artificial, not natural radioactivity. Unfortunately, a lot of time has passed since, but I think that with [our instruments] we will be able to attain the required sensitivity.

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Werner Grothmann. 2002 interview. Jonastalverein Archive, Arnstadt.
[p. 31:] It is known to me that there were four atomic tests... The last test was then again with a small charge [fuel] in March 1945. [p. 17:] But I would like to say something about the background, why Himmler did not come to Thuringia for the atomic bomb test on the fourth of March. [p. 40:] This test was to provide proof that the ignition system worked stably and to serve as preparation for a corresponding attack that was supposed to be flown with a rocket… You see, that went so far that the stand for our atom test in Thuringia was manufactured by a metalworking shop in Thuringia. I know it because when meeting there, Diebner explained, in response to someone's question about whether our people had built it, it was from a metalworking shop from the area. They would not have known what it was meant for. The test was carried out directly there, even though that was in an inhabited area, because due to the course of the war we did not have a lot of choice and, of course, because time was also critical. So we just stayed where the necessary material was produced and stored. In addition, our people and those of Diebner's other group had their laboratories and the development department. And here close by, too, the mass production of uranium bombs had been planned. In addition, at the beginning of January, the ignition [system] production or at least the development of an ignition system intended for the uranium bomb was likewise supposed to be relocated here, according to my memory... Diebner allegedly assured that the explosive effect would be quite small for the small amount [of fuel] that the test would require. Unfortunately his prediction was not confirmed. What happened there was horrible. In addition, there were other consequences in the surrounding area, of which I only heard, that doctors, who were under contract with us, had to be deployed there. [p. 13:] After the third attempt, which was the one from March in Thuringia, Hitler was informed… It was like this: when the test in Thuringia succeeded, according to my understanding, workers from a camp died accidentally.

[For more information see Forgotten Creators D.12.]

12 August 1944

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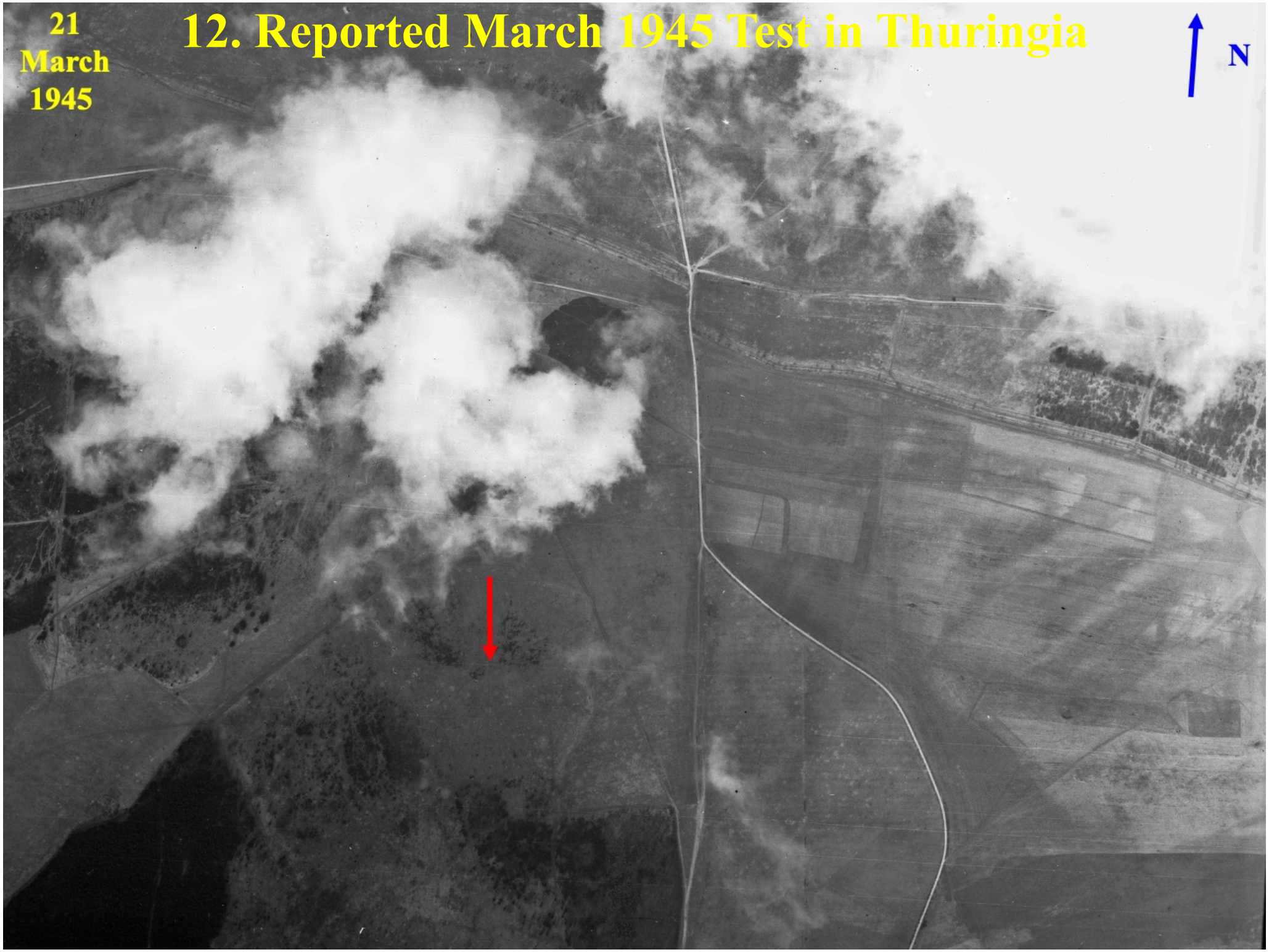
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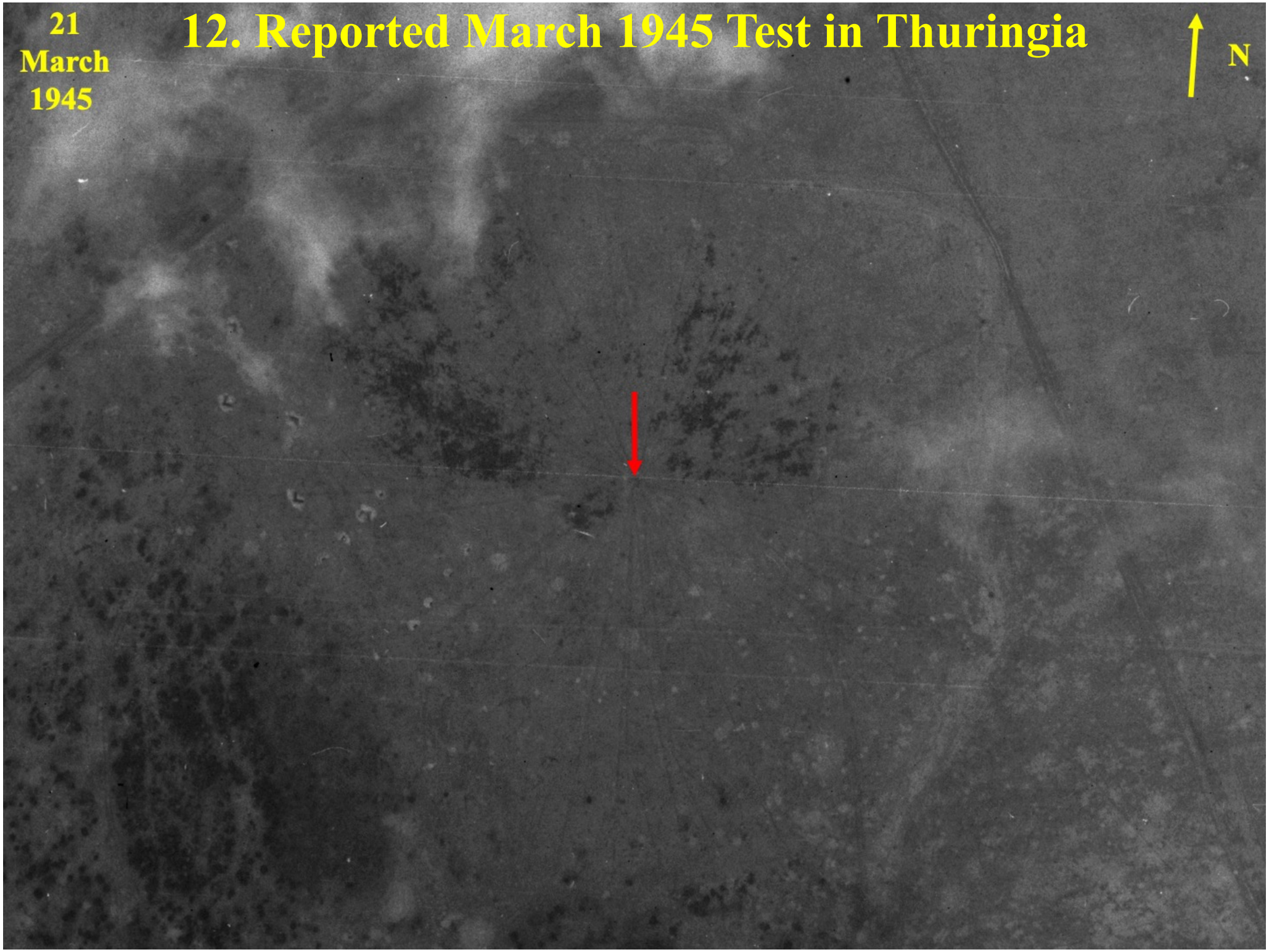
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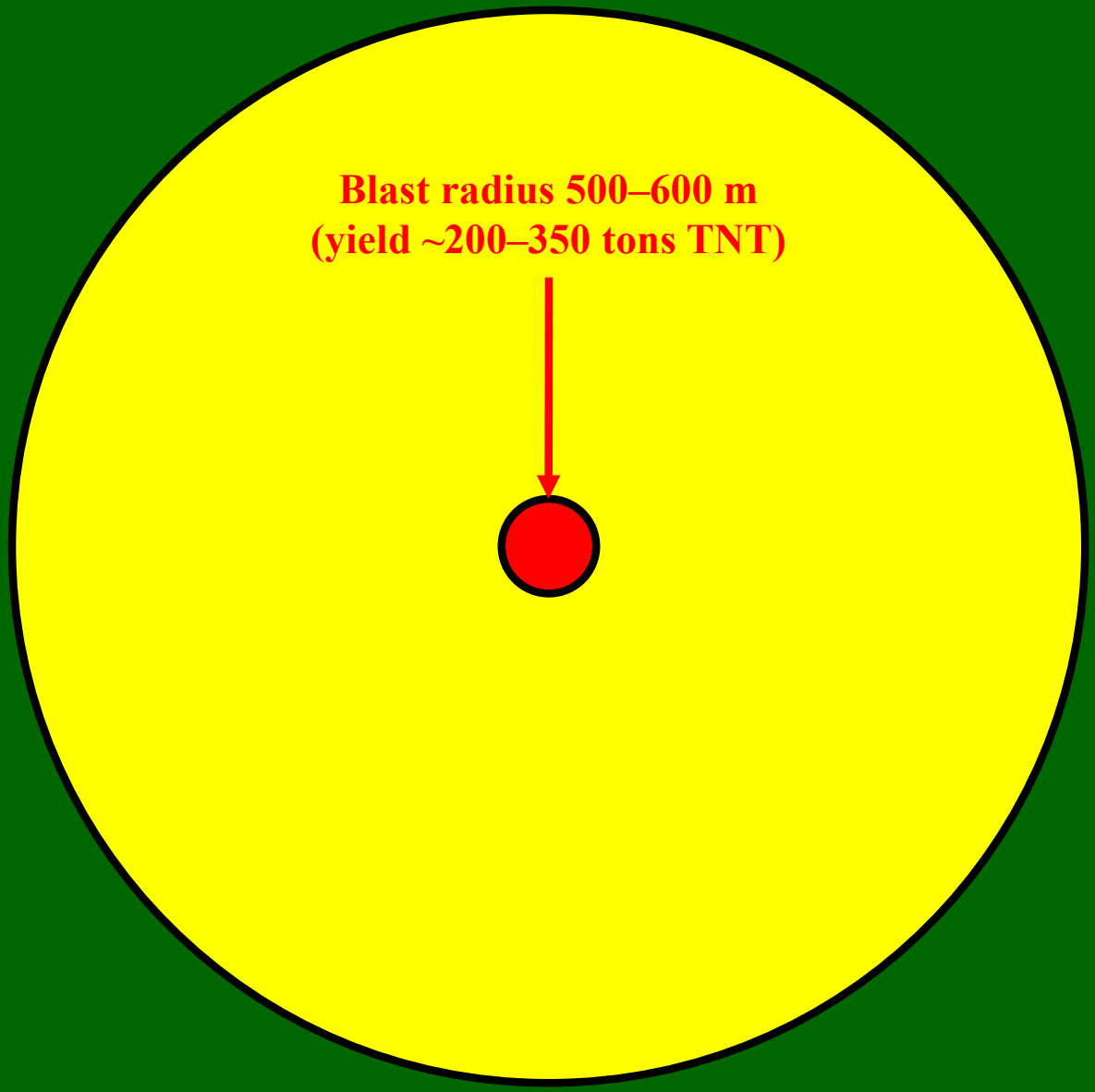

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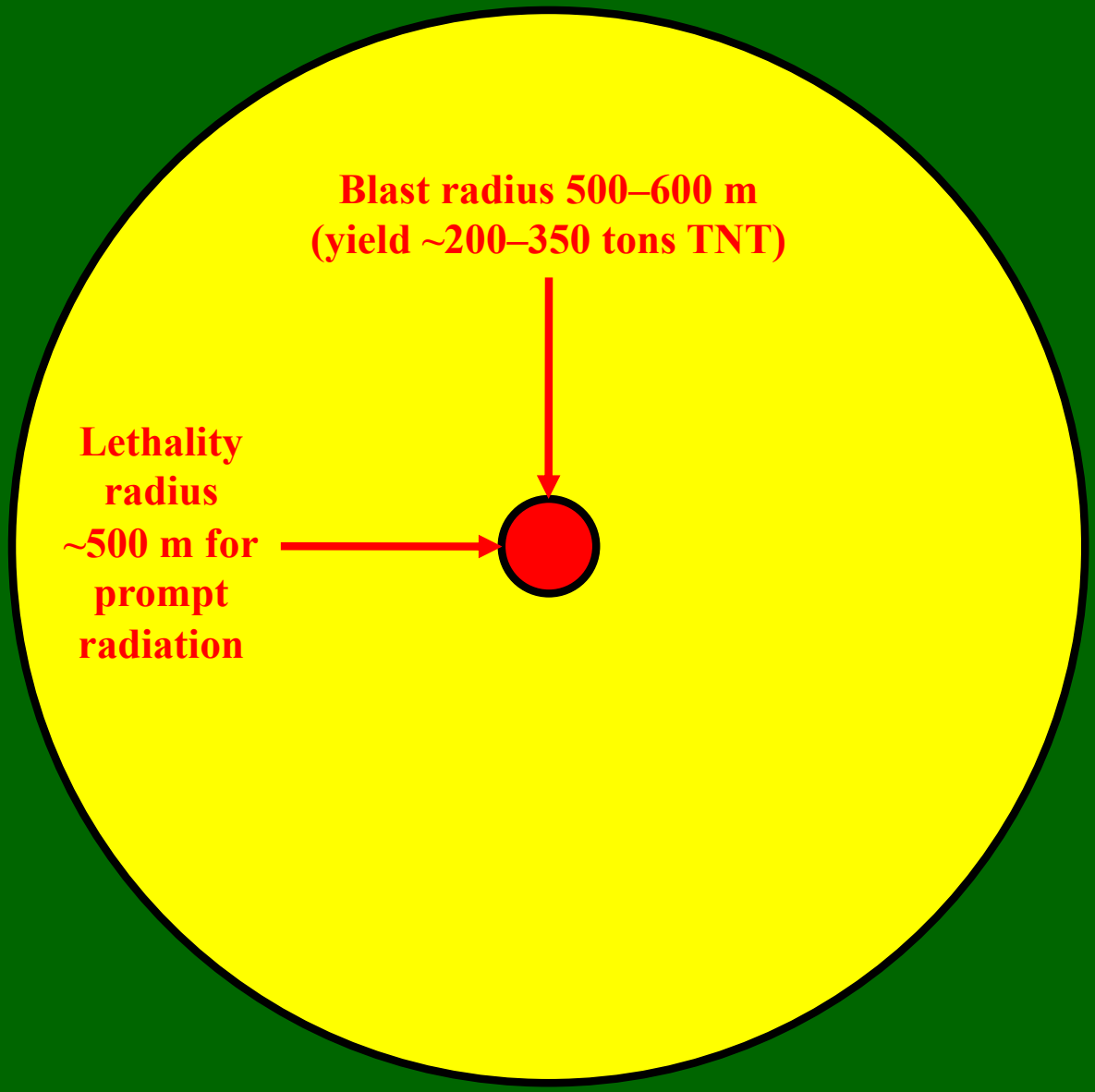

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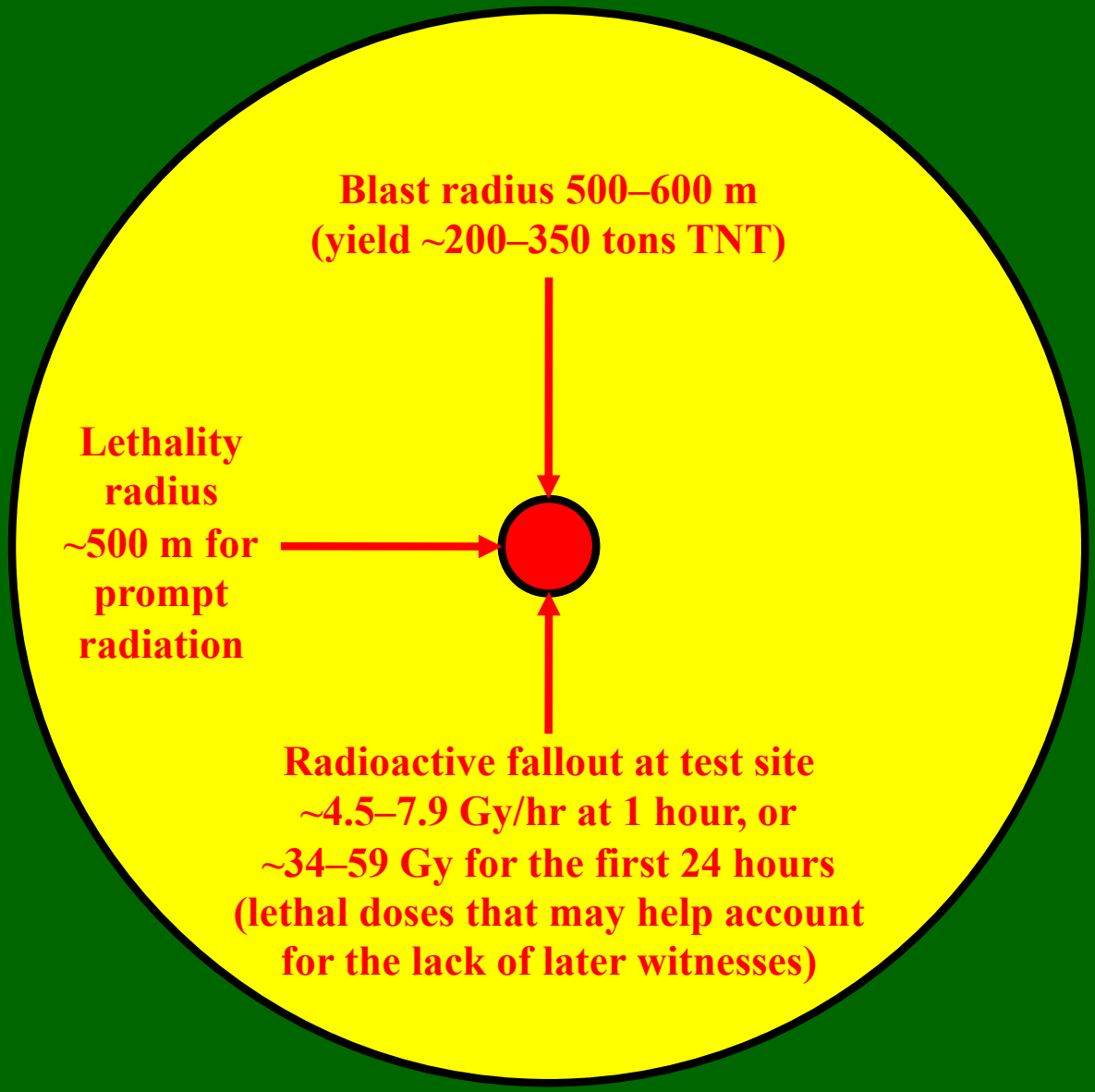

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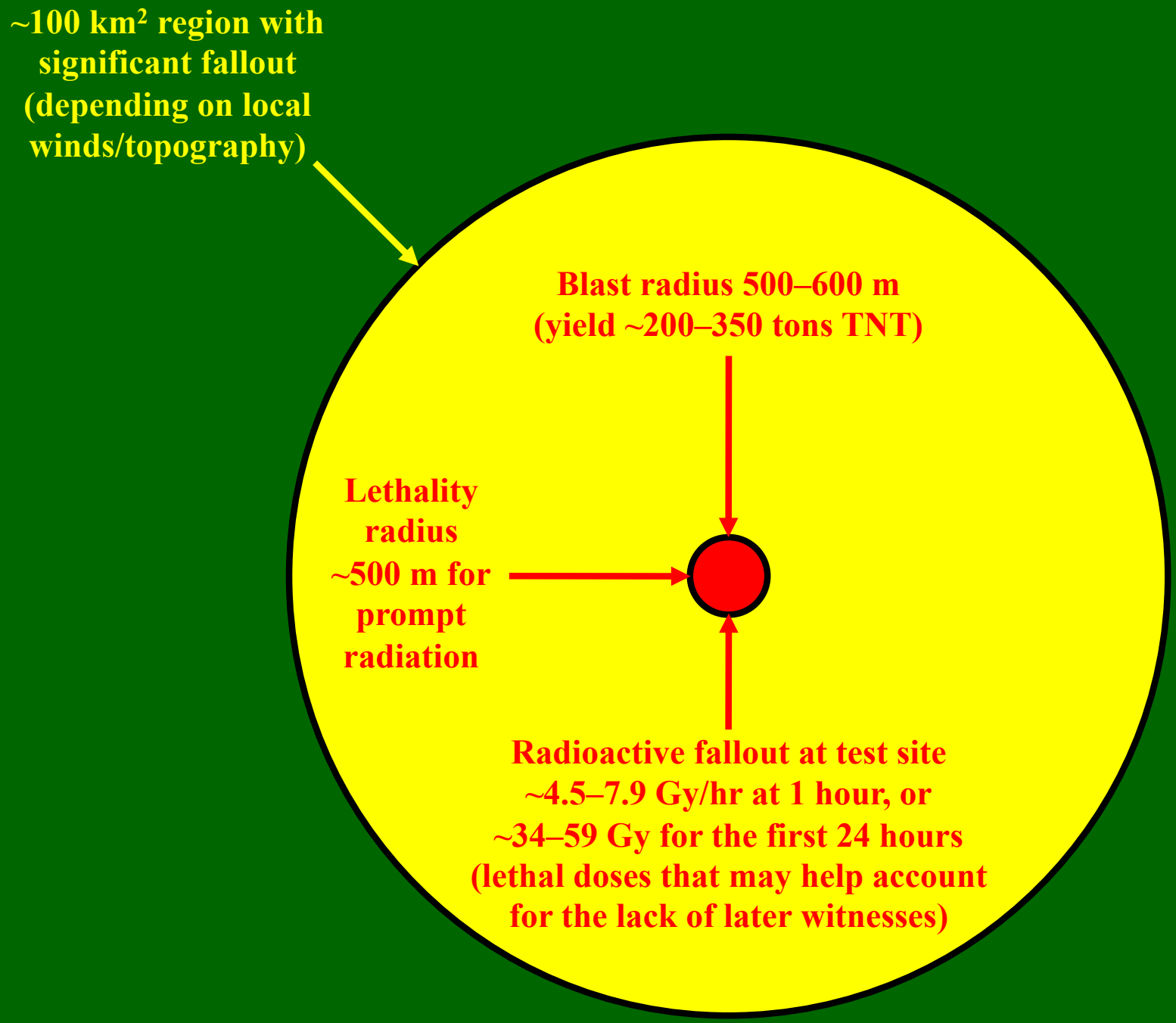

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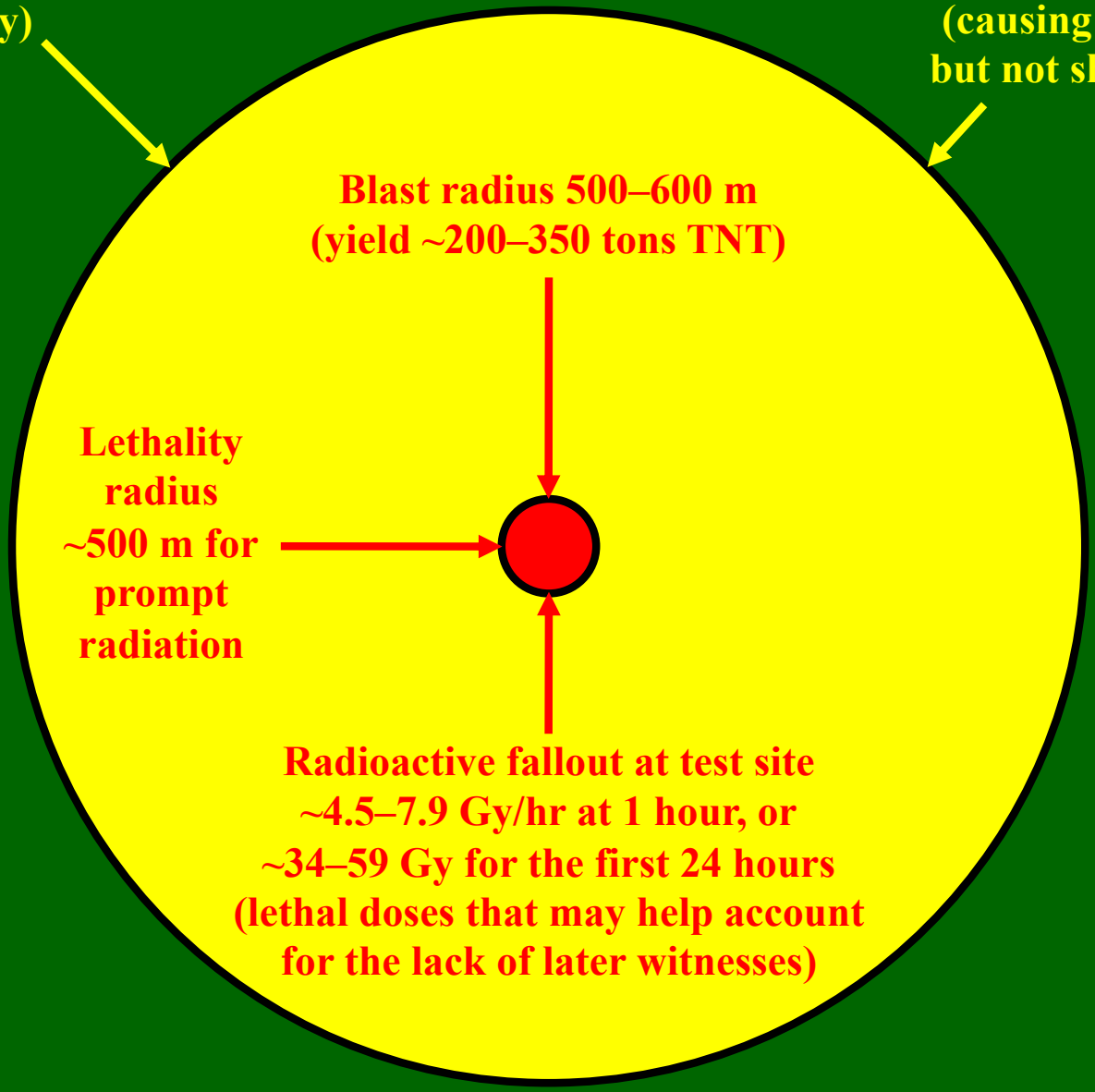

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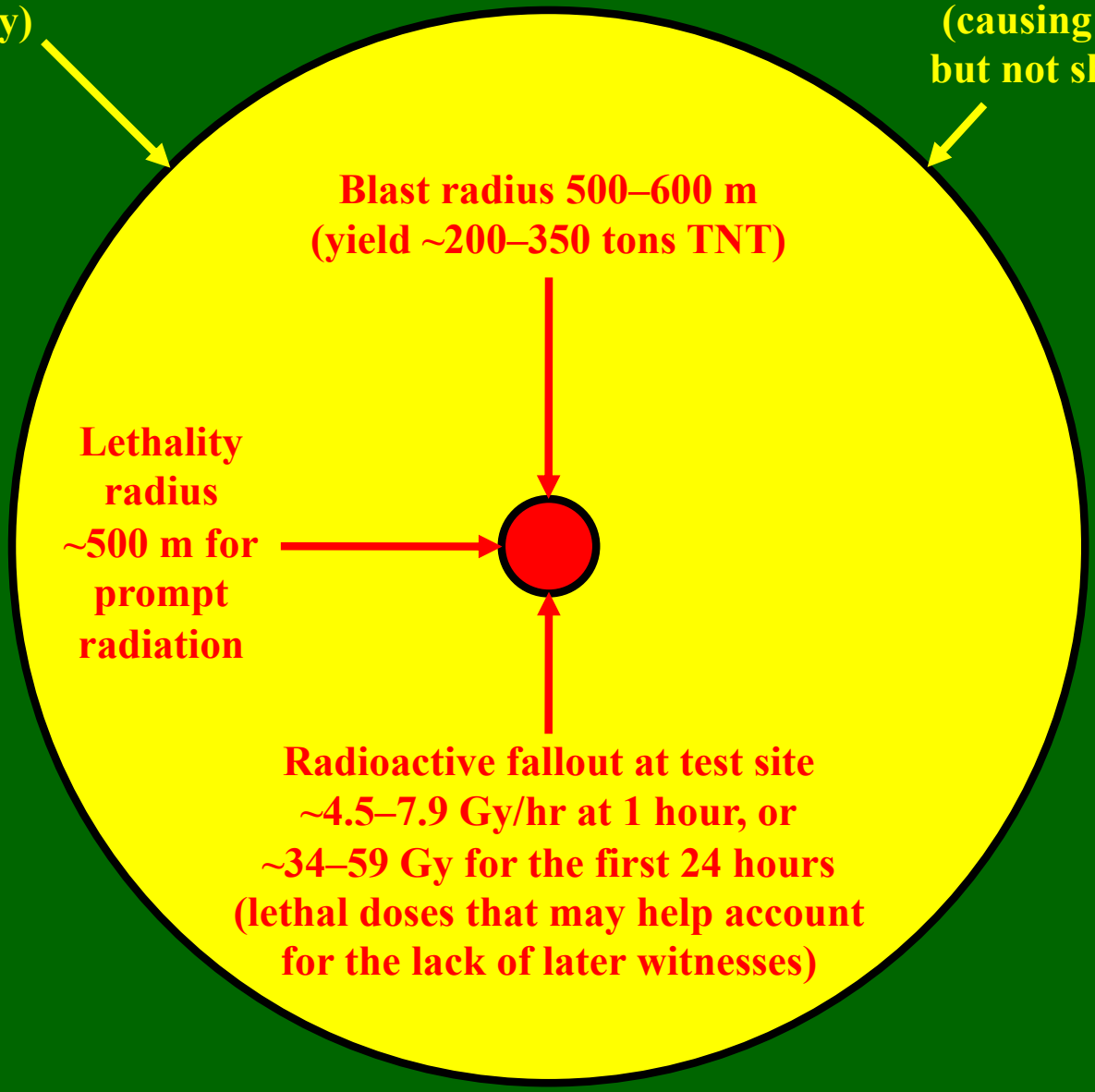

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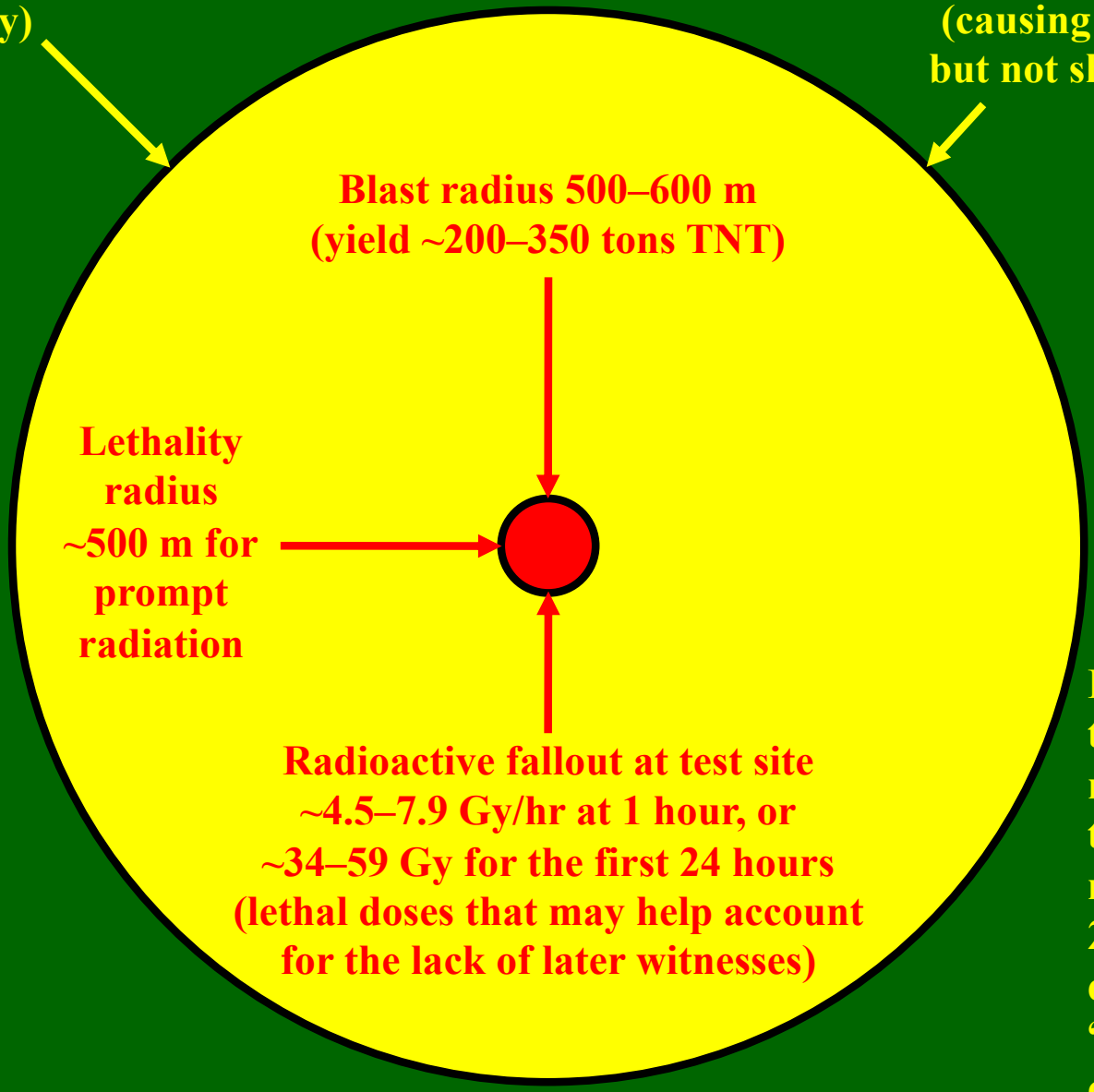
~100 km² region with significant fallout (depending on local winds/topography)

Radioactive fallout in region ~0.15–0.26 Gy/hr at 1 hour, or ~1.1–2.0 Gy for the first 24 hours (causing radiation sickness but not short-term lethality)



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Prompt radiation at the test site and the radioactive fallout at the test site and in nearby towns within 24 hours fit Ilyichev's description that a "massive radioactive effect was observed"

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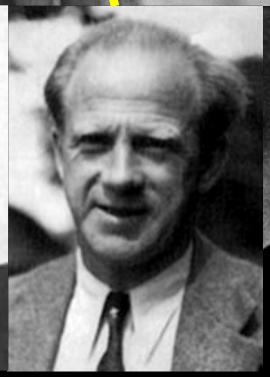

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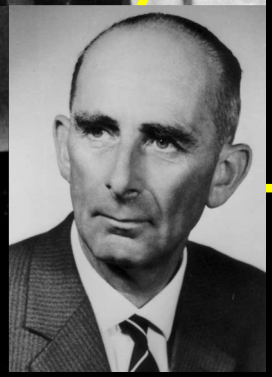

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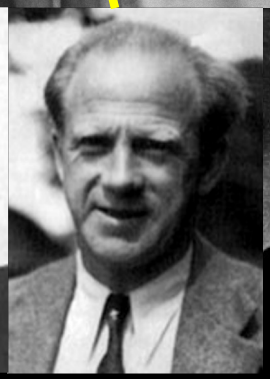

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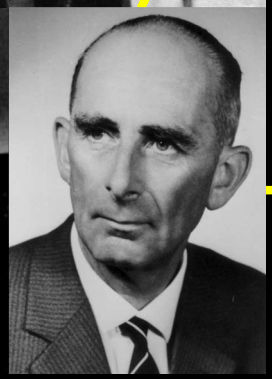

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Leslie Groves's Foreign Intelligence Unit files. 14 September 1944. Special Interrogation Report 2. NARA RG 77, Entry UD-22A, Box 171, Folder 32.7003-2 GERMANY: US Wartime Positive Int. (July-Oct. 44): "Linz's Hermann Goering Works, which were in production, were pretty well bombed out."

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Erwin Bartmann, 2013, *Für Volk und Führer,* pp. 160–161, 231:

'As you know, I am responsible for making the telephone connections when calls are made to and from the Air Ministry. Listen to this—the other day I made a connection between Göring and the *Führer*. […] Göring asked the *Führer* for permission to use three special bombs but he refused. "If I use them in the east they will get us from the west," said the *Führer*.' […]

After the war, I became friends with Rochus Misch, a fellow *Leibstandarte* veteran and communications officer in the *Führerbunker* until the final days of the *Reich*. The topic of the special bombs came up in conversation. 'Three bombs,' he said, 'where did you hear that? There were nine.'

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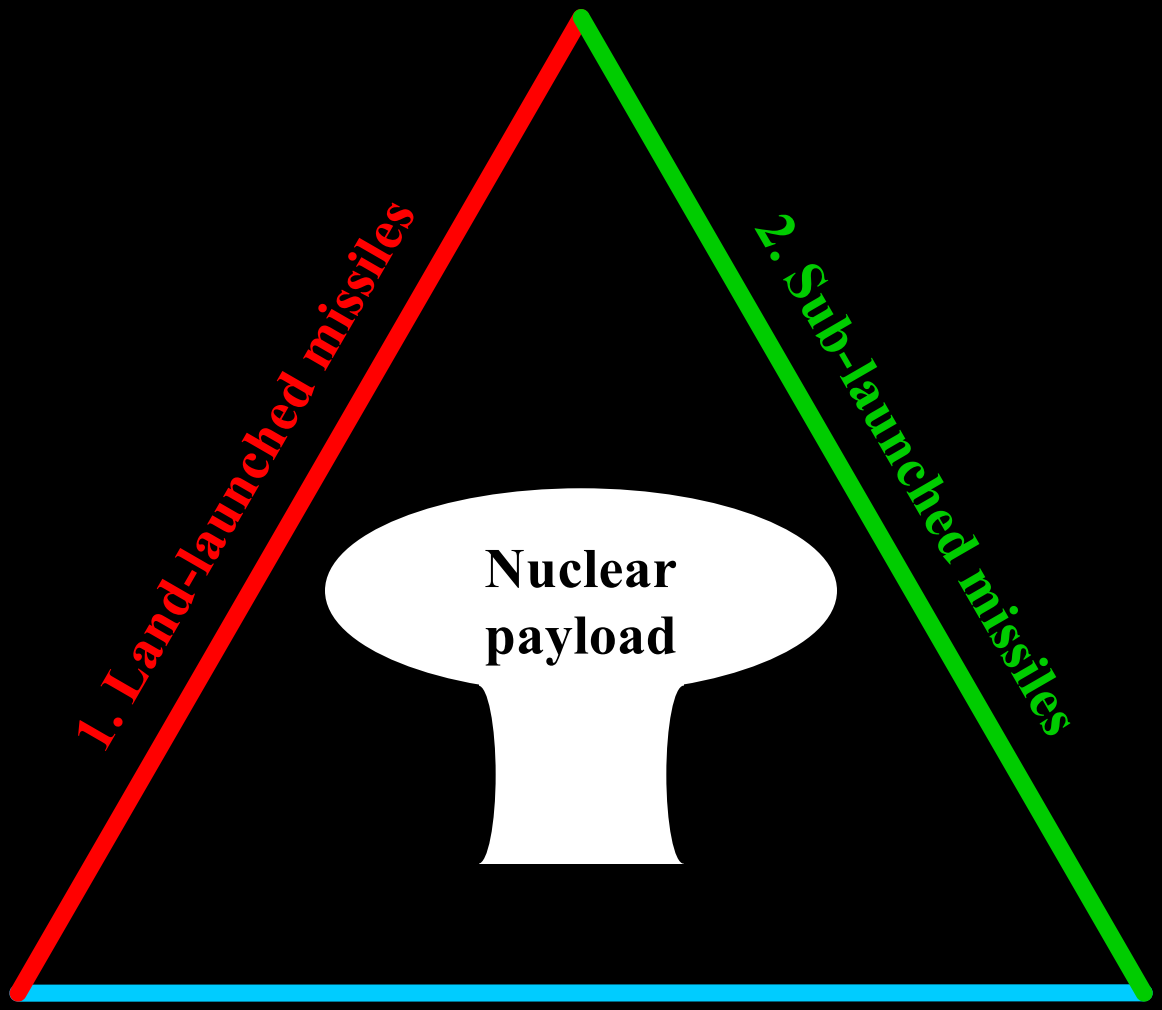
Werner Grothmann, 2002 interview, Jonastalverein Archive, pp. 31–32:

It is known to me that there were four atomic tests. The first still in 1943 in the autumn in the North Sea, which failed. Then two in 1944 in the autumn and the late autumn. One of them on the ground, that is on a small stand, the later one in the atmosphere on a parachute. That one in winter 1944 in the air was highly explosive and the charge [fuel] was also larger. That could have been in November. The last test was then again with a small charge in March 1945. […] I can definitely declare that I was told of six atomic bombs that came from three different research installations. All were prototypes. In addition, there were some very small devices that were intended for laboratory experiments.

Nuclear Triad: Delivery Vehicles for Nuclear Weapons



- **The nuclear triad was NOT originated by the U.S. and Soviet Union after World War II.**
- **The nuclear triad was originated by Germany during WWII, then the tech was transferred.**

For more information, see *Forgotten Creators* Appendix E.

13. Multiple Sources: Why Germany Did Not Use Its Nuclear Weapons

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THOMA: Then he would have used it long ago.

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In his conversation with Kesselring, latter said to Wolff our situation is desperate, nobody dares tell truth to Fuehrer who surrounded by small group of advisers who still believe in a last specific secret weapon which they call "Verzweiflunge" weapon [Verzweiflungswaffe: desperation weapon]. Kesselring believed this weapon can prolong war but not decide it, but might cause terrible blood bath on both sides. Kesselring said if Fuehrer gave him order to use weapon he would surrender his command.

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Winston S. Churchill to General Hastings Ismay. 6 July 1944.

I WANT you to think very seriously over this question of poison gas. I would not use it unless it could be shown either that (a) it was life or death for us, or (b) that it would shorten the war by a year. […] I want a cold-blooded calculation made as to how it would pay us to use poison gas, by which I mean principally mustard. […] If the bombardment of London really became a serious nuisance and great rockets with far-reaching and devastating effect fell on many centres of Government and labour, I should be prepared to do anything that would hit the enemy in a murderous place. […] We could drench the cities of the Ruhr and many other cities in Germany in such a way that most of the population would be requiring constant medical attention. […] I quite agree it may be several weeks or even months before I shall ask you to drench Germany with poison gas, and if we do it, let us do it 100%.

14. Allied Belief in German Nuclear Weapons—Where Are the Reports?

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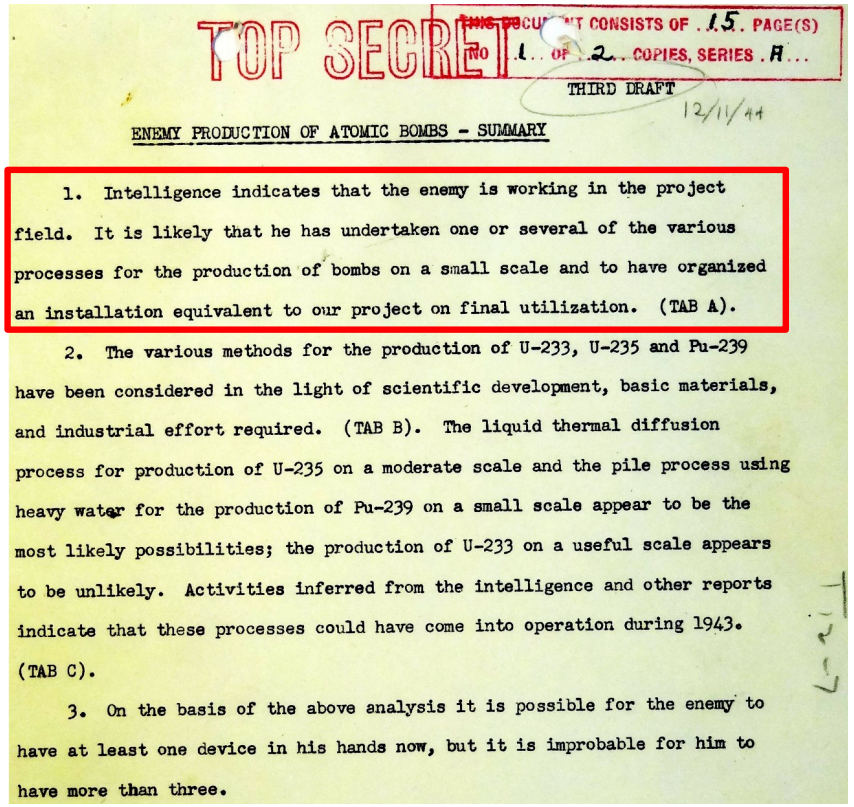

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THIRD DRAFT

12/11/44

ENEMY PRODUCTION OF ATOMIC BOMBS - SUMMARY

1. Intelligence indicates that the enemy is working in the project field. It is likely that he has undertaken one or several of the various processes for the production of bombs on a small scale and to have organized an installation equivalent to our project on final utilization. (TAB A).

2. The various methods for the production of U-233, U-235 and Pu-239 have been considered in the light of scientific development, basic materials, and industrial effort required. (TAB B). The liquid thermal diffusion process for production of U-235 on a moderate scale and the pile process using heavy water for the production of Pu-239 on a small scale appear to be the most likely possibilities; the production of U-233 on a useful scale appears to be unlikely. Activities inferred from the intelligence and other reports indicate that these processes could have come into operation during 1943. (TAB C).

3. On the basis of the above analysis it is possible for the enemy to have at least one device in his hands now, but it is improbable for him to have more than three.

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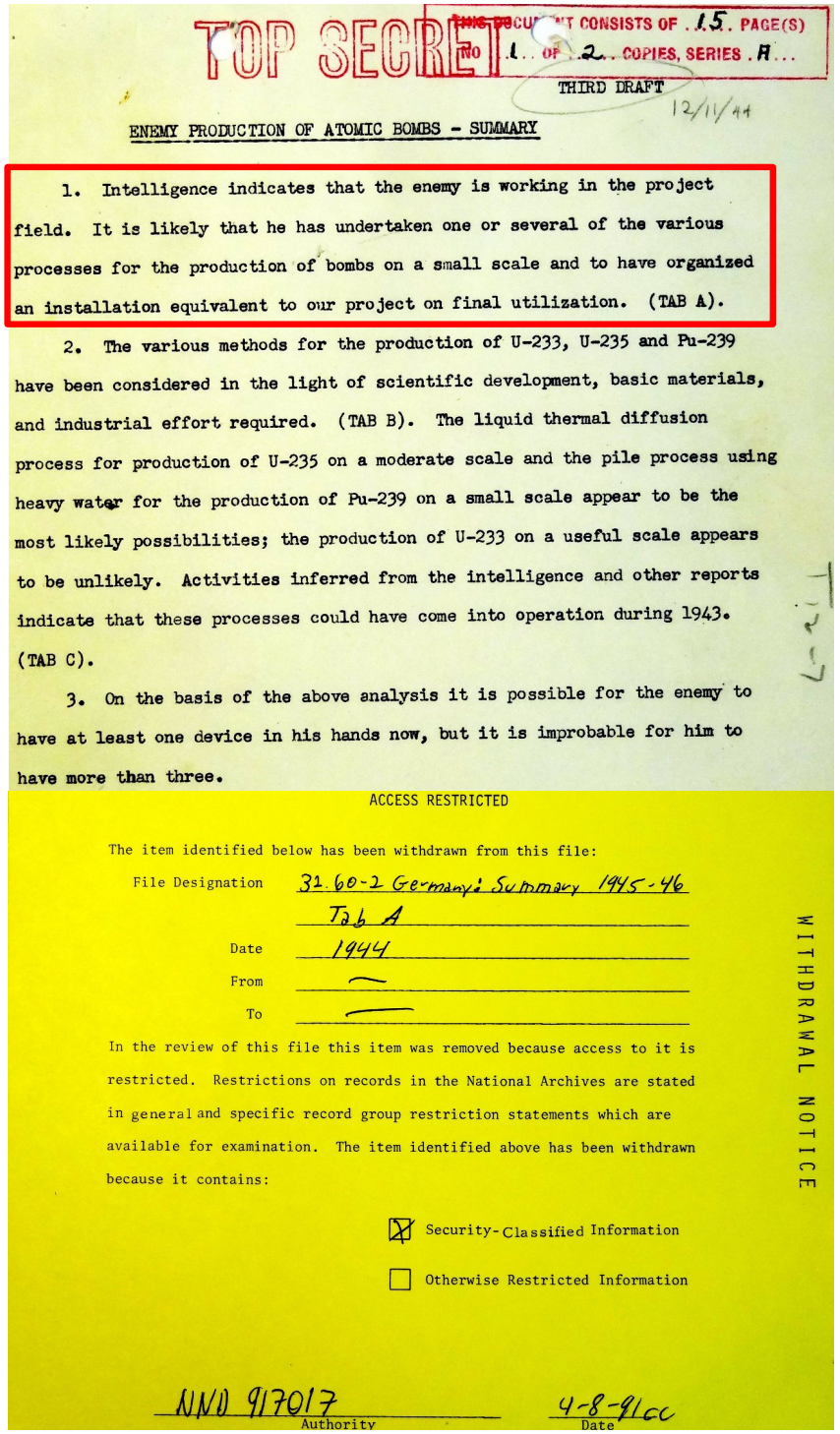

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ENEMY PRODUCTION OF ATOMIC BOMBS - SUMMARY

1. Intelligence indicates that the enemy is working in the project field. It is likely that he has undertaken one or several of the various processes for the production of bombs on a small scale and to have organized an installation equivalent to our project on final utilization. (TAB A).

2. The various methods for the production of U-233, U-235 and Pu-239 have been considered in the light of scientific development, basic materials, and industrial effort required. (TAB B). The liquid thermal diffusion process for production of U-235 on a moderate scale and the pile process using heavy water for the production of Pu-239 on a small scale appear to be the most likely possibilities; the production of U-233 on a useful scale appears to be unlikely. Activities inferred from the intelligence and other reports indicate that these processes could have come into operation during 1943. (TAB C).

3. On the basis of the above analysis it is possible for the enemy to have at least one device in his hands now, but it is improbable for him to have more than three.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation 32.60-2 Germany: Summary 1945-46
Tab A
Date 1944
From —
To —

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information

☐ Otherwise Restricted Information

WITHDRAWAL NOTICE

NND 917017 Authority

4-8-91 cc Date

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Authority NND 917017

NARA RG 77, Entry UD-22A, Box 171, Folder
32.60-2 Germany: Summary Reports (1945-1946)

14. Allied Belief in German Nuclear Weapons—Where Are the Reports?

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AAF Review. July 1946. German Rocketeers: German Rockets and Guided Missiles Almost Won the War for the Nazis. [Based heavily on information from Col. Donald Putt.]
It is now also fairly generally known that the atomic bomb race was close--again, closer than we care to think about. And paralleling the Nazis' research on atomic explosives was their accelerated development of the V-2 program. Linking these two projects together makes credible another theory which is current among Allied guided missile groups: namely, that it was the intention of Nazi technicians to put some sort of atomic device in the warhead of the V-2... But it is still a matter of scientific conjecture just how many weeks--or days--it might have taken Germany to be ready with her atomic devices for the V-2s.

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General George C. Marshall. 1 September 1945. Final Report to the Secretary of War.
Victory in this global war depended on the successful execution of OVERLORD. That must not fail… These conclusions seemed inescapable: France must be invaded in 1944, to shorten the war by facilitating the advance westward of the Soviet forces. At the same time German technological advances such as in the development of atomic explosives made it imperative that we attack before these terrible weapons could be turned against us.

General T. J. Betts and Sir R. P. Linstead. 15 Sept. 1945. AFHRA A5186, pp. 904–1026.
Certain items have been omitted because of security considerations… Of particular significance were the statements, made by German experts in the rocket and controlled missile field, that much of the priority accorded their work by the German High Command was in anticipation of the use of atomic explosives. These authorities stated that KWI had repeatedly assured Hitler that an atomic explosive would be available for use within a comparatively short time. During the last months of work by the Peenemünde staff, V-weapons were designed with much smaller war-heads. Quite possibly this trend was in anticipation of the successful development of a German atomic explosive.

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U.S. Department of Commerce. 1946. The Chemical Problem in Germany. p. 8. NARA RG 40, Entry UD-75, Box 3, Folder Press Releases.
Spectacular accomplishments in uranium,… nuclear physics and many other fields, have been uncovered in the investigation of the chemicals field alone.

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AAF Review. July 1946. German Rocketeers: German Rockets and Guided Missiles Almost Won the War for the Nazis. [Based heavily on information from Col. Donald Putt.]
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Royal Army Ordnance Corps. October 1946. *R.A.O.C. Gazette* 28:5:150.
Many interesting discoveries were made by Ordnance representatives *en route*. D.D.O.S. of 8 Corps found a factory engaged in production work for the German atomic bomb. The ammunition for Germany's largest gun was also located. Two of these massive guns had been captured by the Russians, but this was the first time their ammunition had been seen. At Belsen, the Ordnance service found itself faced with an unprecedented task.

14. Allied Belief in German Nuclear Weapons—Where Are the Reports?

Major Robert Furman. 22 May 1945. NARA RG 77, Entry UD-22A, Box 168, Folder 202.2 LONDON OFFICE: Combined Intell Disc.
Boris [Pash] left here for home to try to convince authorities that the Alsos job is over. But in this theater, [General T. J.] Betts, [General George] Conrad and [MIT Professor Edward] Bowles are not agreeing that the job for which Alsos was set up to do is in any way completed… A great many TA [nuclear] reports still remain in Germany, as you know. Therefore, reports on installations are received weekly about which we do very little. We always try to pick papers that are reported to exist, to remove them from circulation but it is impossible to keep other agencies from finding out about the German effort.

Generals Omar Bradley and Dwight Eisenhower. 31 May 1945. NARA RG 77, Entry UD-22A, Box 160, Folder APR 45-Dec. '45.
A laboratory containing equipment and documents related to experimental work on atomic bombs and AA rockets was located near Lofer, E 7399 by Third US Army.

Newsweek. 13 August 1945, p. 30.
Metal of the Millennium: German scientists nearly succeeded in solving it. Since the surrender of the Nazi armies, Allied officers have revealed that Germany would have been able to strike with atomic bombs by January 1945, if the invasion had not come six months before. The highest Allied officials knew that such explosives could have won the war for the Axis.

U.S. News. 17 August 1945, pp. 20-23.
The Germans had planned to use the atomic bomb in the warhead of a V-type winged torpedo such as they fired upon England across the Channel. With such a bomb, they might have devastated England.

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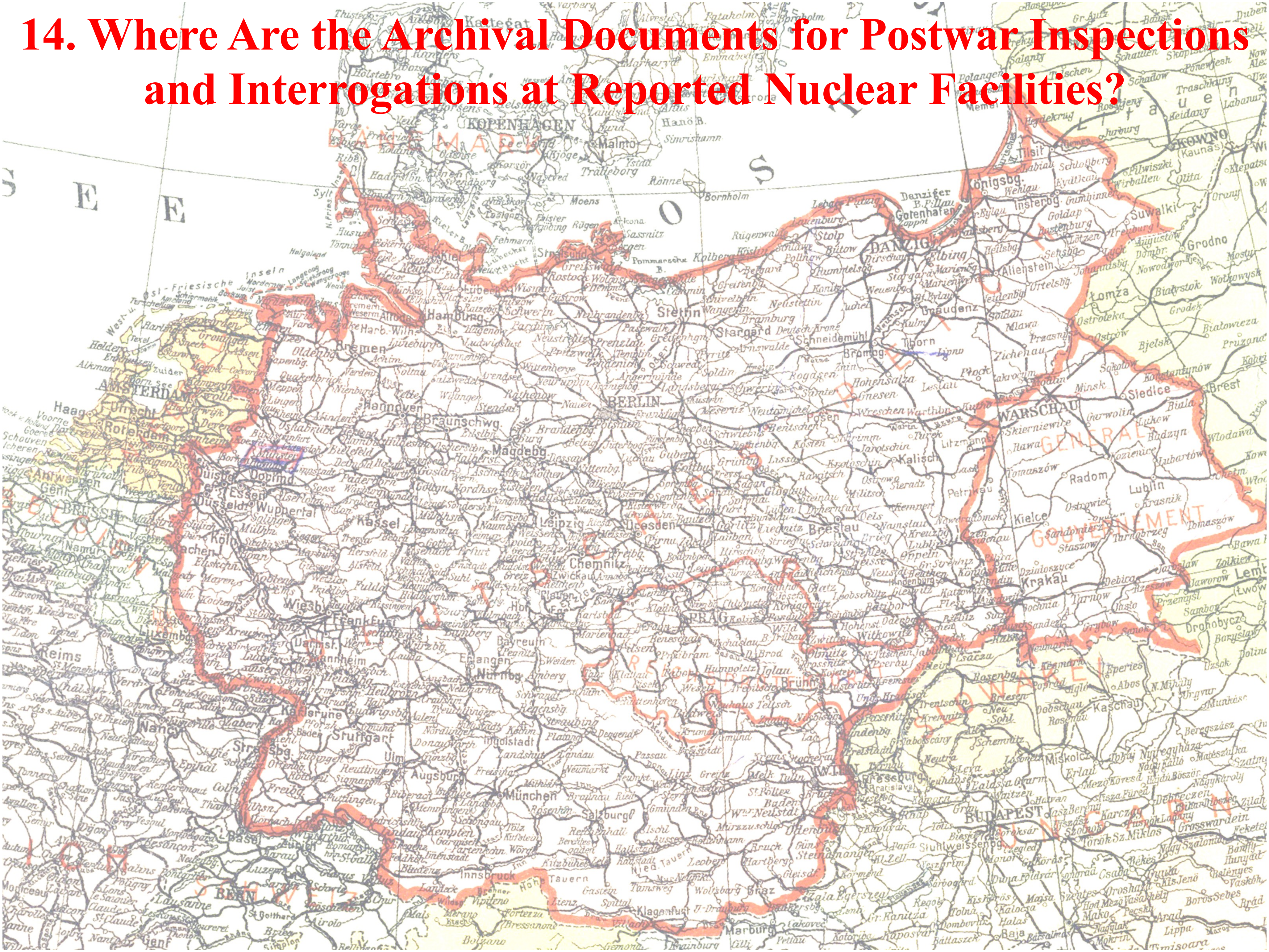
Science Service. Reveal Nazis Planned Rocket to Blast N.Y. at 6000 MPH. Indianapolis Times. 2 August 1947, p. 4.
WASHINGTON, Aug. 2---The Germans planned a bomb to cross the Atlantic and blast New York. It was a rocket to be started on its long journey by another rocket which detached itself when its job was done. This was revealed today by Brig. Gen. William L. Richardson of the U.S. Army Air Forces. Gen. Richardson, chief of the A.A.F. Guided Missiles and Air Defense Division, spoke as a guest of Watson Davis, director of Science Service, on ``Adventures in Science,'' heard over the Columbia network… There is evidence to believe, he stated, that the Germans intended to utilize an atomic warhead which would have made this weapon extremely deadly.

14. Where Are the Archival Documents for Postwar Inspections and Interrogations at Reported Nuclear Facilities?



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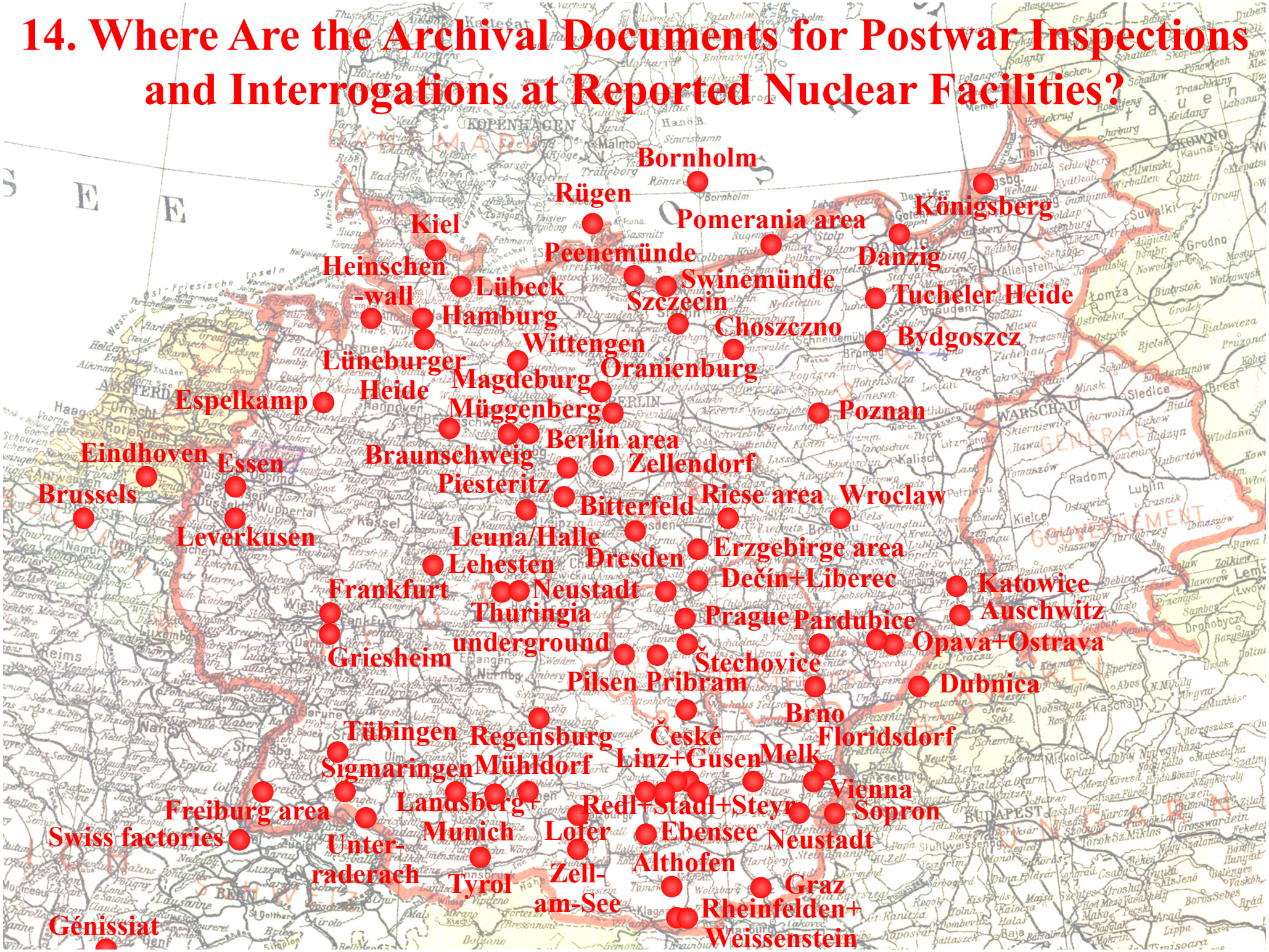

14. Where Are the Archival Documents for Postwar Inspections and Interrogations at Reported Nuclear Facilities?


Montgomery at Lüneburger Heide


Eisenhower at Ohrdruf


Patton at Pilsen


U.S. troops at Gusen

Bornholm
Rügen
Kiel
Heinschen-wall
Lübeck
Hamburg
Lüneburger Heide
Wittengen
Magdeburg
Oranienburg
Espelkamp
Müggenberg
Berlin area
Braunschweig
Zellendorf
Eindhoven
Essen
Brussels
Piesteritz
Bitterfeld
Riese area
Wroclaw
Leverkusen
Leuna/Halle
Dresden
Erzgebirge area
Lehesten
Dečín+Liberec
Frankfurt
Neustadt
Katowice
Thuringia
Prague
Pardubice
Auschwitz
underground
Opava+Ostrava
Griesheim
Štechovice
Pilsen
Pribram
Dubnica
Brno
Tübingen
Regensburg
České
Floridsdorf
Sigmaringen
Mühldorf
Linz+Gusen
Melk
Vienna
Landsberg+
Redl+Stadl+Steyr
Sopron
Freiburg area
Munich
Lofer
Ebensee
Neustadt
Swiss factories
Unter-raderach
Althofen
Zell-am-See
Tyrol
Graz
Rheinfelden+
Weissenstein
Génissiat
Pomerania area
Peenemünde
Swinemünde
Szczecin
Choszczno
Königsberg
Danzig
Tucheler Heide
Bydgoszcz
Poznan

14. International Shipments—Where Are the Reports???

NARA RG 77, Entry UD-22A, Box 171, Folder 32.60-2
GERMANY: Summary Reports (1945-1946),
Summary of Information June and July [1944]

The Japanese have announced that they too have discovered the effects of fission and have also said that Germany was working on the project. The interchange of technical information between Japan and Germany is being accomplished by means of submarine, surface ships, the Siberian railway and by air.

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DECLASSIFIED
Authority NND 917017

Operation LUSTY. Jan 1946. AFHRA C5098 pdf p. 586

A casual remark made by a technical engineer, who stated that he had recently been offered a position in Japan, led to his being thoroughly interrogated for significant technical information. As an aside, and what he probably considered a relatively unimportant incident, he stated that less than a month ago, about the middle of April, ten submarines heavily loaded with the latest German equipment relative to aerial warfare, were dispatched from Kiel to Japan. When Lt Col. O'Brien was thus informed he immediately advised the Directorate of Intelligence, USAFE, who in turn notified the Japanese Intelligence Section of SHAEF. A cable was then dispatched to all commands in every theater of war. All vessels in ports and at sea were notified, and one of the biggest searches ever undertaken during the war for submarines was initiated. What route they had taken, whether they had gone alone or together, no one knew. But so extensive was the search and so carefully was it executed by warships of all Allied nations, that by the end of June, six of these ten submarines had been captured intact, some a relatively short distance away from their bases, others perilously close to Japan.

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THIS PAGE DECLASSIFIED IAW EO 13526

NARA Boston RG 181. 1st Naval District. Office of the Assistant Chief of Staff for Operations. Formerly Security Classified General Correspondence 1944--1945. Box 26. Folder U-Boats, Surrender of.

SECRET 27 MAY
262151 (P)

FROM: CNO
TO: NYPORT
INFO: COMONE
SUBJECT: MINE TUBES, UNLOADING OF

INTERROGATION LT PFAFF SECOND WATCH OFFICER U-234 DISCLOSES HE WAS IN CHARGE OF CARGO AND PERSONALLY SUPERVISED LOADING ALL MINE TUBES.

PFAFF PREPARED MANIFEST LIST AND KNOWS KIND DOCUMENTS AND CARGO IN EACH TUBE.

PFAFF STATES LONG CONTAINERS SHOULD BE UNPACKED IN HORIZONTAL POSITION AND SHORT CONTAINERS IN VERTICAL POSITION.

URANIUM OXIDE LOADED IN GOLD LINED CYLINDERS AND AS LONG AS CYLINDERS NOT OPENED CAN BE HANDLED LIKE CRUDE TNT.

THESE CONTAINERS SHOULD NOT BE OPENED AS SUBSTANCE WILL BECOME SENSITIVE AND DANGEROUS.

PFAFF IS AVAILABLE AND WILLING TO AID UNLOADING IF RNEDT DESIRES. ADVISE.

DISTRIBUTION
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14. Personnel: Hans Kammler

SS General Hans Kammler was in charge of the nuclear weapons program.

Wilhelm Voss. April 1946. NARA RG 319, Entry A1-134B, Folder XE065651.
In the last years [of the war], the central management of the development and production of the most secret weapons and devices was in the hands of SS General Professor Kammler and his working group. These were the most secret weapons, devices, and processes, some of which were actually used, but some of which were not used [in the war], namely in the field of atom smashing, the transformation of elements, the atomic bomb and atomic energy, and also rocket weapons, the latest propulsion systems for aircraft, remote control, etc…. Kammler succeeded in centralizing the development work in his field. He was the representative of the Ministry of Armaments, the Army Ordnance Office, the Air Force, and the SS at the same time.

HQ CIC, USFET, Region Munich IV, 25 April 1946. Subject: Wilhelm Voss. NARA RG 263, Entry ZZ-18, Box 133, Folder Voss, Friedrich Wilhelm.
Subject states that the two men that were responsible for research on the most secret weapons at Skoda were SS Gruppenfuehrer Prof. KAMMLER and his deputy SS Oberfuehrer PURUCKER. On the 10 May 1945 VOSS and PURUCKER were in Schimelitz, fleeing in the direction of the American troops. PURUCKER was driving a large civilian car which contained many of the plans on the atom bomb. This car plus material fell into the hands of the Russians…

Heinrich Klein. 1977. *Vom Geschoß zum Feuerpfeil.* Motorbuch. pp. 96-97.
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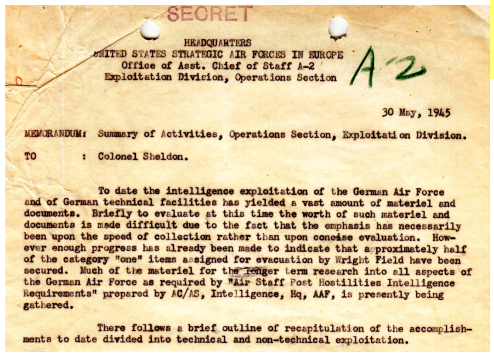
BIOS 142. Targets of Opportunity in the Sonthofen Area. 1945.
Obergruppenführer Professor Kammler, one of the directors of the S.S. Hauptamt, was said to have great influence on Himmler and more influence on Hitler than Speer himself; and he was kept informed on all questions concerning armaments… One of the functions of the S.S. was to control the work of politically unreliable scientists who were kept in concentration camps… Trials on some kind of atomic bomb were made at or near the camp.

Werner Grothmann. 2002. Jonastalverein Archive, p. 18.
Kammler was responsible for almost all secret developments and special projects, and he was constantly on the move. He spread optimism almost until the end of March [1945]…

14. Personnel: Hans Kammler

SS General Hans Kammler was in charge of the nuclear weapons program.

He was interrogated by the U.S. for at least 6 months after the war. The information he provided was sufficiently valuable to shield him from all prosecution. Where are the reports on his wartime work and postwar life?



SECRET

HEADQUARTERS
UNITED STATES STRATEGIC AIR FORCES IN EUROPE
Office of Asst. Chief of Staff A-2
Exploitation Division, Operations Section

A-2

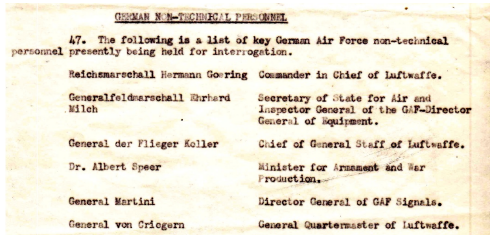
30 May, 1945

MEMORANDUM: Summary of Activities, Operations Section, Exploitation Division.

TO : Colonel Sheldon.

To date the intelligence exploitation of the German Air Force and of German technical facilities has yielded a vast amount of materiel and documents. Briefly to evaluate at this time the worth of such materiel and documents is made difficult due to the fact that the emphasis has necessarily been upon the speed of collection rather than upon concise evaluation. However enough progress has already been made to indicate that approximately half of the category "one" items assigned for evacuation by Wright Field have been secured. Much of the material for the longer term research into all aspects of the German Air Force as required by "Air Staff Post Hostilities Intelligence Requirements" prepared by AC/AS, Intelligence, Hq, AAF, is presently being gathered.

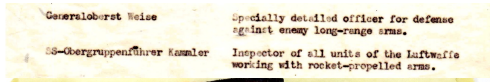
There follows a brief outline of recapitulation of the accomplishments to date divided into technical and non-technical exploitation.

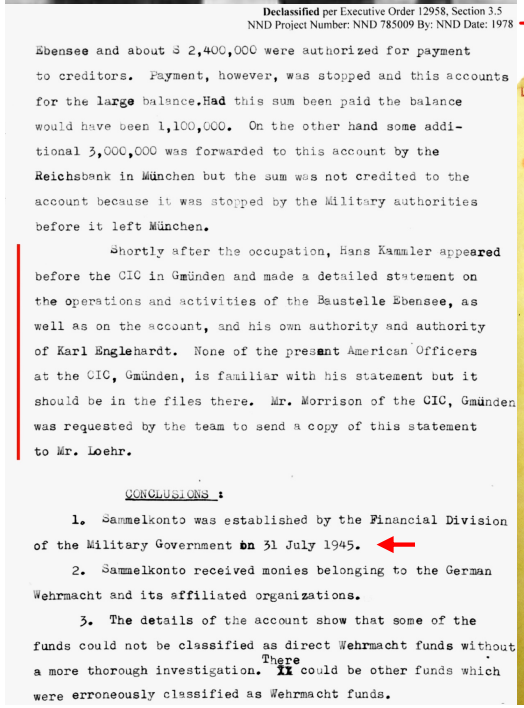


GERMAN NON-TECHNICAL PERSONNEL

47. The following is a list of key German Air Force non-technical personnel presently being held for interrogation.

Reichsmarschall Hermann Goering	Commander in Chief of Luftwaffe.
Generalfeldmarschall Ehrhard Milch	Secretary of State for Air and Inspector General of the GAF-Director General of Equipment.
General der Flieger Koller	Chief of General Staff of Luftwaffe.
Dr. Albert Speer	Minister for Armament and War Production.
General Martini	Director General of GAF Signals.
General von Criegern	General Quartermaster of Luftwaffe.
Generaloberst Heise	Specially detailed officer for defense against enemy long-range arms.
SS-Obergruppenführer Kammler	Inspector of all units of the Luftwaffe working with rocket-propelled arms.





Declassified per Executive Order 12958, Section 3.5
NND Project Number: NND 785009 By: NND Date: 1978

Ebensee and about S 2,400,000 were authorized for payment to creditors. Payment, however, was stopped and this accounts for the large balance. Had this sum been paid the balance would have been 1,100,000. On the other hand some additional 3,000,000 was forwarded to this account by the Reichsbank in München but the sum was not credited to the account because it was stopped by the Military authorities before it left München.

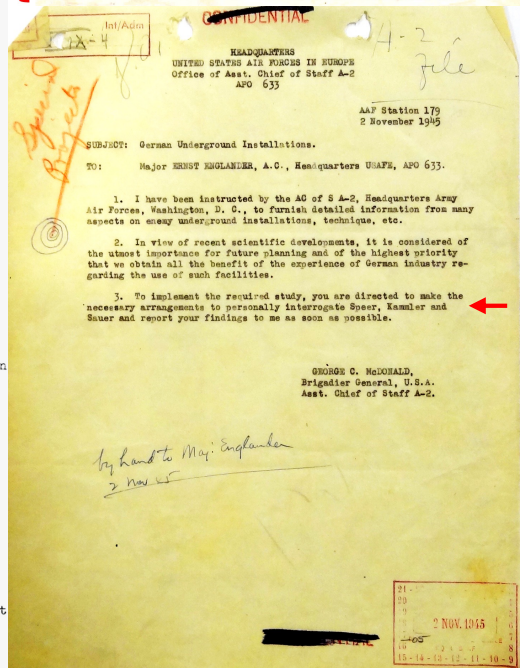
Shortly after the occupation, Hans Kammler appeared before the CIC in Gmünden and made a detailed statement on the operations and activities of the Baustelle Ebensee, as well as on the account, and his own authority and authority of Karl Englehardt. None of the present American Officers at the CIC, Gmünden, is familiar with his statement but it should be in the files there. Mr. Morrison of the CIC, Gmünden was requested by the team to send a copy of this statement to Mr. Loehr.

CONCLUSIONS :

1. Sammelkonto was established by the Financial Division of the Military Government on 31 July 1945.

2. Sammelkonto received monies belonging to the German Wehrmacht and its affiliated organizations.

3. The details of the account show that some of the funds could not be classified as direct Wehrmacht funds without a more thorough investigation. There could be other funds which were erroneously classified as Wehrmacht funds.



CONFIDENTIAL

Int/Adm

HEADQUARTERS
UNITED STATES AIR FORCES IN EUROPE
Office of Asst. Chief of Staff A-2
APO 633

AAF Station 179
2 November 1945

SUBJECT: German Underground Installations.

TO: Major ERNST ENGLANDER, A.C., Headquarters USAFE, APO 633.

1. I have been instructed by the AC of S A-2, Headquarters Army Air Forces, Washington, D. C., to furnish detailed information from many aspects on enemy underground installations, technique, etc.

2. In view of recent scientific developments, it is considered of the utmost importance for future planning and of the highest priority that we obtain all the benefit of the experience of German industry regarding the use of such facilities.

3. To implement the required study, you are directed to make the necessary arrangements to personally interrogate Speer, Kammler and Sauer and report your findings to me as soon as possible.

GEORGE C. McDONALD,
Brigadier General, U.S.A.
Asst. Chief of Staff A-2.

by hand to Maj. Englander
2 Nov

2 NOV. 1945

Loyd K. Pepple. 30 May 1945. AFHRA folder 570.605 1944-46.
Louis D. Caplane and William G. Magee. NARA RG 260, DN1929, Roll 0126, pp. 26 ff.
George C. McDonald. 2 November 1945. AFHRA folder 570.6501A 1945-46.

Wilhelm Voss. April 1946. NARA RG 319, Entry A1-134B, Folder XE065651.
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- **Published detailed calculations of fission reactors and fission bombs in June 1939.**

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- **Appears to have been the top physicist of the German nuclear weapons program, working for the Reichspost, Heereswaffenamt, University of Berlin, Kaiser Wilhelm Institutes, Reichsforschungsrat, University of Königsberg (reported to have fission reactors), and Gusen SS facility.**

NARA RG 319, Entry A1-134B, Box 202, Folder XE196681 Siegfried Fluegge

The following information was received by phone from L&S Office Marburg, Wednesday, 17 Sept 47, thru Mrs. Steinbacher:

Flügge, Siegfried, Dr.

Date of birth:	16 March 1912
Place of Birth:	Dresden, Saxony, Germany
Present address:	Marburg/Lahn, Wilhelm Roser Str. 33 A
Present employment:	as professor at University of Marburg (ordentlicher Professor)
Special Field:	Nuclear Physics (Struktur der Materie)
Background information:	from 1918 - 1921: attended elementary school, Dresden
	" 1921 - 1929: " high school (Gymnasium) in Dresden
	" 1929 - 1930: attended Technical High School, Dresden.
	" 1930 - 1933: at University in Göttingen
	1933 Doctor of Physics at University of Göttingen.
	" 1933 - 1935: worked at University of Frankfurt as Scientific Assistant.
	" 1935 - 1937: lectured at University of Leipzig
	1937 to Berlin
	" 1937 - 1942: worked in chemical department of the Kaiser-Wilhelm-Institute in Berlin, Dahlem.
	" 1942 - 1944: assistant at the Institute of Scientific Research of the Reichspost, Berlin
	" 1940 - 1944: lectured at the University of Berlin
	" 1944 appointed professor (ausserordentlicher) at the University of Königsberg.

After the surrender, he went to Göttingen, where he was employed as Professor for History of Physical Science from 1945 to 1947.

He was not called to Military Service during the War, because he worked as a Scientist of Physics for the "Heereswaffenamt", Berlin, and was later exempted of any Army Service by the Reichsforschungsrat in Berlin.

14. Personnel: Siegfried Flügge

- **Published detailed calculations of fission reactors and fission bombs in June 1939.**
- **Appears to have been the top physicist of the German nuclear weapons program, working for the Reichspost, Heereswaffenamt, University of Berlin, Kaiser Wilhelm Institutes, Reichsforschungsrat, University of Königsberg (reported to have fission reactors), and Gusen SS facility.**
- **Was brought to work in the U.S. after the war at the specific request of Edward Teller to "be of marked assistance in carrying out" a "physics... program... of interest and importance to the national security."**

NARA RG 319, Entry A1-134B, Box 202, Folder XE196681 Siegfried Fluegge

The following information was received by phone from L&S Office Marburg, Wednesday, 17 Sept 47, thru Mrs. Steinbacher:

Flügge, Siegfried, Dr.

Date of birth:	16 March 1912	
Place of Birth:	Dresden, Saxony, Germany	
Present address:	Marburg/Lahn, Wilhelm Roser Str. 33 A	
Present employment:	as professor at University of Marburg (ordentlicher Professor)	
Special Field:	Nuclear Physics (Struktur der Materie)	
Background information:	from 1918 - 1921:	attended elementary school, Dresden
	" 1921 - 1929:	" high school (Gymnasium) in Dresden
	" 1929 - 1930:	attended Technical High School, Dresden.
	" 1930 - 1933:	at University in Göttingen
	1933	Doctor of Physics at University of Göttingen.
	" 1933 - 1935:	worked at University of Frankfurt as Scientific Assistant.
	" 1935 - 1937:	lectured at University of Leipzig
	1937	to Berlin
	" 1937 - 1942:	worked in chemical department of the Kaiser-Wilhelm-Institute in Berlin, Dahlem.
	" 1942 - 1944:	assistant at the Institute of Scientific Research of the Reichspost, Berlin
	" 1940 - 1944:	lectured at the University of Berlin
	" 1944	appointed professor (ausserordentlicher) at the University of Königsberg.

After the surrender, he went to Göttingen, where he was employed as Professor for History of Physical Science from 1945 - 1947.

He was not called to Military Service during the War, because he worked as a Scientist of Physics for the "Heereswaffenamt", Berlin, and was later exempted of any Army Service by the Reichsforschungsrat in Berlin.

NARA RG 330, Entry A1-1B, Box 43, Folder Flügge, Siegfried

EXOS:ONR:N421:UL:kcm C
Serial No. 14654 O P Y

NAVY DEPARTMENT
Office of Naval Research
Washington 25, D.C.

July 18, 1947

From: Chief of Naval Research
To: Chief of Naval Intelligence

Subj: Foreign Scientists, Request for assistance on.

1. Professor Edward Teller, Physics Department, University of Chicago, is supervising under contract to this Office a research program on various phases of research in physics of the solid state. This program is of interest and importance to the national security. Professor Teller is very desirous to obtain the services of the German physicist, Dr. Siegfried Flugge, who can be of marked assistance in carrying out the aforementioned program.

2. Professor Teller has requested the Office of Technical Services, Department of Commerce, to obtain Dr. Flügge from Germany. It is requested that the Joint Intelligence Objectives Agency be informed of the Navy's interest in this case, and asked to provide such assistance as is possible to Professor Teller in aiding Dr. Flügge to come to this country.

/s/ C.M. Bolster
Capt., USN
Acting Chief of Naval Research

cc: Mr. Robert Frye, OTS, Dept. of Commerce
Professor Edward Teller, Physics Dept.
University of Chicago

14. Personnel: Siegfried Flügge

- **Published detailed calculations of fission reactors and fission bombs in June 1939.**
- **Appears to have been the top physicist of the German nuclear weapons program, working for the Reichspost, Heereswaffenamt, University of Berlin, Kaiser Wilhelm Institutes, Reichsforschungsrat, University of Königsberg (reported to have fission reactors), and Gusen SS facility.**
- **Was brought to work in the U.S. after the war at the specific request of Edward Teller to "be of marked assistance in carrying out" a "physics... program... of interest and importance to the national security."**
- **Was placed on the Top Secret JIOA K "hot list" when not in the U.S. and constantly monitored/detained for at least a decade after the war, on the direct orders of CIC Colonel George R. Eckman, formerly of Alsos.**

DECLASSIFIED Authority NND 907017

NARA RG 319, Entry A1-134B, Box 202, Folder XE196681 Siegfried Fluegge

The following information was received by phone from L&S Office Marburg, Wednesday, 17 Sept 47, thru Mrs. Steinbacher:

Flügge, Siegfried, Dr.

Date of birth:	16 March 1912	
Place of Birth:	Dresden, Saxony, Germany	
Present address:	Marburg/Lahn, Wilhelm Roser Str. 33 A	
Present employment:	as professor at University of Marburg (ordentlicher Professor)	
Special Field:	Nuclear Physics (Struktur der Materie)	
Background information:	from 1918 - 1921:	attended elementary school, Dresden
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	" 1940 - 1944:	lectured at the University of Berlin
	" 1944	appointed professor (ausserordentlicher) at the University of Königsberg.

After the surrender, he went to Göttingen, where he was employed as Professor for History of Physical Science from 1945 to 1947.

He was not called to Military Service during the War, because he worked as a Scientist of Physics for the "Heereswaffenamt", Berlin, and was later exempted of any Army Service by the Reichsforschungsrat in Berlin.

Where are the reports on Flügge's interrogations and on his postwar work?

DECLASSIFIED Authority NND 013039

NARA RG 330, Entry A1-1B, Box 43, Folder Flügge, Siegfried

EXOS:ONR:N421:UL:kcm C O P Y

Serial No. 14654

NAVY DEPARTMENT
Office of Naval Research
Washington 25, D.C.

July 18, 1947

From: Chief of Naval Research
To: Chief of Naval Intelligence

Subj: Foreign Scientists, Request for assistance on.

1. Professor Edward Teller, Physics Department, University of Chicago, is supervising under contract to this Office a research program on various phases of research in physics of the solid state. This program is of interest and importance to the national security. Professor Teller is very desirous to obtain the services of the German physicist, Dr. Siegfried Flugge, who can be of marked assistance in carrying out the aforementioned program.

2. Professor Teller has requested the Office of Technical Services, Department of Commerce, to obtain Dr. Flügge from Germany. It is requested that the Joint Intelligence Objectives Agency be informed of the Navy's interest in this case, and asked to provide such assistance as is possible to Professor Teller in aiding Dr. Flügge to come to this country.

/s/ C.M. Bolster
Capt., USN
Acting Chief of Naval Research

cc: Mr. Robert Frye, OTS, Dept. of Commerce
Professor Edward Teller, Physics Dept.
University of Chicago

DECLASSIFIED Authority NND 907017

NARA RG 319, Entry A1-134B, Box 202, Folder XE196681 Siegfried Fluegge

FLUEGGE, Siegfried Wilhelm (Dr.) 25 April 1952

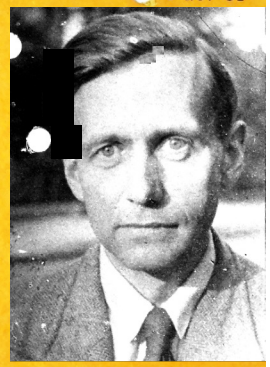
File D-196681

Res: MARBURG, Wilhelm Roserstrasse 33a

Priority 1, (JIOA Personality on the "K" List)

REF: D-137899 Secret ltr dtd 31 Jan 52 file X-272
SUB: Custodial Detention
cs

FLUEGGE, S. (Professor) 4 Nov 54



Employed by subject. Now in MARBURG.

Ref: D-264237 BfV Report dtd 26 Aug 53 File: BR53-11-91
Sub:German Academy of Sciences of BERLIN F-3
Re: Nuclear Physics Institute
CS GERNAND

14. Personnel: Others

Where Are the Reports/Interrogations?

14. Personnel: Others

Where Are the Reports/Interrogations?

Dozens of experts with knowledge of the German nuclear program (including H-bombs) were brought to the U.S./U.K. after WWII

Karl-Friedrich Bonhoeffer	Gottfried Guderley	Walter Nielsch (?)
Wernher von Braun	Paul Harteck	Edgar Petersen
Rudolf Brill	Otto Haxel	Heinz Schlicke
Adolf Busemann	Richard Herzog	Erich Schumann
Walter Dornberger	Johannes Hans Jensen	Otto Schwede
Rudolf Edse	Willibald Jentschke	Edmung Sorg
Krafft Ehricke	Ulrich Jetter	Kurt Starke
Wilhelm Eitel	Georg Joos	Ernst Stuhlinger
Gerhard Falck	Hartmut Kallmann	Hans Suess
Karl Fiebinger	Hans Kammler	Herbert Wagner
Wolfgang Finkelnburg	Gerald Klein	Wilhelm Westphal
Rudolf Fleischmann	Stanley Kronenberg	Friedwardt Winterberg
Siegfried Flügge	Heinz Maier-Leibnitz	Karl Wirtz
Walter Glaser	Werner Maurer	Gernot Zippe
Wilhelm Groth	Hugo Neuert	Etc.

NARA RG 330, Entry A1-1B, Boxes 1-186.
JIOA Foreign Scientist Case Files.

14. Personnel: Others

Where Are the Reports/Interrogations?

Dozens of experts with knowledge of the German nuclear program (including H-bombs) were brought to the U.S./U.K. after WWII

Karl-Friedrich Bonhoeffer	Gottfried Guderley	Walter Nielsch (?)
Wernher von Braun	Paul Harteck	Edgar Petersen
Rudolf Brill	Otto Haxel	Heinz Schlicke
Adolf Busemann	Richard Herzog	Erich Schumann
Walter Dornberger	Johannes Hans Jensen	Otto Schwede
Rudolf Edse	Willibald Jentschke	Edmung Sorg
Krafft Ehricke	Ulrich Jetter	Kurt Starke
Wilhelm Eitel	Georg Joos	Ernst Stuhlinger
Gerhard Falck	Hartmut Kallmann	Hans Suess
Karl Fiebinger	Hans Kammler	Herbert Wagner
Wolfgang Finkelnburg	Gerald Klein	Wilhelm Westphal
Rudolf Fleischmann	Stanley Kronenberg	Friedwardt Winterberg
Siegfried Flügge	Heinz Maier-Leibnitz	Karl Wirtz
Walter Glaser	Werner Maurer	Gernot Zippe
Wilhelm Groth	Hugo Neuert	Etc.

NARA RG 330, Entry A1-1B, Boxes 1-186.
JIOA Foreign Scientist Case Files.

DECLASSIFIED
Authority NND 963231

Countless others were interrogated in Europe, or taken to France, the Soviet Union, or other countries

Walter Trinks. 1945. NARA RG 319, Entry A1-134B, Folder XE098301 Trinks, Walter.
TO THE AMERICAN COMMAND OF THE INTERNMENT CAMP? CIC-STAFF… I am a Physicist and have been employed with the OKH until the end of the war in the research dept. of the office for arms [HWA] as referee for the physics of explosions and blasting… At the end of the war I was occupied with experiments for producing extreme high pressures and temperatures, extreme velocities (up to 15 km/sec) and heavy swingings of the air [shock waves]. The practical use of these researches comprises: 1st for the war: the defense against V-weapons super- and atomic bombs by destroying them before they reach their target and the initiation of atomic bombs.

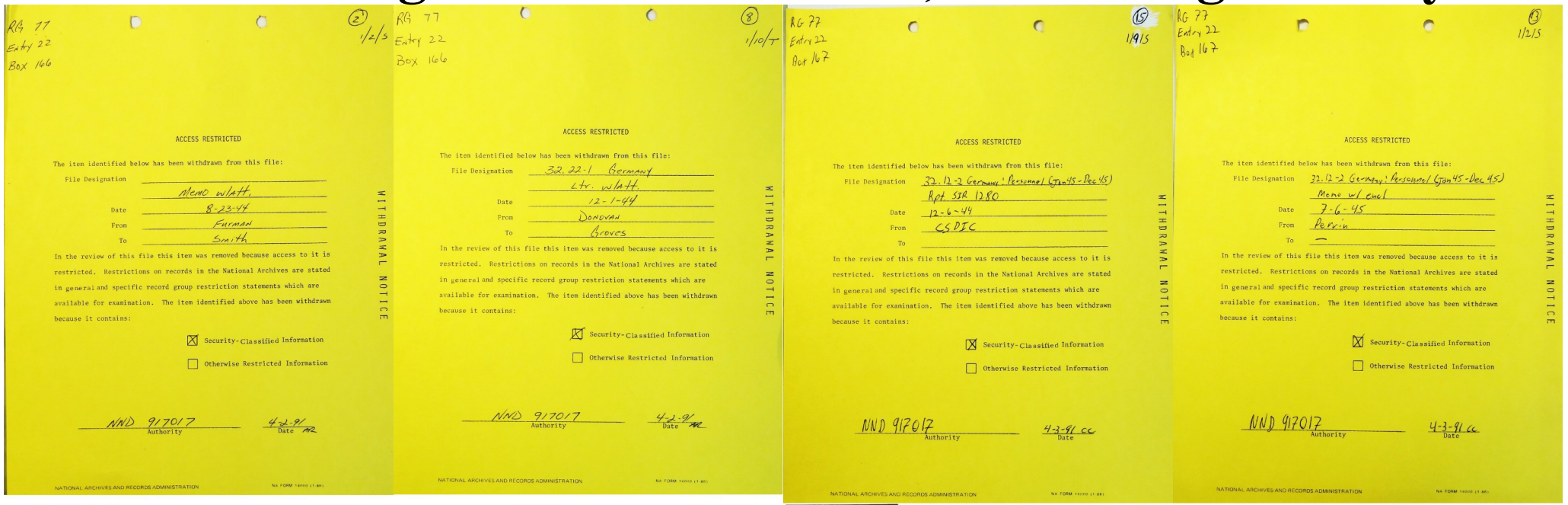
Charles A. Crowley to W. F. Heimlich. 31 August 1945. Headquarters United States Air Forces in Europe (Main). AFHRA C5094 frames 0957-0958.
Gerald Klein (Dr.), Dipl.-Eng., Manager of LGW. Address: Berlin-Dahlem, Hohe Ähren 10b. Specialty: Electrical flying control, V-2 control. A very efficient electrical engineer. Developed V-2 control devices. Worked at Peenemünde and later became group director of atomic devices in RLM [Reichsluftfahrtministerium]. At present being used by the British. Evacuated by "T" Force.

Robert E. Work. 18 September 1945. Preliminary Interrogation Report. Prof. Dr. Ulrich Hoffmann. AFHRA A5183 frame 0609.
PhD in chemistry from University of Berlin in 1926. Instructor at University of Berlin until 1936. Called to University of Rostock in 1936 where he became full professor in 1937. In April 1942 he was called to University of Vienna as Director of the Institute for Inorganic and Analytic Chemistry... Dr. Hoffmann's research in the field of air interest was only in the development of the atomic bomb. Claims to have improved method of obtaining FLUOR, which is necessary to obtain UF6, one of the basic ingredients of the atomic bomb.

Todos M. Odarenko. 1945. FIAT 63. Activities of the Second Institute of Physics of the University of Vienna.
Contrary to the statements, attributed by the U.S. newspapers to the various U.S. atomic experts, that it "would take the Germans some 100 years to solve the problem of atomic disintegration on an explosive basis" (for the manufacture of bombs), the opinion of the members of the Institute themselves was that, given a supply of radium and uranium, and permitting their return to Vienna, where certain of their materials and equipments are stored, they would be able to "complete their work" in some 3 to 6 months… That these claims of the Institute are not to be disregarded too readily would follow from the fact that Prof. Smyth spent considerable time with the Institute, revisited them several times, and thought it necessary to insist on the most stringent type of control over the scientific activities of the group, as well as on close individual observations.

Memo to P. M. Wilson. Atom-Bomb Specialist. 4 April 1946 TNA FO 1031/112.
Karl Heinz BOSECK, former Ustuf in the Waffen SS, alleges that he is an Atom-Bomb expert. He is now interned in No. 2 CIC, SANDBOSTEL and his P.O.W. No. is 204526. [Boseck studied under Erich Schumann, worked at Oranienburg SS facility near Auer.]

14. Why Are So Many Archival Files on the German Nuclear Program Still Classified, or Missing Entirely?


RG 77
Entry 22
Box 166

(2) 1/2/S

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Memo w/att.
Date: 8-23-44
From: Furman
To: Smith

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 Authority — 4-2-91 Date

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

RG 77
Entry 22
Box 166

(8) 1/10/T

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: 32.22-1 Germany
Ltr. w/att.
Date: 12-1-44
From: Donovan
To: Groves

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 Authority — 4-2-91 Date

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

RG 77
Entry 22
Box 167

(15) 1/9/S

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: 32.12-2 Germany: Personnel (Jan 45-Dec 45)
Rpt SSR 1280
Date: 12-6-44
From: CSDIC
To:

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 Authority — 4-3-91 cc Date

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

RG 77
Entry 22
Box 167

(13) 1/2/S

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: 32.12-2 Germany: Personnel (Jan 45-Dec 45)
Memo w/ encl
Date: 7-6-45
From: Perrin
To: —

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 Authority — 4-3-91 cc Date

WITHDRAWAL NOTICE

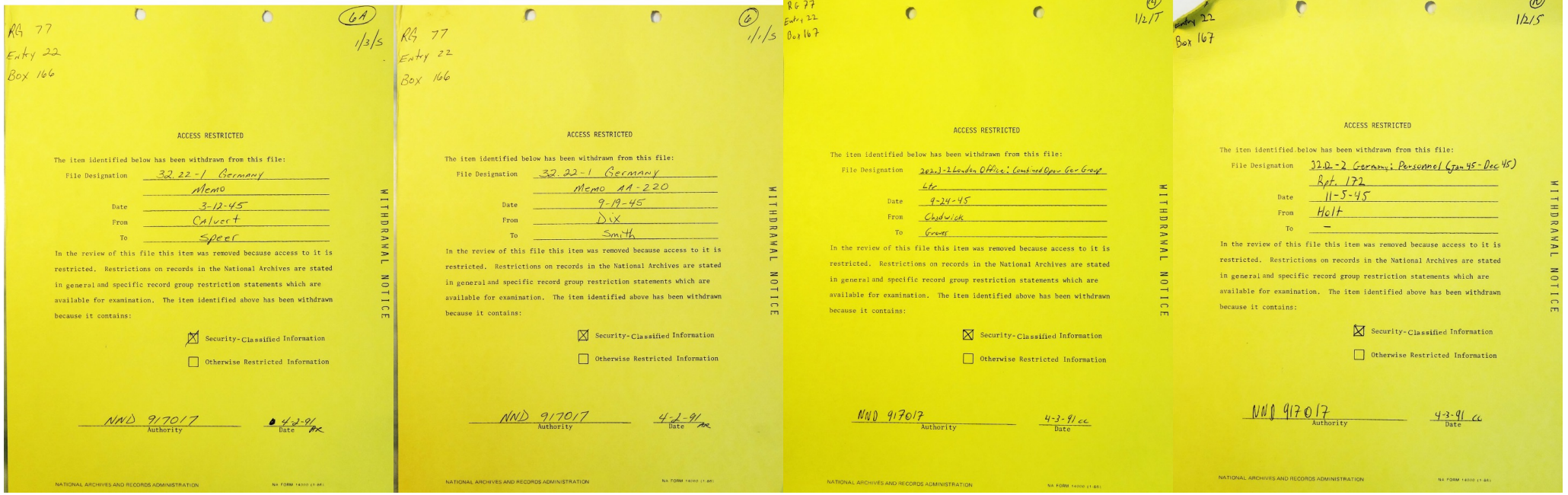
NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 166

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 167


RG 77
Entry 22
Box 166

(6A) 1/3/S

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: 32.22-1 Germany
Memo
Date: 3-12-45
From: Calvert
To: Speer

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 Authority — 4-2-91 Date

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

RG 77
Entry 22
Box 166

(6) 1/1/S

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: 32.22-1 Germany
Memo AA-220
Date: 9-19-45
From: Dux
To: Smith

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 Authority — 4-2-91 Date

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

RG 77
Entry 22
Box 167

(14) 1/2/T

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: 202.3-2 London Office: Combined Oper. Gen Group
Ltr.
Date: 9-24-45
From: Chadwick
To: Groves

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 Authority — 4-3-91 cc Date

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

Entry 22
Box 167

(10) 1/2/S

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: 32.12-2 Germany: Personnel (Jan 45-Dec 45)
Rpt. 172
Date: 11-5-45
From: Holt
To: —

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

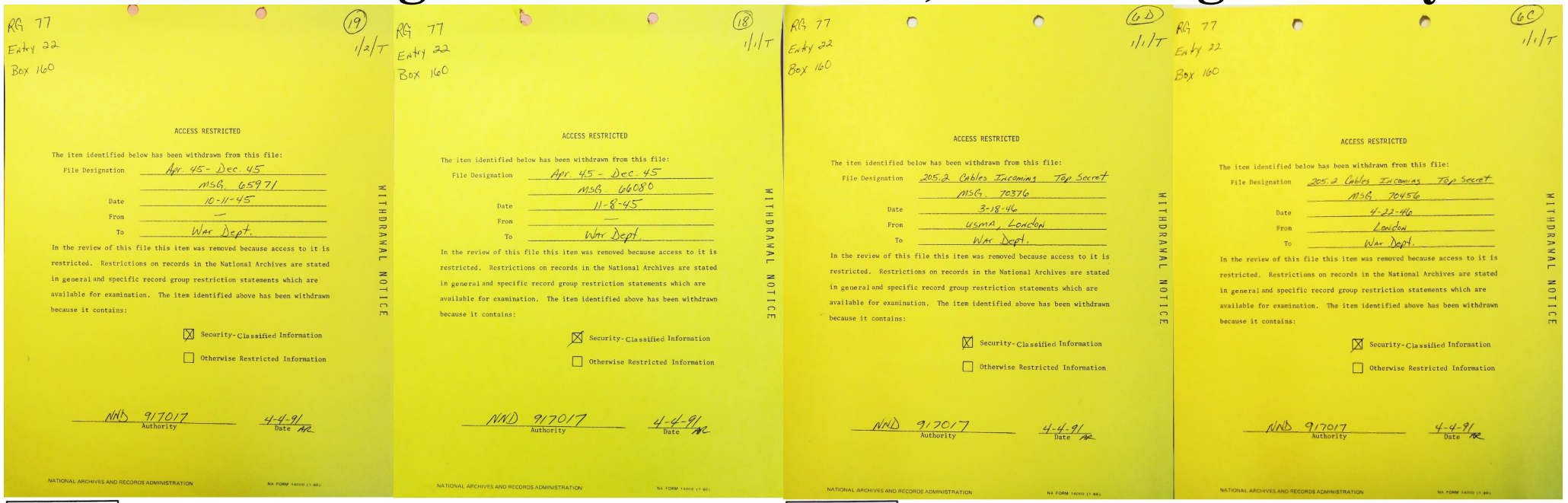
☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 Authority — 4-3-91 cc Date

WITHDRAWAL NOTICE

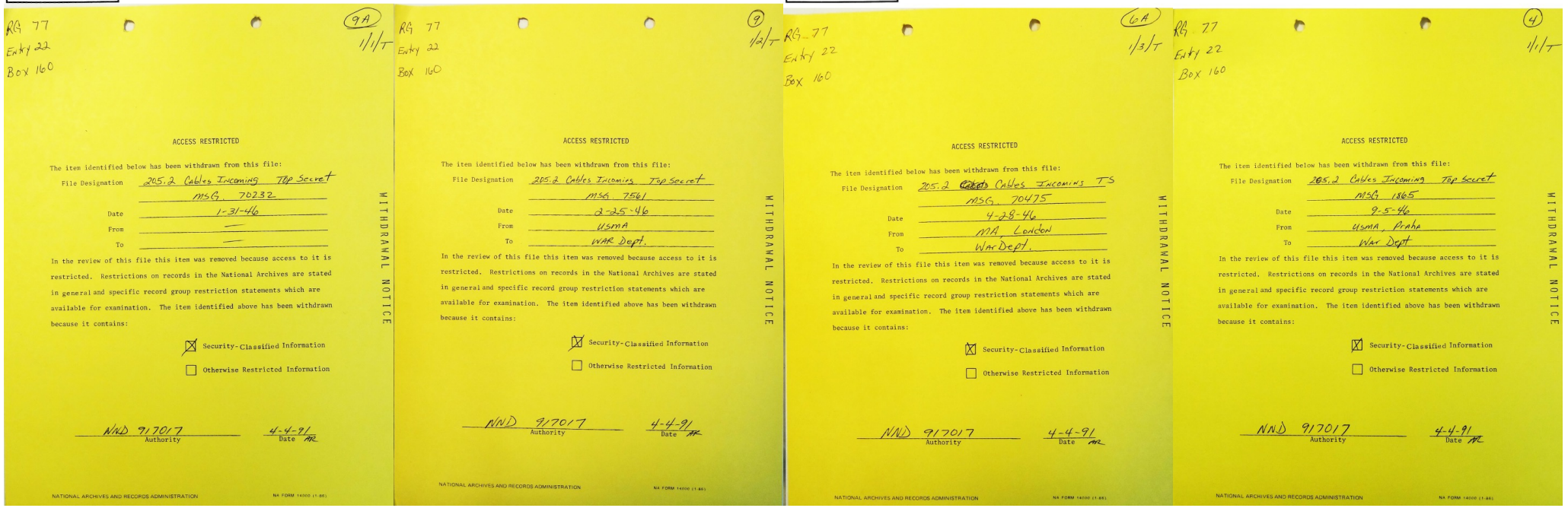
NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

14. Why Are So Many Archival Files on the German Nuclear Program Still Classified, or Missing Entirely?



DECLASSIFIED Authority NND 917017

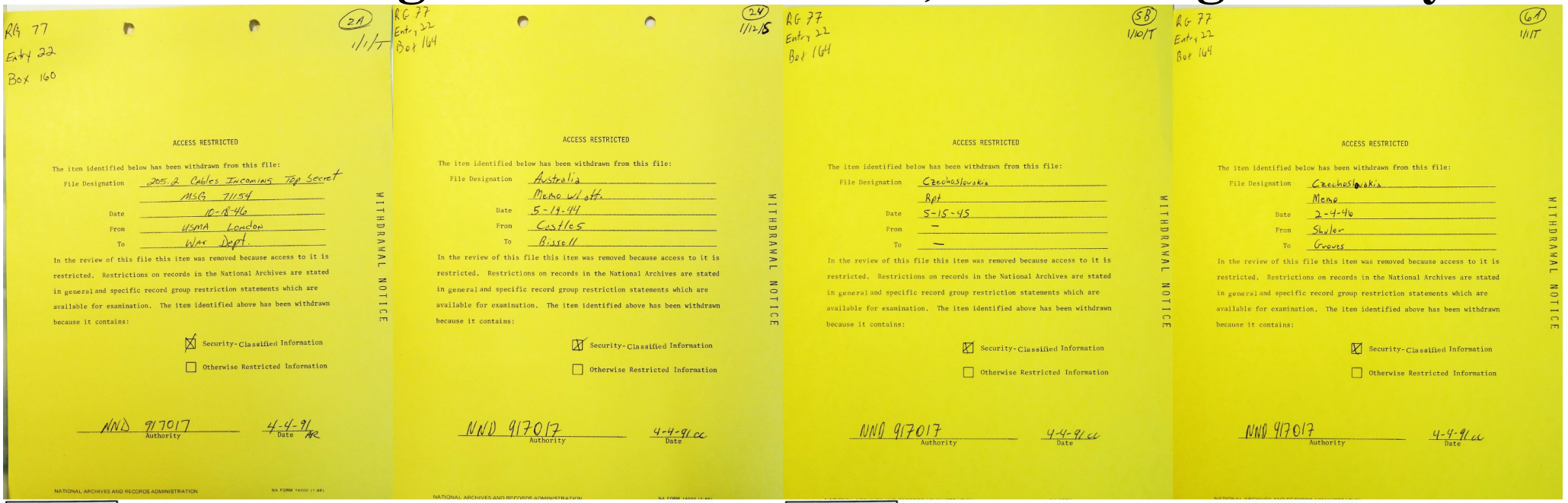
NARA RG 77, Entry UD-22A, Box 160



DECLASSIFIED Authority NND 917017

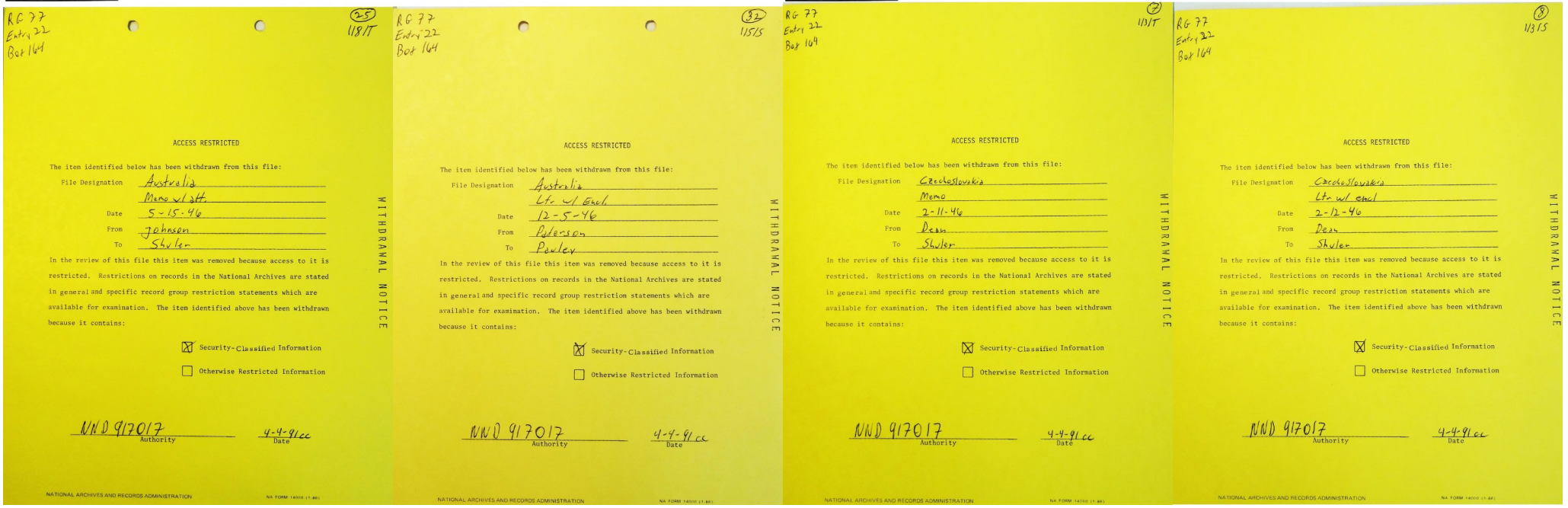
NARA RG 77, Entry UD-22A, Box 160

14. Why Are So Many Archival Files on the German Nuclear Program Still Classified, or Missing Entirely?



DECLASSIFIED Authority NND 917017

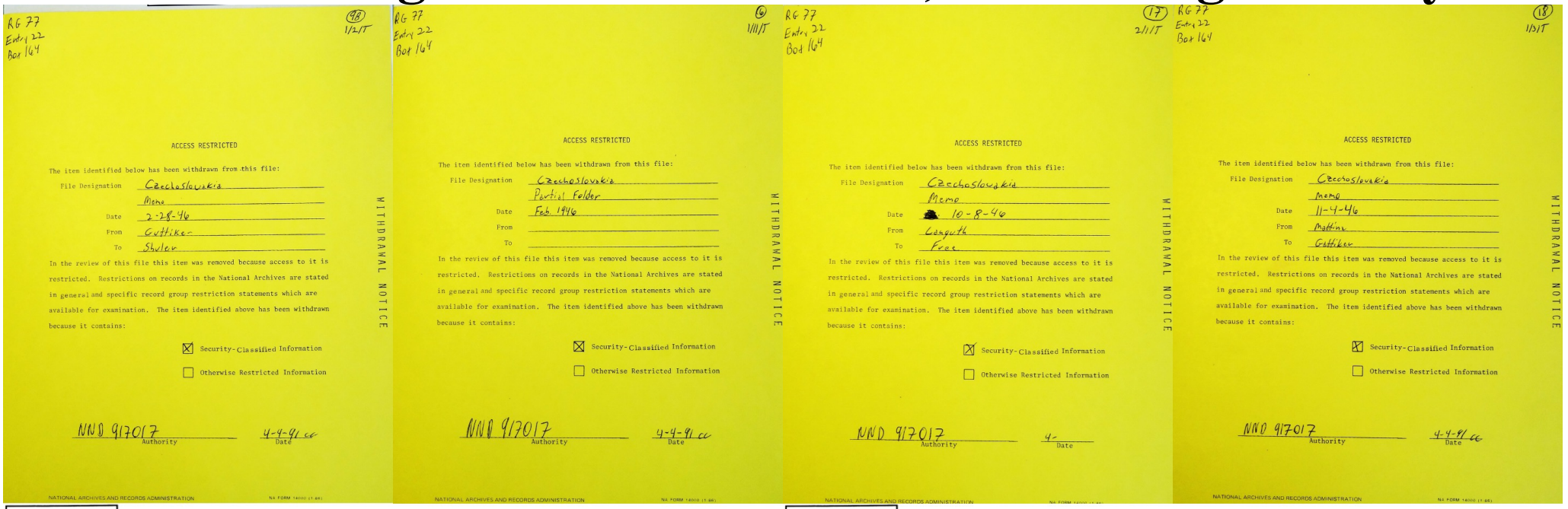
NARA RG 77, Entry UD-22A, Boxes 160 & 164



DECLASSIFIED Authority NND 917017

NARA RG 77, Entry UD-22A, Box 164

14. Why Are So Many Archival Files on the German Nuclear Program Still Classified, or Missing Entirely?

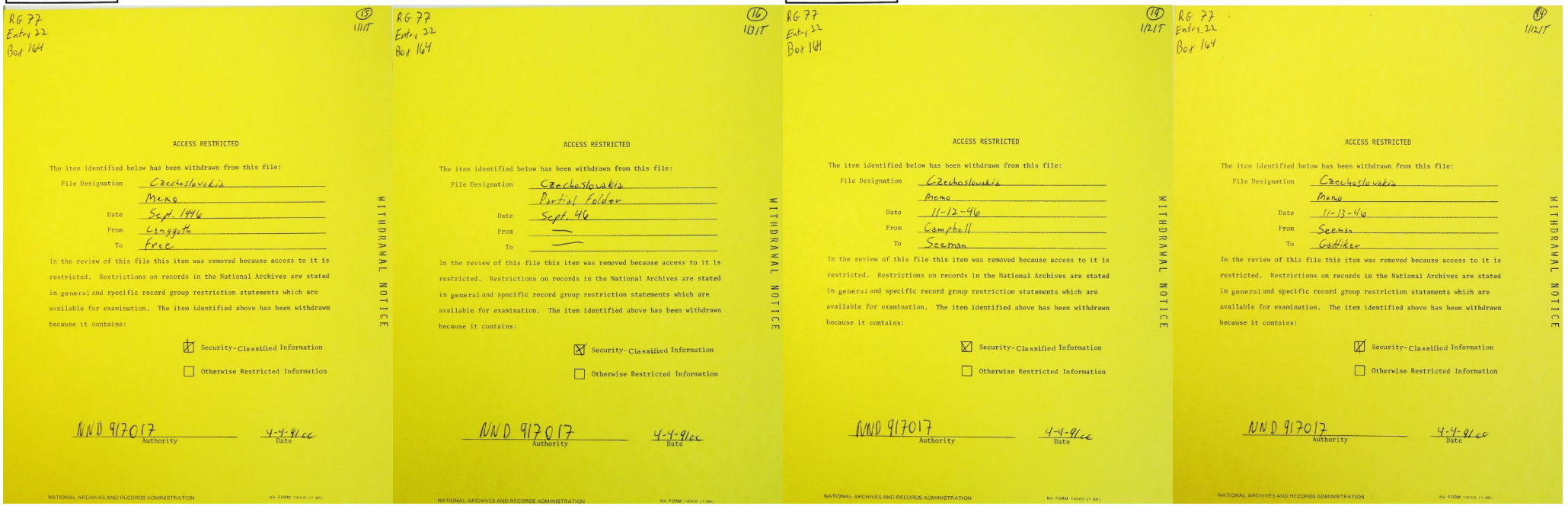


DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 164

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 164



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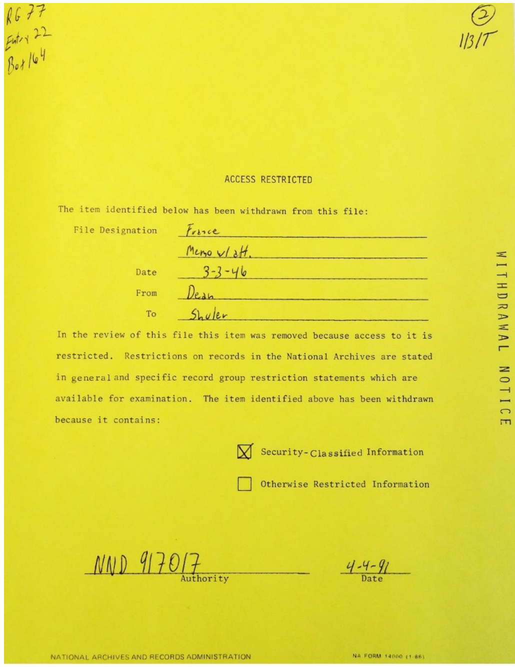


RG 77 Entry 22 Box 164 — (2) 1/13/T

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: France, Memo w/att.
Date: 3-3-46
From: Dean
To: Shuler

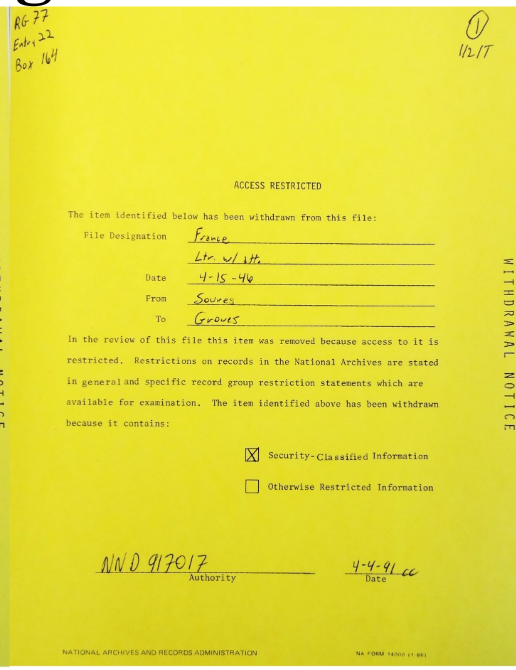
In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 (Authority) — 4-4-91 (Date)

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (1-86)



RG 77 Entry 22 Box 164 — (1) 1/2/T

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: France, Ltr. w/att.
Date: 4-15-46
From: Sowers
To: Groves

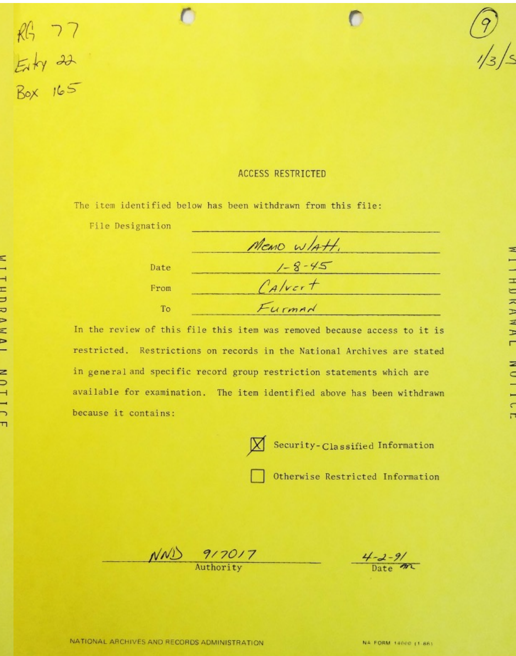
In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 (Authority) — 4-4-91 cc (Date)

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (1-86)



RG 77 Entry 22 Box 165 — (9) 1/3/S

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Memo w/att.
Date: 1-8-45
From: Calvert
To: Furman

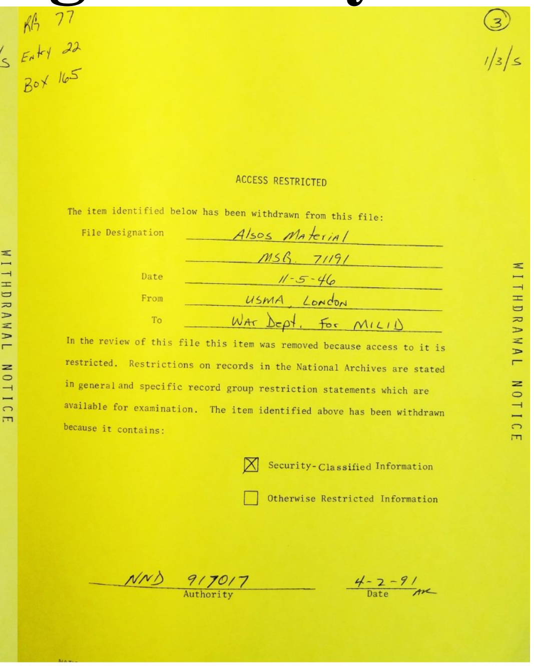
In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 (Authority) — 4-2-91 AR (Date)

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (1-86)



RG 77 Entry 22 Box 165 — (3) 1/3/S

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Alsos Material, MSB 71191
Date: 11-5-46
From: USMA, London
To: War Dept. for MILID

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 (Authority) — 4-2-91 AR (Date)

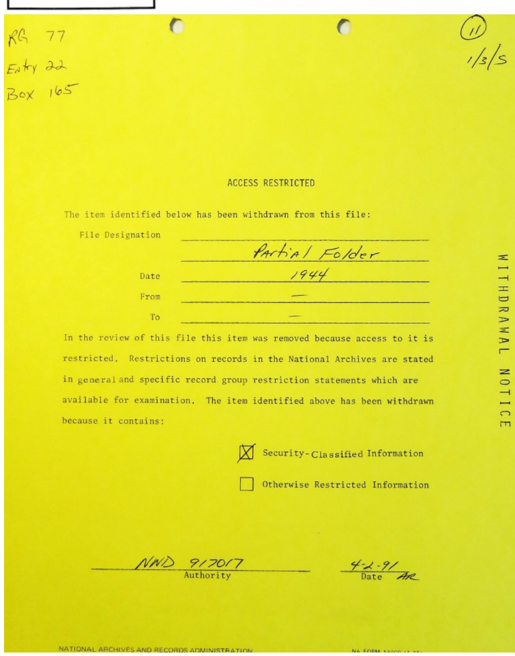
WITHDRAWAL NOTICE

DECLASSIFIED Authority NND 917017

NARA RG 77, Entry UD-22A, Boxes 164 & 165

DECLASSIFIED Authority NND 917017

NARA RG 77, Entry UD-22A, Box 165



RG 77 Entry 22 Box 165 — (11) 1/3/S

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Partial Folder
Date: 1944
From: —
To:

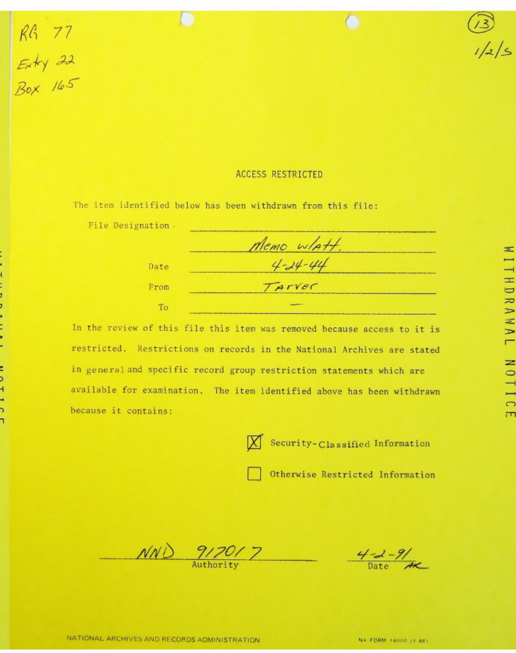
In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 (Authority) — 4-2-91 AR (Date)

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION



RG 77 Entry 22 Box 165 — (13) 1/2/S

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Memo w/att.
Date: 4-24-44
From: Tarver
To: —

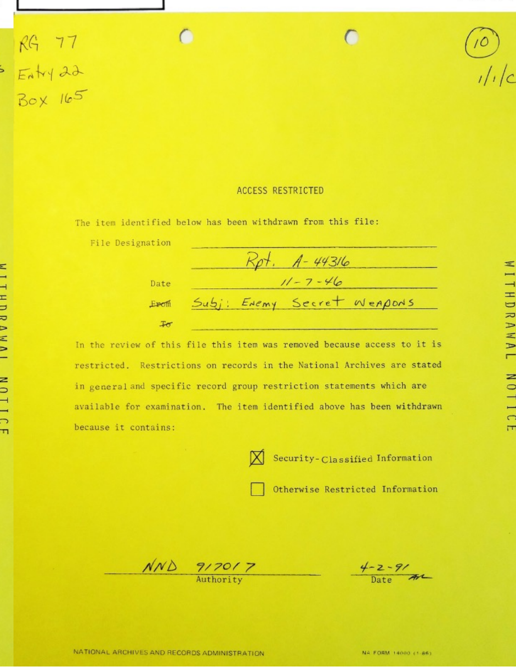
In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 (Authority) — 4-2-91 AR (Date)

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (1-86)



RG 77 Entry 22 Box 165 — (10) 1/1/C

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Rpt. A-44316
Date: 11-7-46
~~From~~ Subj: Enemy Secret Weapons
~~To~~

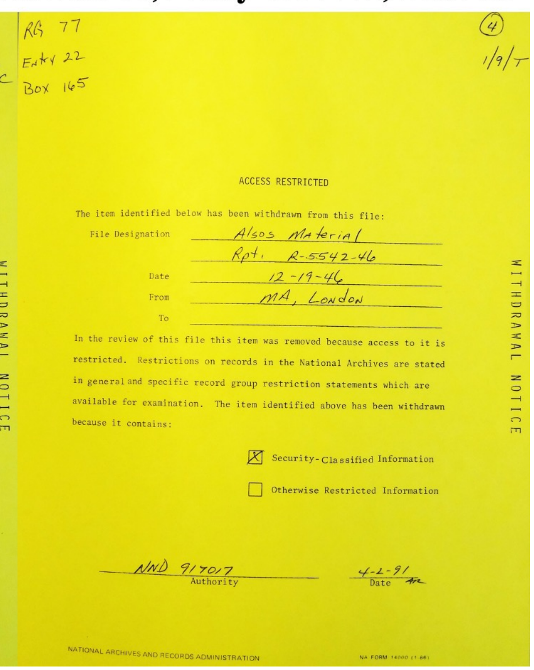
In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 (Authority) — 4-2-91 AR (Date)

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (1-86)



RG 77 Entry 22 Box 165 — (4) 1/9/T

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Alsos Material, Rpt. R-5542-46
Date: 12-19-46
From: MA, London
To:

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

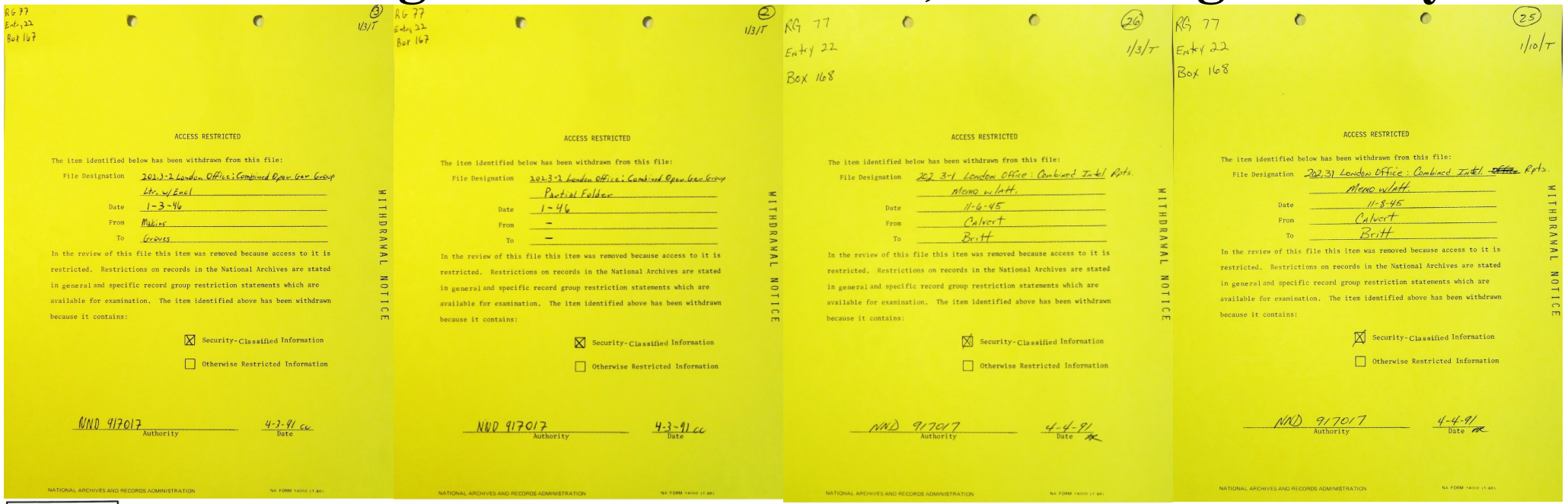
☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 (Authority) — 4-2-91 AR (Date)

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (1-86)

14. Why Are So Many Archival Files on the German Nuclear Program Still Classified, or Missing Entirely?

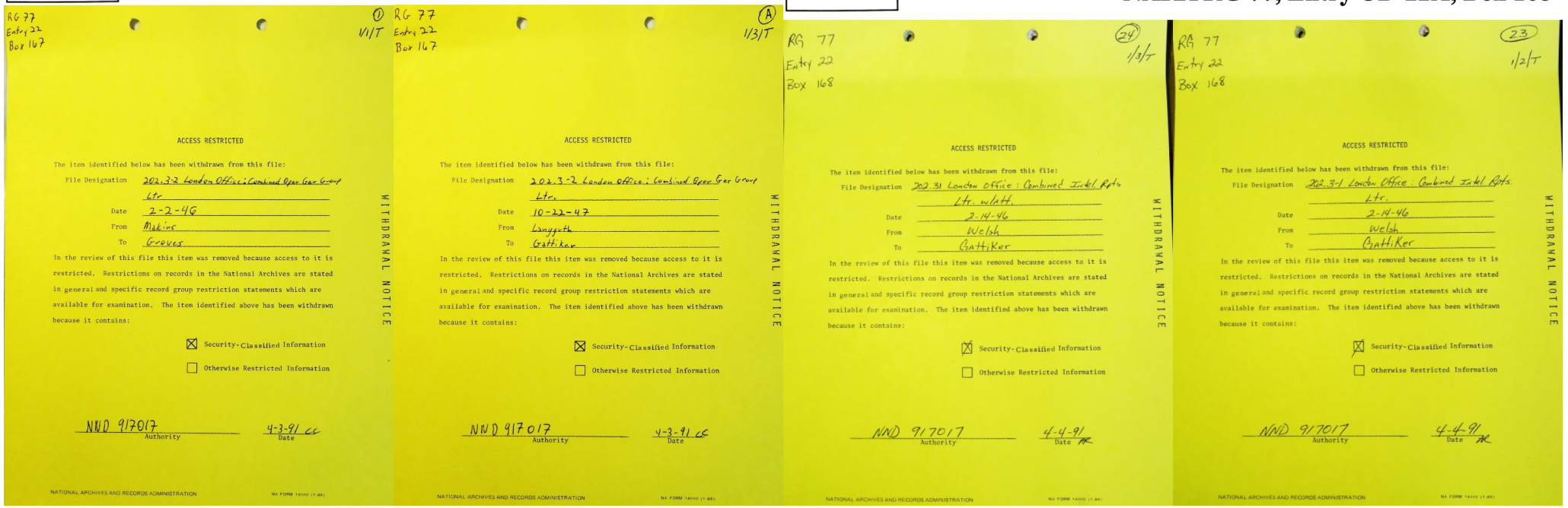


DECLASSIFIED
Authority NND 917017

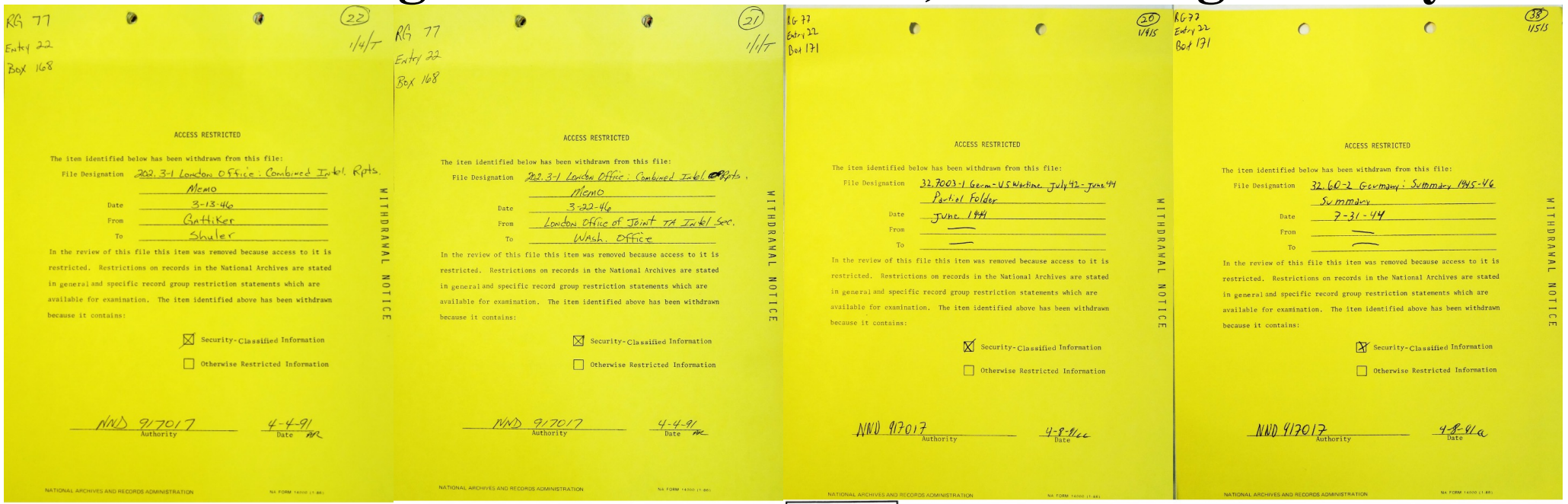
NARA RG 77, Entry UD-22A, Box 167

DECLASSIFIED
Authority NND 917017

NARA RG 77, Entry UD-22A, Box 168



14. Why Are So Many Archival Files on the German Nuclear Program Still Classified, or Missing Entirely?

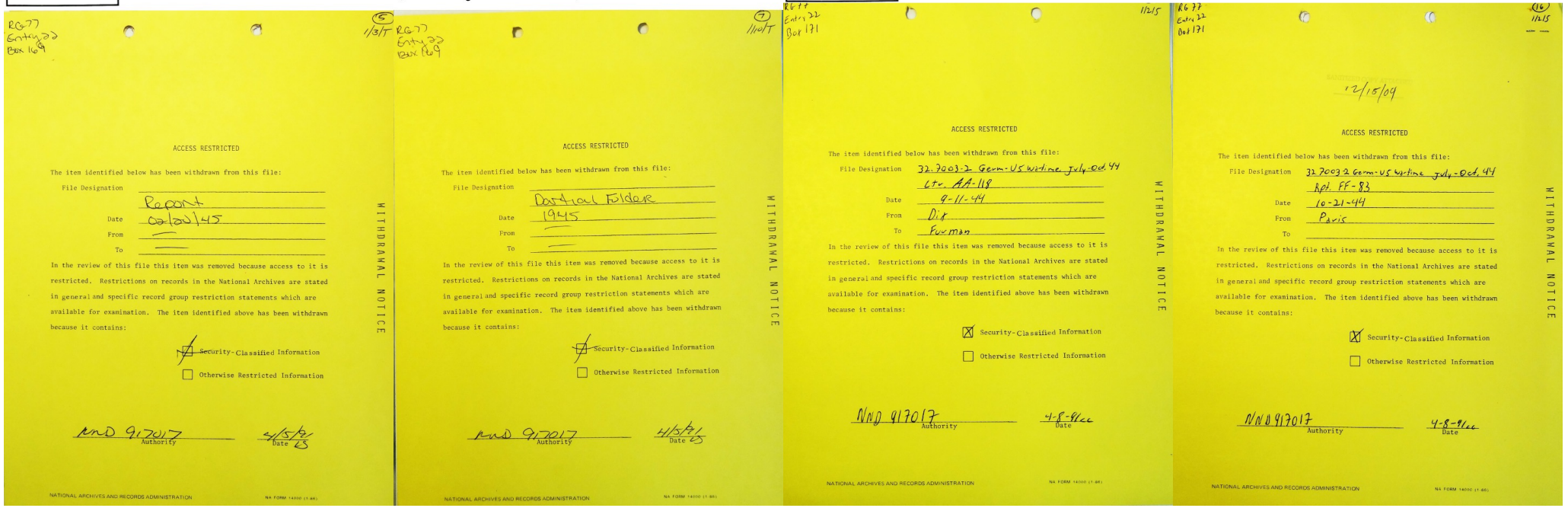


DECLASSIFIED Authority NND 917017

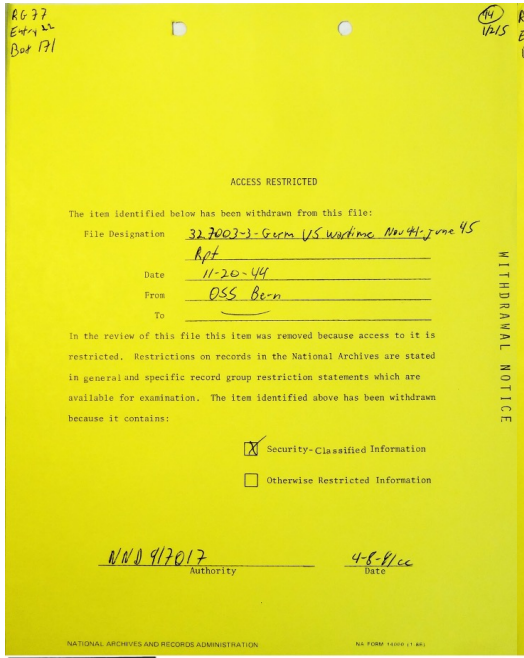
NARA RG 77, Entry UD-22A, Boxes 168 & 169

DECLASSIFIED Authority NND 917017

NARA RG 77, Entry UD-22A, Box 171



14. Why Are So Many Archival Files on the German Nuclear Program Still Classified, or Missing Entirely?


RG 77
Entry 22
Box 171

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: 32.7003-3-Germ US wartime Nov 44-June 45 Rpt
Date: 11-20-44
From: OSS Bern
To: —

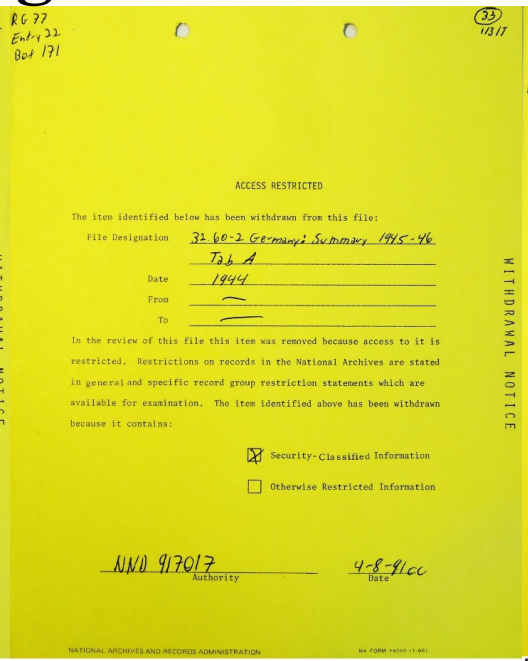
In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 Authority — 4-8-91 cc Date

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION


RG 77
Entry 22
Box 171

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: 32.60-2 Germany Summary 1945-46 Tab A
Date: 1944
From: —
To: —

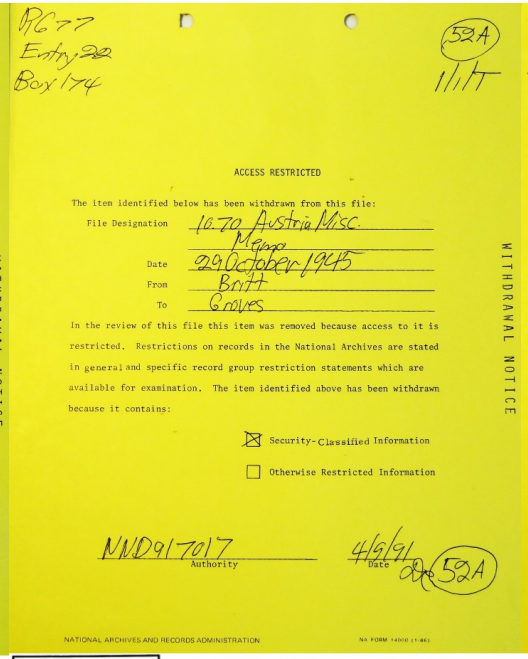
In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 Authority — 4-8-91 cc Date

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION


RG 77
Entry 22
Box 174

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: 10.70 Austria/Misc. Memo
Date: 29 October 1945
From: Britt
To: Groves

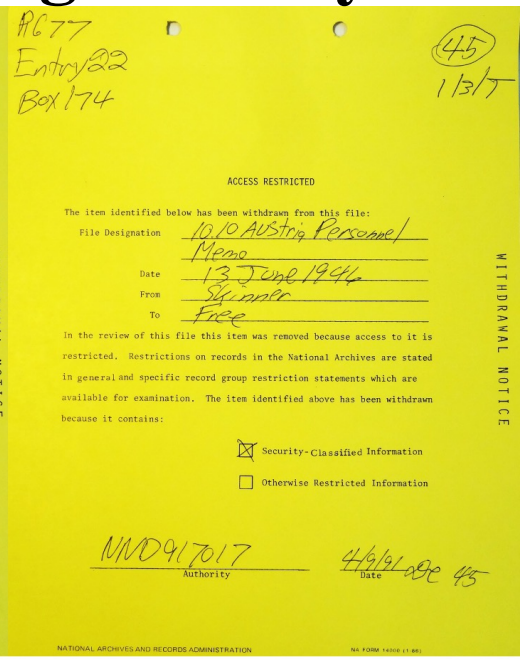
In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND917017 Authority — 4/9/91 Date — 52A

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION


RG 77
Entry 22
Box 174

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: 10.10 Austria Personnel Memo
Date: 13 June 1946
From: Skinner
To: Free

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

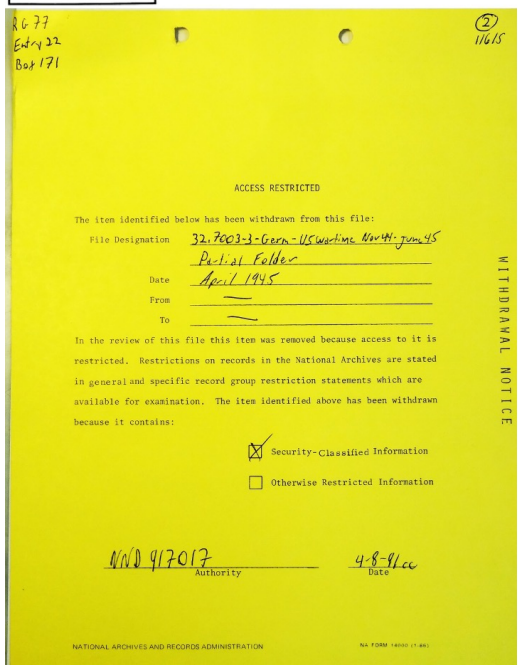
NND917017 Authority — 4/9/91 Date — 45

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

DECLASSIFIED Authority NNS 917017

NARA RG 77, Entry UD-22A, Box 171


RG 77
Entry 22
Box 171

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: 32.7003-3-Germ-US wartime Nov 44-June 45 Pol. Sit. Folder
Date: April 1945
From: —
To: —

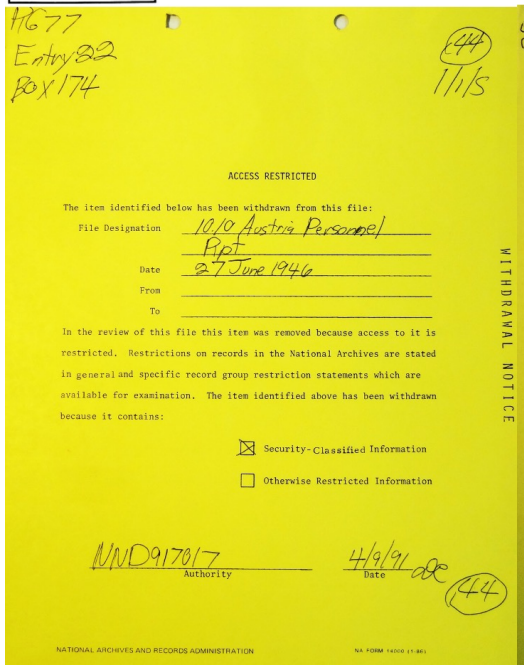
In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 Authority — 4-8-91 cc Date

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION


RG 77
Entry 22
Box 174

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: 10.10 Austria Personnel Rpt
Date: 27 June 1946
From: —
To: —

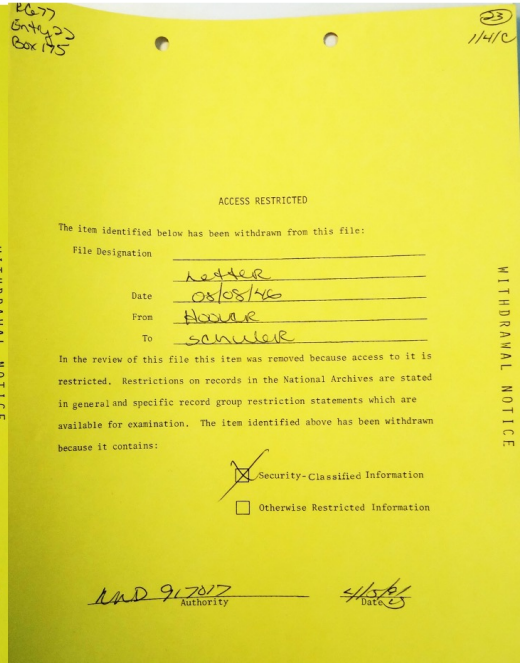
In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND917017 Authority — 4/9/91 Date — 44

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION


RG 77
Entry 22
Box 175

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Letter
Date: 08/05/46
From: Hoover
To: Schuller

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 917017 Authority — 4/15/91 Date

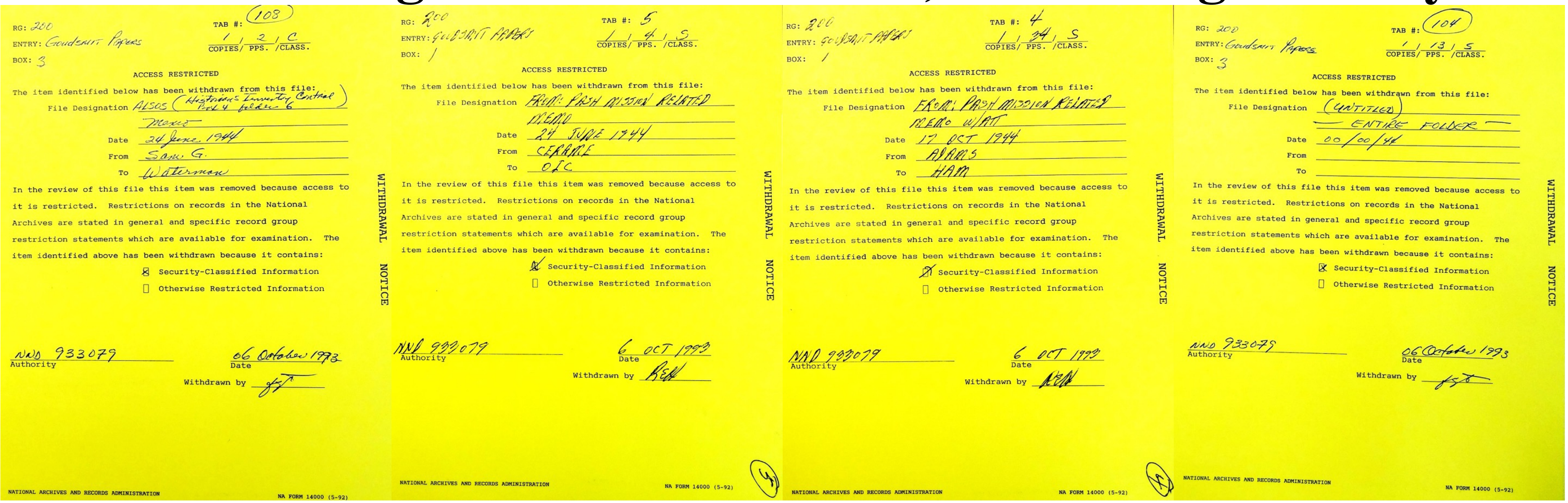
WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION

DECLASSIFIED Authority NNS 917017

NARA RG 77, Entry UD-22A, Boxes 174 & 175

14. Why Are So Many Archival Files on the German Nuclear Program Still Classified, or Missing Entirely?



RG: 200 ENTRY: Goudsmit Papers BOX: 3 — TAB #: 108 — 1 / 2 / C COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:
File Designation ALSOS (Historians Inventory Control Box 4 folder 6) Memo
Date 24 June 1944
From Sam G.
To Waterman

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 933079 Authority — 06 October 1993 Date — Withdrawn by [signature]

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (5-92)

RG: 200 ENTRY: Goudsmit Papers BOX: 1 — TAB #: 5 — 1 / 4 / S COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:
File Designation FROM: PASH MISSION RELATED MEMO
Date 24 JUNE 1944
From CERAME
To OIC

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 933079 Authority — 6 OCT 1993 Date — Withdrawn by [signature]

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (5-92)

RG: 200 ENTRY: Goudsmit Papers BOX: 1 — TAB #: 4 — 1 / 24 / S COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:
File Designation FROM: PASH MISSION RELATED MEMO W/ATT
Date 17 OCT 1944
From ADAMS
To HAM

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 933079 Authority — 6 OCT 1993 Date — Withdrawn by [signature]

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (5-92)

RG: 200 ENTRY: Goudsmit Papers BOX: 3 — TAB #: 104 — 1 / 13 / S COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:
File Designation (UNTITLED) — ENTIRE FOLDER —
Date 00/00/44
From
To

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

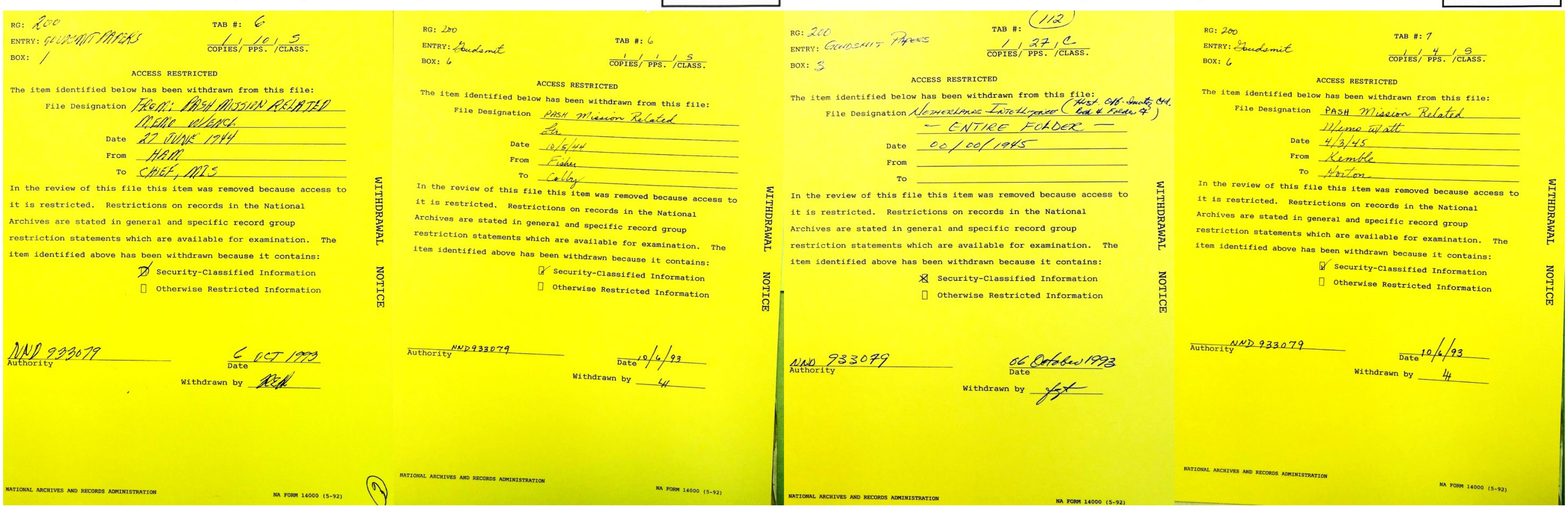
NND 933079 Authority — 06 October 1993 Date — Withdrawn by [signature]

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (5-92)

NARA RG GOUDS, Entry UD-7420, Boxes 1–9 — DECLASSIFIED Authority NND933079

NARA RG GOUDS, Entry UD-7420, Boxes 1–9 — DECLASSIFIED Authority NND933079



RG: 200 ENTRY: Goudsmit Papers BOX: 1 — TAB #: 6 — 1 / 10 / S COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:
File Designation FROM: PASH MISSION RELATED MEMO W/ENCL
Date 27 JUNE 1944
From HAM
To CHIEF, MIS

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 933079 Authority — 6 OCT 1993 Date — Withdrawn by [signature]

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (5-92)

RG: 200 ENTRY: Goudsmit BOX: 6 — TAB #: 6 — 1 / 1 / S COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:
File Designation PASH Mission Related Ltr
Date 10/5/44
From Fisher
To Colby

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND933079 Authority — 10/6/93 Date — Withdrawn by [signature]

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (5-92)

RG: 200 ENTRY: Goudsmit Papers BOX: 3 — TAB #: 112 — 1 / 27 / C COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:
File Designation Netherlands Intelligence (Hist. Off. Inventory Ctrl. Box 4 Folder 4) — ENTIRE FOLDER —
Date 00/00/1945
From
To

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 933079 Authority — 06 October 1993 Date — Withdrawn by [signature]

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (5-92)

RG: 200 ENTRY: Goudsmit BOX: 6 — TAB #: 7 — 1 / 4 / S COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:
File Designation PASH Mission Related Memo w/att
Date 4/3/45
From Kemble
To Horton

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

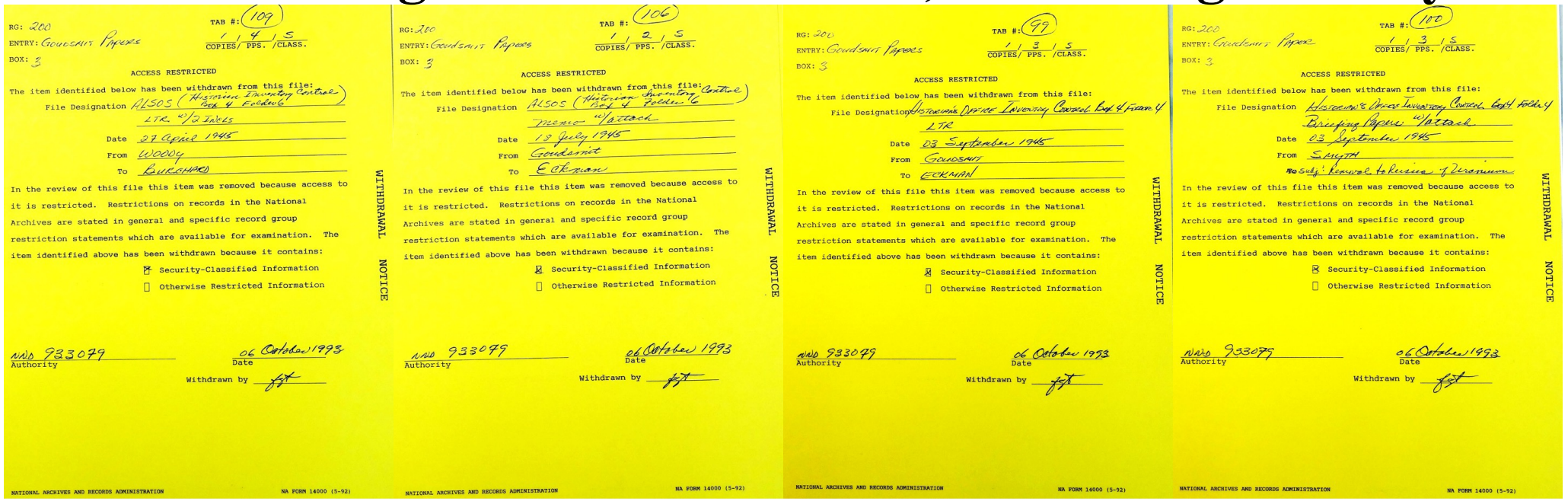
☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 933079 Authority — 10/6/93 Date — Withdrawn by [signature]

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (5-92)

14. Why Are So Many Archival Files on the German Nuclear Program Still Classified, or Missing Entirely?



RG: 200
ENTRY: Goudsmit Papers
BOX: 3
TAB #: (109)
1 / 4 / 5
COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation ALSOS (Historian Inventory Control Box 4 Folder 6)
LTR. 4/2 Incls
Date 27 April 1945
From WOODY
To BURKHARDT

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 933079 Authority
06 October 1993 Date
Withdrawn by fgt

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

RG: 200
ENTRY: Goudsmit Papers
BOX: 3
TAB #: (106)
1 / 2 / 5
COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation ALSOS (Historian Inventory Control Box 4 Folder 6)
memo 4/attach
Date 13 July 1945
From Goudsmit
To Eckman

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 933079 Authority
06 October 1993 Date
Withdrawn by fgt

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

RG: 200
ENTRY: Goudsmit Papers
BOX: 3
TAB #: (99)
1 / 3 / 5
COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation Historian's Office Inventory Control Box 4 Folder 4
LTR
Date 03 September 1945
From GOUDSMIT
To ECKMAN

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 933079 Authority
06 October 1993 Date
Withdrawn by fgt

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

RG: 200
ENTRY: Goudsmit Papers
BOX: 3
TAB #: (100)
1 / 3 / 5
COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation Historian's Office Inventory Control Box 4 Folder 4
Briefing Papers 4/attach
Date 03 September 1945
From SMYTH
To Subj: Removal to Russia of Uranium

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 933079 Authority
06 October 1993 Date
Withdrawn by fgt

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

NARA RG GOUDS, Entry UD-7420, Boxes 1–9

DECLASSIFIED Authority NND 933079

NARA RG GOUDS, Entry UD-7420, Boxes 1–9

DECLASSIFIED Authority NND 933079

RG: 200
ENTRY: Goudsmit Papers
BOX: 3
TAB #: (107)
1 / 3 / 5
COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation ALSOS (Historian's Inventory Control Box 4 Folder 6)
Memo
Date 07 August 1945
From Goudsmit
To Subj: Dissemination of Energy Scientific

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 933079 Authority
06 October 1993 Date
Withdrawn by fgt

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

RG: 200
ENTRY: Goudsmit Papers
BOX: 3
TAB #: (105)
1 / 3 / 5
COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation ALSOS (Historian Inventory Control Box 4 Folder 6)
Memo
Date 10 August 1945
From Goudsmit
To HAM

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 933079 Authority
06 October 1993 Date
Withdrawn by fgt

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

RG: 200
ENTRY: Goudsmit Papers
BOX: 3
TAB #: (110)
1 / 1 / 5
COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation ALSOS (Historian's Inventory Control Box 4 Folder 6)
Memo
Date 03 September 1945
From GOUDSMIT
To ECKMAN

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
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NND 933079 Authority
06 October 1993 Date
Withdrawn by fgt

WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

RG: 200
ENTRY: Goudsmit Papers
BOX: 3
TAB #: (111)
1 / 7 / 5
COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation ALSOS (Historian's Inventory Control Box 4 Folder 6)
Memo 4/attachs
Date 10 September 1945
From GOUDSMIT
To ECKMAN

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NND 933079 Authority
06 October 1993 Date
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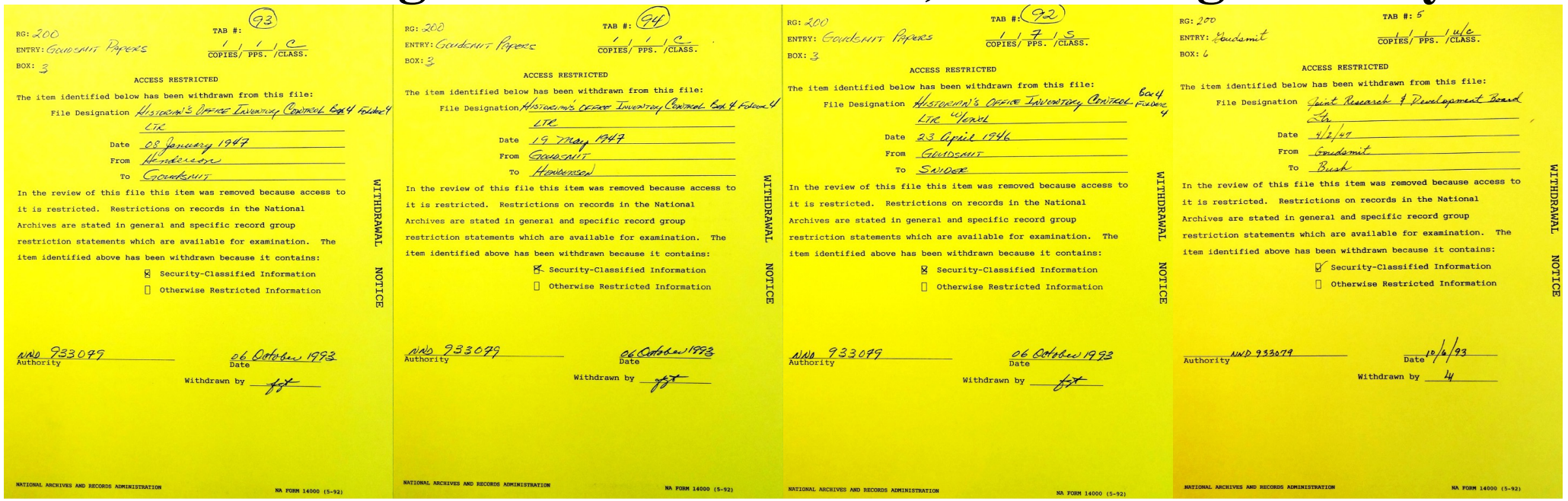
WITHDRAWAL NOTICE

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

14. Why Are So Many Archival Files on the German Nuclear Program Still Classified, or Missing Entirely?



RG: 200
ENTRY: Goudsmit Papers
BOX: 3
TAB #: (93)
1 / 1 / C
COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Historian's Office Inventory Control Box 4 Folder 4
LTR
Date: 08 January 1947
From: Henderson
To: Goudsmit

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

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NND 933079 Authority
06 October 1993 Date
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NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

RG: 200
ENTRY: Goudsmit Papers
BOX: 3
TAB #: (94)
1 / 1 / C
COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Historian's Office Inventory Control Box 4 Folder 4
LTR
Date: 19 May 1947
From: Goudsmit
To: Henderson

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

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NND 933079 Authority
06 October 1993 Date
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NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

RG: 200
ENTRY: Goudsmit Papers
BOX: 3
TAB #: (92)
1 / 7 / S
COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Historian's Office Inventory Control Box 4 Folder 4
LTR "Yeoman"
Date: 23 April 1946
From: Goudsmit
To: Snyder

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

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NND 933079 Authority
06 October 1993 Date
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NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

RG: 200
ENTRY: Goudsmit
BOX: 6
TAB #: 5
1 / 1 / U/C
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ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Joint Research & Development Board
Ltr
Date: 4/2/47
From: Goudsmit
To: Bush

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☑ Security-Classified Information
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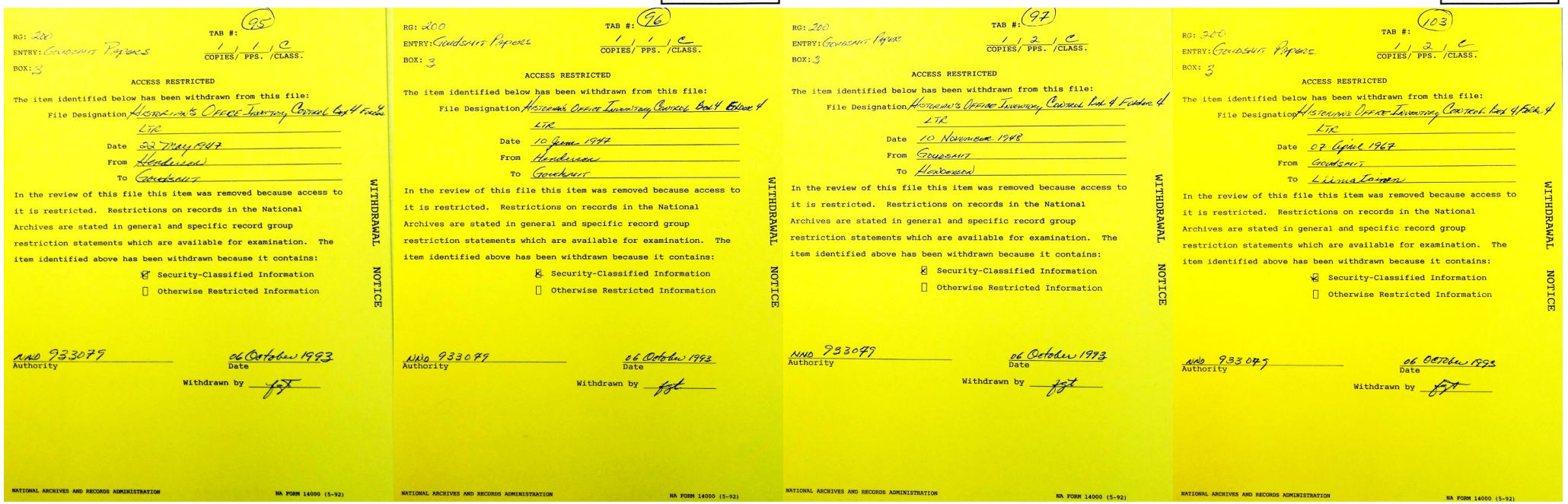
NND 933079 Authority
10/6/93 Date
Withdrawn by 4

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

NARA RG GOUDS, Entry UD-7420, Boxes 1–9

DECLASSIFIED Authority NND 933079



RG: 200
ENTRY: Goudsmit Papers
BOX: 3
TAB #: (95)
1 / 1 / C
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ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Historian's Office Inventory Control Box 4 Folder 4
LTR
Date: 22 May 1947
From: Henderson
To: Goudsmit

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
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NND 933079 Authority
06 October 1993 Date
Withdrawn by fgt

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

RG: 200
ENTRY: Goudsmit Papers
BOX: 3
TAB #: (96)
1 / 1 / C
COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Historian's Office Inventory Control Box 4 Folder 4
LTR
Date: 10 June 1947
From: Henderson
To: Goudsmit

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

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☐ Otherwise Restricted Information

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NND 933079 Authority
06 October 1993 Date
Withdrawn by fgt

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

RG: 200
ENTRY: Goudsmit Papers
BOX: 3
TAB #: (97)
1 / 2 / C
COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Historian's Office Inventory Control Box 4 Folder 4
LTR
Date: 10 November 1948
From: Goudsmit
To: Henderson

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WITHDRAWAL NOTICE

NND 933079 Authority
06 October 1993 Date
Withdrawn by fgt

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

RG: 200
ENTRY: Goudsmit Papers
BOX: 3
TAB #: (103)
1 / 2 / C
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ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Historian's Office Inventory Control Box 4 Folder 4
LTR
Date: 07 April 1967
From: Goudsmit
To: Lisma Laimen

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

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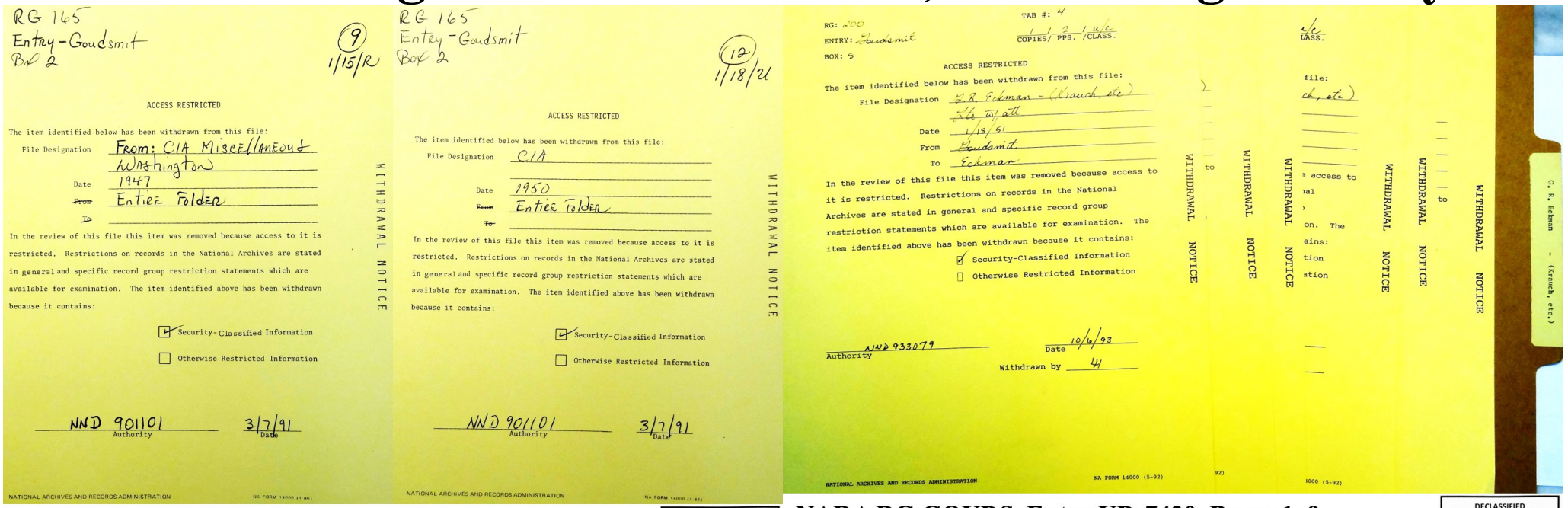
NND 933079 Authority
06 October 1993 Date
Withdrawn by fgt

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION NA FORM 14000 (5-92)

NARA RG GOUDS, Entry UD-7420, Boxes 1–9

DECLASSIFIED Authority NND 933079

14. Why Are So Many Archival Files on the German Nuclear Program Still Classified, or Missing Entirely?



RG 165
Entry - Goudsmit
Box 2

(9)
1/15/R

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: From: CIA Miscellaneous Washington
Date: 1947
~~From~~: Entire Folder
~~To~~:

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☑ Security-Classified Information
☐ Otherwise Restricted Information

NND 901101 (Authority) 3/7/91 (Date)

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (1-86)

WITHDRAWAL NOTICE

RG 165
Entry - Goudsmit
Box 2

(12)
1/18/R

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: CIA
Date: 1950
~~From~~: Entire Folder
~~To~~:

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☑ Security-Classified Information
☐ Otherwise Restricted Information

NND 901101 (Authority) 3/7/91 (Date)

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (1-86)

WITHDRAWAL NOTICE

RG: 200
ENTRY: Goudsmit
BOX: 5

TAB #: 4
1 / 3 / U/C
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ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: E.R. Eckman - (Branch etc)
Ltr to all
Date: 1/15/51
From: Goudsmit
To: Eckman

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☐ Otherwise Restricted Information

NND 933079 (Authority) 10/6/93 (Date)

Withdrawn by 44

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (5-92)

WITHDRAWAL NOTICE

G. R. Eckman - (Branch, etc.)

NARA RG GOUDS, Entry UD-7420, Boxes 1–9

DECLASSIFIED
Authority NND933079

RG: 200
ENTRY: Goudsmit Papers
BOX: 3

TAB #: (113)
1 / 92 / C
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ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: C.I.A. (Historical Inventory Central Col 4 Folder 10)
— ENTIRE FOLDER —
Date: 1954
From:
To:

In the review of this file this item was removed because access to it is restricted. Restrictions on records in the National Archives are stated in general and specific record group restriction statements which are available for examination. The item identified above has been withdrawn because it contains:

☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 933079 (Authority) 06 October 1993 (Date)

Withdrawn by jpt

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (5-92)

WITHDRAWAL NOTICE

RG: 200
ENTRY: Goudsmit Papers
BOX: 3

TAB #: 27
1 / 9 / S
COPIES/ PPS. /CLASS.

ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Folder #2 Secret Documents Nuclear Aircraft...
Entire Folder
Date: 1955
From: —
To: —

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☑ Security-Classified Information
☐ Otherwise Restricted Information

NND 933079 (Authority) 5 October 93 (Date)

Withdrawn by jbl

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (5-92)

WITHDRAWAL NOTICE

NARA RG GOUDS, Entry UD-7420, Boxes 1–9

DECLASSIFIED
Authority NND933079

RG: 200
ENTRY: Goudsmit
BOX: 5

TAB #: 8
1 / 71 / C
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ACCESS RESTRICTED

The item identified below has been withdrawn from this file:

File Designation: Ltr (O'Connor)
Memo w/Attys, G-460
Date: 15 May 1963
From: Goudsmit
To:

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☒ Security-Classified Information
☐ Otherwise Restricted Information

NND 933079 (Authority) 10-7-93 (Date)

Withdrawn by JMK

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION — NA FORM 14000 (5-92)

WITHDRAWAL NOTICE

TAB #: 22
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RESTRICTED

been withdrawn from this file:
Ltr (O'Connor)
Memo G-361
25 June 1956
Goudsmit

item was removed because access to
on records in the National
and specific record group
e available for examination. The
withdrawn because it contains:
curity-Classified Information
herwise Restricted Information

10-7-93 (Date)

Withdrawn by JMK

NA FORM 14000 (5-92)

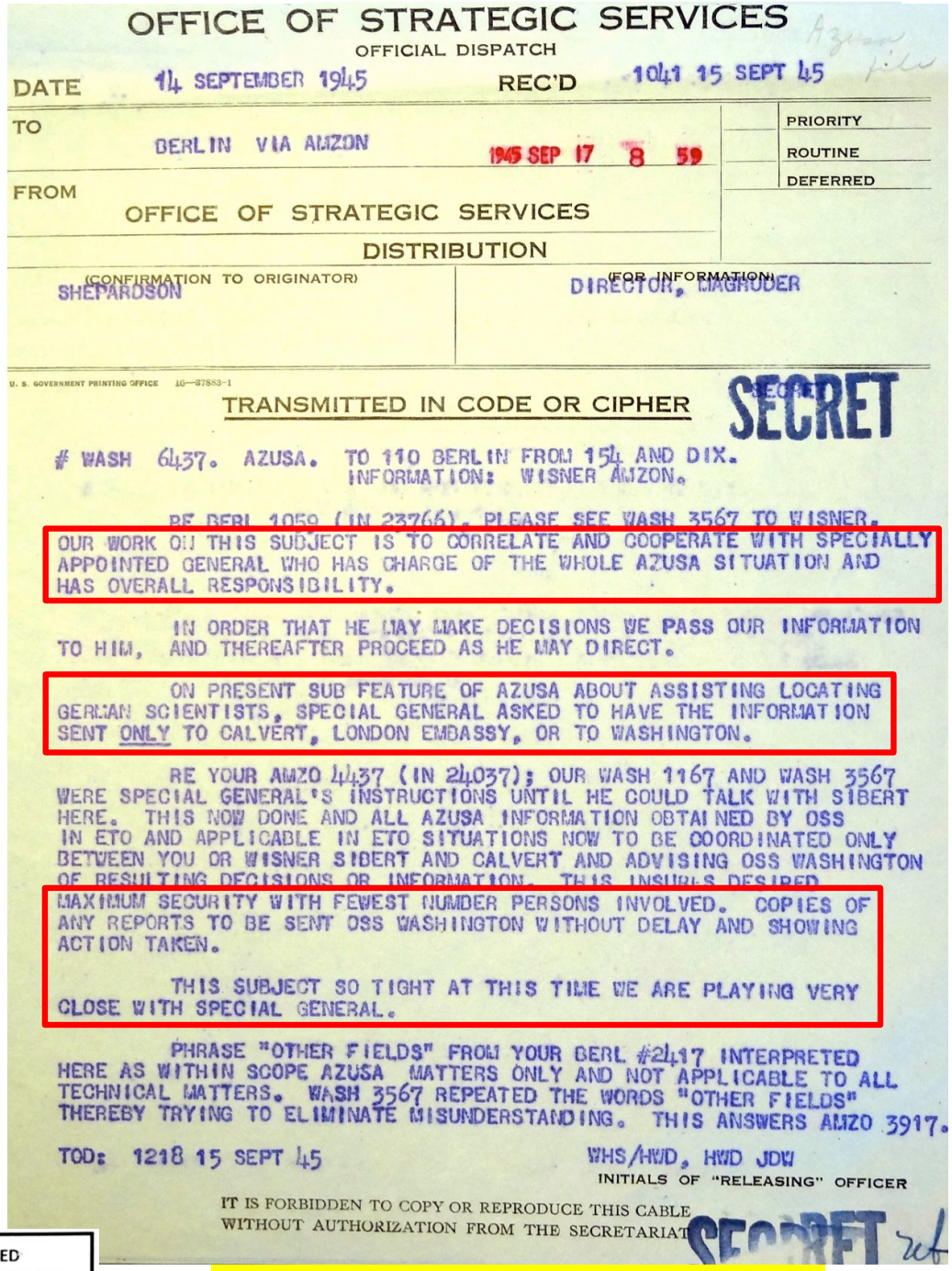
WITHDRAWAL NOTICE

REPORTS (O'Connor) - [illegible]

14. Postwar Allied Knowledge About German Nuclear Weapons

"Azusa" = OSS code word for German nuclear program

NARA RG 226, Entry A1-134, Box 219, Folder 1371: OUT AZUSA Nov. '43 Sept. '45



OFFICE OF STRATEGIC SERVICES

OFFICIAL DISPATCH

DATE 14 SEPTEMBER 1945 REC'D 1041 15 SEPT 45

TO BERLIN VIA AMZON 1945 SEP 17 8 59

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SECRET

WASH 6437. AZUSA. TO 110 BERLIN FROM 154 AND DIX.
INFORMATION: WISNER AMZON.

RE BERL 1059 (IN 23766). PLEASE SEE WASH 3567 TO WISNER. OUR WORK ON THIS SUBJECT IS TO CORRELATE AND COOPERATE WITH SPECIALLY APPOINTED GENERAL WHO HAS CHARGE OF THE WHOLE AZUSA SITUATION AND HAS OVERALL RESPONSIBILITY.

IN ORDER THAT HE MAY MAKE DECISIONS WE PASS OUR INFORMATION TO HIM, AND THEREAFTER PROCEED AS HE MAY DIRECT.

ON PRESENT SUB FEATURE OF AZUSA ABOUT ASSISTING LOCATING GERMAN SCIENTISTS, SPECIAL GENERAL ASKED TO HAVE THE INFORMATION SENT ONLY TO CALVERT, LONDON EMBASSY, OR TO WASHINGTON.

RE YOUR AMZO 4437 (IN 24037); OUR WASH 1167 AND WASH 3567 WERE SPECIAL GENERAL'S INSTRUCTIONS UNTIL HE COULD TALK WITH SIBERT HERE. THIS NOW DONE AND ALL AZUSA INFORMATION OBTAINED BY OSS IN ETO AND APPLICABLE IN ETO SITUATIONS NOW TO BE COORDINATED ONLY BETWEEN YOU OR WISNER SIBERT AND CALVERT AND ADVISING OSS WASHINGTON OF RESULTING DECISIONS OR INFORMATION. THIS INSURES DESIRED MAXIMUM SECURITY WITH FEWEST NUMBER PERSONS INVOLVED. COPIES OF ANY REPORTS TO BE SENT OSS WASHINGTON WITHOUT DELAY AND SHOWING ACTION TAKEN.

THIS SUBJECT SO TIGHT AT THIS TIME WE ARE PLAYING VERY CLOSE WITH SPECIAL GENERAL.

PHRASE "OTHER FIELDS" FROM YOUR BERL #2417 INTERPRETED HERE AS WITHIN SCOPE AZUSA MATTERS ONLY AND NOT APPLICABLE TO ALL TECHNICAL MATTERS. WASH 3567 REPEATED THE WORDS "OTHER FIELDS" THEREBY TRYING TO ELIMINATE MISUNDERSTANDING. THIS ANSWERS AMZO 3917.

TOD: 1218 15 SEPT 45 WHS/HWD, HWD JDW

INITIALS OF "RELEASING" OFFICER

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Where are the reports???

14. Postwar Allied Knowledge About German Nuclear Weapons

"Azusa" = OSS code word for German nuclear program

NARA RG 226, Entry A1-134, Box 219, Folder 1371: OUT AZUSA Nov. '43 Sept. '45

OFFICE OF STRATEGIC SERVICES

OFFICIAL DISPATCH

DATE 14 SEPTEMBER 1945 REC'D 1041 15 SEPT 45

TO BERLIN VIA AMZON 1945 SEP 17 8 59

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TOD: 1218 15 SEPT 45 WHS/HWD, HWD JDW
INITIALS OF "RELEASING" OFFICER

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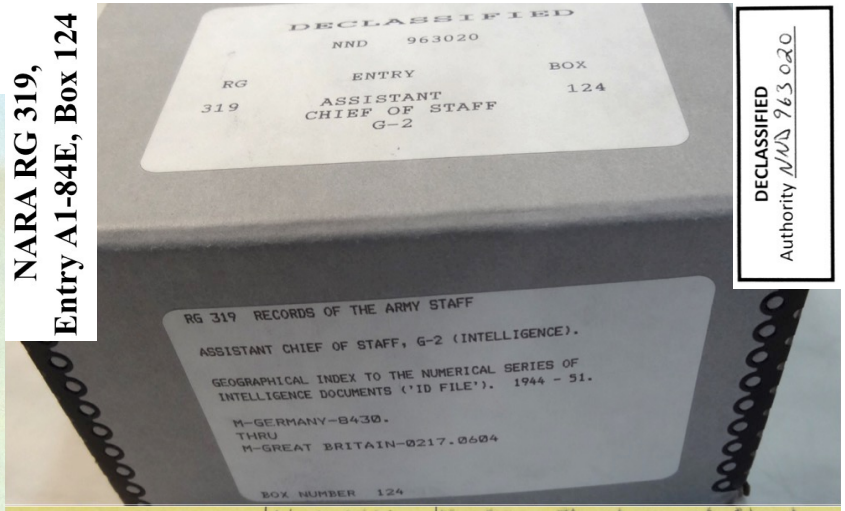
NARA RG 319, Entry A1-84E, Box 124



DECLASSIFIED Authority NND 963020

M - GERMANY (COUNTRY OR AREA)	8600.0800 S.I.B.C. (BID NUMBER)	Nuclear Physics and Atomic Energy-Miscellaneous.

NEW BID-NEW NUMBER

DATE	SOURCE	COMMENTS	SPEC. NO.	M.I.S. NO.
23 Oct 45	Navy	S-Unusual Developments		226512
2 Jan 46	2nd SC	@Blueprints of Atomic Bomb		229196

M-GERMANY (COUNTRY OR AREA)	8600.0811 (BID NUMBER)	Nuclear Physics and Atomic Energy-Miscellaneous-Research

NEW BID-NEW NUMBER

DATE	SOURCE	COMMENTS	SPEC. NO.	M.I.S. NO.
28 Mar 46	ONI	(T)OP-23-F25-1/46"Atom Bomb-Research in Germany & Influence on Developments in Soviet Russia		SD 3249
5 Aug 46	FN 412	S-Russian description of Bikini & Level atomic Bombs		293192
25 Jul 46	State	C-Estimate of German Atomic Research in Spain		293402
15 Aug 46	4870	S-application of atomic energy		300164
24 Aug 46	4870	C-Interrogation of Franz Fochs		301522
19 Aug 46	R-187-46 OB	S-Researchers of atomic Energy		304481
23 Aug 46	State	U-Manuf. of arms and armament-Soviet Zone		303387

INTELLIGENCE LIBRARY

M-GERMANY (COUNTRY OR AREA)	8600.0713 (BID NUMBER)	Nuclear Physics and Atomic(2 Energy Uses - Bombs.

1947 NEW BID-NEW NUMBER

DATE	SOURCE	COMMENTS	M.I.S. NO.
4 June 47	EM-246	C - Atomic Bomb	373409

Where are the reports???

15. Conclusions

According to recently rediscovered archival documents, wartime Germany was reported to be:

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- **Processing uranium ore to uranium oxide, uranium metal, UF_6, and other products at at least ~20 sites.**

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- **Employing tens of thousands of workers in multiple plants to enrich uranium.**
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- **Producing heavy water at at least ~25 sites all over German-controlled Europe.**

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- **Producing enormous quantities of many other materials (beryllium, fluorine, calcium, zirconium, cadmium, etc.) that are vital for a nuclear weapons program, in some cases all at the same site.**

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- **Manufacturing uranium gas centrifuges in factories in Switzerland, Kiel, Freiburg, Göttingen, Munich, Breslau, etc.**
- **Employing tens of thousands of workers in multiple plants to enrich uranium.**
- **Building numerous dedicated power plants to provide electricity to those facilities.**
- **Producing heavy water at at least ~25 sites all over German-controlled Europe.**
- **Producing enormous quantities of many other materials (beryllium, fluorine, calcium, zirconium, cadmium, etc.) that are vital for a nuclear weapons program, in some cases all at the same site.**
- **Building large, partially underground octagonal pool fission reactors that are visible from wartime aerial surveillance photos and described in site reports.**

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- **Producing enormous quantities of many other materials (beryllium, fluorine, calcium, zirconium, cadmium, etc.) that are vital for a nuclear weapons program, in some cases all at the same site.**
- **Building large, partially underground octagonal pool fission reactors that are visible from wartime aerial surveillance photos and described in site reports.**
- **Developing and testing spherical implosion bombs and explosive lenses from 1940 onward.**

15. Conclusions

According to recently rediscovered archival documents, wartime Germany was reported to be:

- **Obtaining thousands of tons of uranium and thorium ores from sites across Europe, beginning in 1938 and continuing as a high priority to the very end of the war.**
- **Processing uranium ore to uranium oxide, uranium metal, UF_6, and other products at at least ~20 sites.**
- **Manufacturing uranium gas centrifuges in factories in Switzerland, Kiel, Freiburg, Göttingen, Munich, Breslau, etc.**
- **Employing tens of thousands of workers in multiple plants to enrich uranium.**
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- **Developing delivery vehicles for those weapons.**

If you received hundreds of pages of documentary evidence that some random modern country suddenly started doing all of those things, would you conclude that that country clearly had no significant nuclear weapons program, or would you decide that all of that evidence raises real concerns and warrants a more detailed investigation?

15. Some Well-Informed People Who Concluded That the German Nuclear Weapons Program Was Not Small and Primitive

United States
President Franklin D. Roosevelt
Vice President Henry A. Wallace
Senator Harry F. Byrd
Senator Elbert D. Thomas
Justice Robert H. Jackson
FBI Director J. Edgar Hoover
Secretary Henry H. Fowler
Ambassador John Gunther Dean
General Henry H. Arnold
General Thomas J. Betts
General Omar N. Bradley
General George Bryan Conrad
General Dwight D. Eisenhower
General Leslie R. Groves
General John L. Magruder
General George C. Marshall
General George S. Patton
General Donald L. Putt
General George C. McDonald
General William L. Richardson
General Carl A. Spaatz
Commander Herbert Agar
Colonel Howard W. Dix
Colonel George R. Eckman
Colonel John A. Keck
Colonel John A. O'Mara
Colonel Loyd K. Pepple
General Leslie E. Simon
Colonel Lowell P. Weicker
Colonel George Bryant Woods
Major Horace K. Calvert
Major Alexander de Seversky
Major Robert R. Furman
Captain George C. Davis
Jack H. Alberti
Moe Berg

United States (cont'd)
William Casey
Allen Dulles
Frederick R. Loofbourow
Whitney Shepardson
Dr. Samuel K. Allison
Dr. Edward L. Bowles (MIT)
Dr. Karl P. Cohen
Dr. Enrico Fermi
Dr. Richard P. Fischer
Dr. Samuel A. Goudsmit
Caperton B. Horsley
Dr. Gerard P. Kuiper
Dr. Philip Morrison
Dr. Lothar W. Nordheim
Dr. Todos M. Odarenko
Dr. J. Robert Oppenheimer
Dr. Charles P. Smyth
Dr. Leo Szilard
Dr. Edward Teller
Dr. Alvin M. Weinberg
Dr. Eugene P. Wigner
Fritz Lang
Associated Press reporters
Life reporters
Los Angeles Times reporters
Newsweek reporters
New York Times reporters
Time reporters
Washington Post reporters

United Kingdom
Sir Winston Churchill
Sir Roy Fedden
Sir Reginald Patrick Linstead
Lord Robert Gilbert Vansittart
Lord John Moore-Brabazon
Esme Bligh, Earl of Darnley
Major Edmund Tilley
Charles Chamberlain
David Gattiker
George Gordon Young

Soviet Union
General Ivan Ilyichev
Marshal Georgy Zhukov
Boris Chertok
Dr. Georgy Flerov
Dr. Igor Kurchatov
Pavel V. Oleynikov
L. D. Riabev

Other:
Czech sources
(e.g., Karel Staller)
Dutch sources (e.g.,
Anthony van der Steenhoven)
French sources
(e.g., Jacques Bergier)
Polish sources
(e.g., Gezo Mansfeldt)
Swedish sources
(e.g., Nils Werner Larsson)
Swiss sources
(e.g., Constantin Chilowsky)

Axis
Adolf Hitler
Hermann Göring
Heinrich Himmler
Wilhelm Ohnesorge
Benito Mussolini
Grand Mufti of Jerusalem
Erwin Bartmann
Helmut J. Fischer
Werner Grothmann
Julius Schaub
Werner Wächter
Manfred von Ardenne
Dr. Wernher von Braun
Dr. Kurt Diebner
Dr. Robert Döpel
Dr. Rudolf Edse
Dr. Siegfried Flügge
Dr. Wilhelm Groth
Dr. Otto Hahn
Dr. Fritz Houtermans
Dr. Johannes Hans Jensen
Dr. Fritz Rehbein
Dr. Erich Schumann
Dr. Hermann Staudinger
Dr. Georg Stetter
Heinz Stölzel
Dr. Walter Trinks
Dr. Wilhelm Voss
General Walter Dornberger
General Gerhard Franz
General Hans Kammler
General Heinrich Kittel
Erwin Respondek
Hans Ulrich Rudel
Adolf Schneider
Alwin Urff

15. Further Work

The true, detailed, complete history of the German nuclear program has not yet been publicly written by anyone (including me).

To do that, we must first:

- **Search for relevant documents in archives and personal collections around the world, and lobby to have all files declassified and released.**

- **Conduct industrial archaeology digs (carefully!) and laboratory analyses at all sites suspected to have been involved in the German nuclear program.**

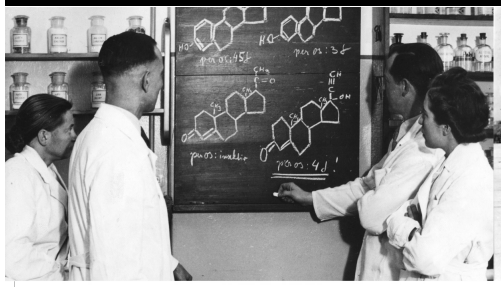
We want you…
to dig!

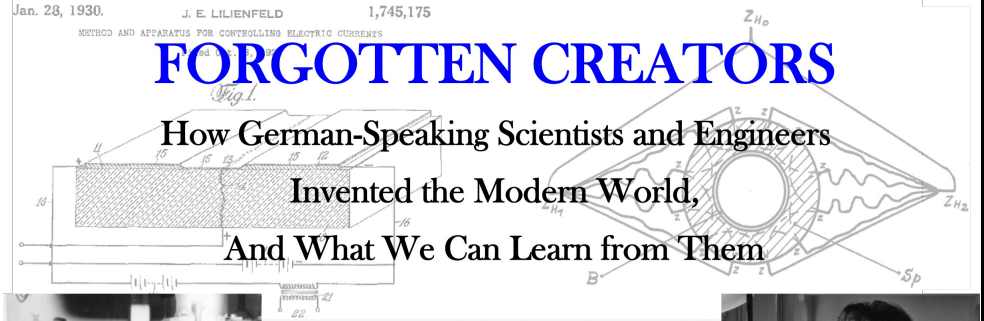
Acknowledgments

American Institute of Physics Bohr Library & Archives (Maryland)
Archiv der Max-Planck-Gesellschaft (Berlin-Dahlem)
Archiv der Österreichischen Akademie der Wissenschaften (Vienna)
Atomkeller Museum (Haigerloch)
Bayerische Staatsbibliothek (Munich)
Bornholm Defence Museum
Bornholm Museum
Bundesarchiv Militärarchiv (Freiburg)
Deutsches Historisches Institut (Moscow)
Deutsches Historisches Museum (Berlin)
Deutsches Museum (Munich)
Deutsches Technikmuseum (Berlin)
Foundation Centre for German Communication (Netherlands)
Franklin D. Roosevelt Presidential Library (Hyde Park, NY)
Gedenkdienstkomitee Gusen (Austria)
Historisch-Technisches Museum Peenemünde
Historisch-Technisches Museum Versuchsstelle Kummersdorf
Jonastalverein (Arnstadt)
KZ-Gedenkstätte Mittelbau-Dora (Nordhausen)
Nationaal Archief (The Hague, Netherlands)
National Air and Space Museum (Washington, DC)
Norwegian Industrial Workers Museum (Vemork)
Sachverständigenbüro Staude (Limbach-Oberfrohna)
Schweizerisches Bundesarchiv (Bern)
Schweizerische Nationalbibliothek (Bern)
Staatsarchiv, Staatskanzlei Obwalden (Sarnen, Switzerland)
Standortübungsplatz (Truppenübungsplatz) Ohrdruf
Technisches Museum Wien (Vienna)
U.K. Imperial War Museum Archive (Duxford)
U.K. National Archives (Kew)
University of Vienna
U.S. Air Force Historical Research Agency (Alabama)
U.S. Combined Arms Research Library (Kansas)
U.S. Holocaust Memorial Museum (Washington, DC)
U.S. Library of Congress
U.S. National Archives at Atlanta (Morrow, Georgia)
U.S. National Archives at Boston (Waltham, Massachusetts)
U.S. National Archives at College Park (Maryland)
U.S. National WWII Museum (New Orleans)
Villa Folke Bernadotte (von Ardenne house, Berlin)
Yad Vashem Holocaust Resource Center (Israel)

Guido Abate
Joseph E. Backofen, Jr.
Umberto Bartocci
Christian Bergner
David Bleecker
Stefan Brauburger
Gordon James Brown
David Cassidy
Casey Clarke
George Cully
Frank Döbert
Gernot Eilers
Silke Fengler
Friedrich Georg
Charlie Hall
István Hargittai
Rudolf Haunschmied
Michael Haupt
Gunther Hebestreit
Philip Henshall
Marko Herceg
Manfred Höfert
Dieter Hoffmann
Karl-Heinz Huhn
Carter Hydrick
Guy Inchbald
Rainer Karlsch
Adam Kretschmer
Wolf Krotzky
Tom Kunkle
Norberto Lahuerta
Benjamin Levin
Kathy Lowney
Manuel Lukas
Jaroslav Mareš
Diane McWhorter
Thomas Mehner
Marek Michalski
Günter Nagel
Yorck Neudenberger
Michael Neufeld
Douglas M. O'Reagan
William Pellas
Philip Pesavento
Heiko Petermann
Fritz Pfeiffer
Jaroslav Pilar
Lee Pondrom
Johannes Preuss
Bruce Cameron Reed
Georg Ribienski
Luca Russo
Rolf-Harald Ruthke
William Schneck
Wolfgang Schwanitz
Brian R. Scott
D. Ray Smith
Henry Stevens
Family of Heinz Stoelzel
David Strozzi
Andreas Sulzer
Matthias Uhl
Mark Wade
Mark Walker
Stephen Walton
Alex Wellerstein
Ed West
Kevin, Cathy,
and Peter Wilson
Clive R. Woodley
Benjamin Zusman
My family for their
patience and support

Modern society runs on revolutionary innovations from the predominantly German-speaking scientific world ~1800–1945

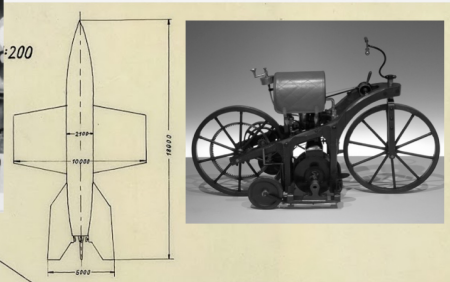


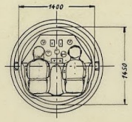


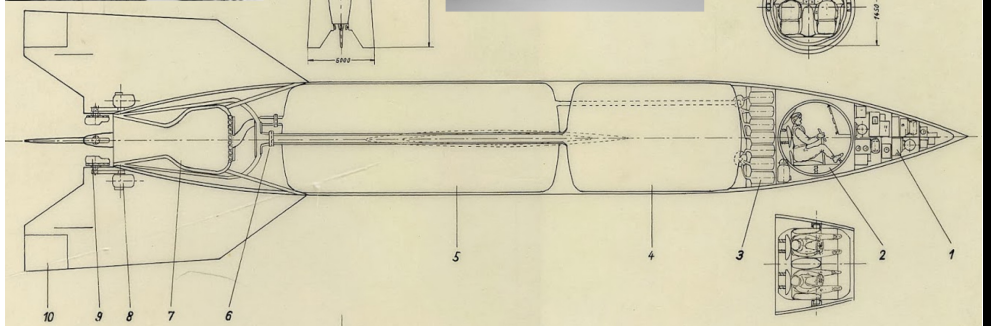
FORGOTTEN CREATORS

How German-Speaking Scientists and Engineers Invented the Modern World, And What We Can Learn from Them

Todd H. Rider







Available for free at: riderinstitute.org/revolutionary-innovation

Over 6000 pages covering:

- **Major innovators and innovations produced by the predominantly German-speaking scientific world ~1800–1945**
- **Systemic factors that promoted so much innovation in that place and time**
- **Technology transfer out of the German-speaking world**
- **What we can learn that could improve innovation in the modern world**
- **>1000 pages of primary sources/analysis on the WWII German nuclear program**
- **>400 pages of bibliography**

Reviewed by European and American historians and scientists

Updated as new information is found

Short version—but click the links!

8.8 Nuclear Engineering in the Third Reich

This section presents evidence which suggests that the World War II German nuclear program was much larger and much more advanced than has previously been generally understood. While this claim may seem controversial, much of the relevant archival evidence has only been declassified and rediscovered in recent years, and was not publicly available when earlier historical assessments were made. The evidence presented here covers:

For a far more detailed presentation of the currently available evidence, see Appendix D. As explained in Section 8.8.15, much more work is needed to uncover and evaluate evidence regarding the true history and extent of the wartime nuclear program.

8.8.1 Flaws in the Conventional Historical View of the German Program

The conventional historical view that has been held from 1945 to the present is that the World War II German nuclear program was very small and poorly funded, that Germany was still trying to complete its first prototype fission reactor when the war ended, and that Germany never even made a serious attempt to develop nuclear weapons.[6] This view is based on three categories of evidence, although each category has its own limitations as summarized below and in Section D.1:

[6] E.g., Goudsmit 1945; Goudsmit 1947; Groves 1962; Hentschel and Hentschel 1996; Hoffmann 2023; Irving 1967; Pash 1969; Popp 2016, 2021; Powers 1993; Rhodes 1986; Rose 1998; Walker 1989, 1995, 2020, 2024a, 2024b.

Long version of nuclear program

Available for free at:
riderinstitute.org/revolutionary-innovation

Appendix D

Advanced Creations in Nuclear Engineering

Der Welt Erbe gewänne zu eigen,
wer aus dem Rheingold schüfe den Ring,
der maßlose Macht ihm verlieh'.

The whole world can be possessed by one
who from the Rhinegold forges the Ring,
which can bestow immeasurable power.

Richard Wagner. 1854. *Das Rheingold.* Scene I. Wellgunde.

As discussed in Chapter 8, contributions by the German-speaking research world to fundamental nuclear science are very well documented.[1] Wilhelm Röntgen discovered X-rays in 1895, and Ludwig Zehnder was making detailed whole-body X-ray photos of humans by 1896. Hans Geiger and Walther Müller developed accurate radiation meter designs (Geiger counters or Geiger-Müller tubes) during the period 1908–1928 that are still in use today. Nuclear fission reactions were first proposed by Ida Tacke Noddack in 1934, and demonstrated and explained by Otto Hahn, Fritz Strassmann, Lise Meitner, and Otto Frisch in 1938–1939. Nuclear fusion reactions were proposed by Fritz Houtermans and his student Robert Atkinson in 1928–1929, and refined by Carl Friedrich von Weizsäcker and Hans Bethe in 1938. Detailed mathematical models of the nucleus, essential for accurately predicting nuclear decays and reactions, were first developed by von Weizsäcker in 1935 and ultimately finalized by Otto Haxel, Johannes Hans Jensen, Maria Goeppert Mayer, Hans Suess, and Eugene Wigner by 1949.

[1] See for example: Bethe 1991, 1997; Blatt and Weisskopf 1952; Brown and Lee 2006; Otto Hahn 1968; Irving 1967; L'Annunziata 2016; Nachmansohn 1979; Rife 1999; Schweber 2012; Sime 1996; Szanton 1992; Wigner 1967.

Some Reviewers' Comments on *Forgotten Creators*

"Todd H. Rider's *Forgotten Creators* is an encyclopedic consideration of Germany's central place in the advancement of science and technology between 1800 and 1945. Drawing upon a wide range of sources, Rider has summarized that effort in a survey that will impress the reader just as much for the breadth of German intellectual achievement as for the influence that achievement has had upon the modern world."

George W. Cully, retired Director, Office of History at Air University, Maxwell Air Force Base, Alabama

"Todd H. Rider's *Forgotten Creators* is a monumental treatise about and an exciting intellectual journey through the contributions of scientists and technologists in Germany and other Central European countries and German-speaking areas to universal progress. It is thoroughly researched, meticulously documented, and presented in an easy-to-perceive way. The pre-war and pre-Nazi German system of science support has lessons that would be difficult to emulate but worthy to ponder about even today. The long-range tragic consequences in science caused by National Socialism are well demonstrated as are the benefits in the West and in the East from the exodus of Jewish scientists before and the importation of others from Germany following World War II. The book is a virtually bottomless well for mining reliable information in the history of science and technology. The 'forgotten creators' are no longer forgotten. Todd is to be congratulated for his accomplishment and thanked for sharing it so generously with the international community."

István Hargittai, Professor Emeritus of Chemistry, Budapest University of Technology and Economics, author of *Buried Glory, Candid Science, Drive and Curiosity, Great Minds, Judging Edward Teller, Martians of Science,* and *The Road to Stockholm*

"The book *Forgotten Creators* is a really impressive book, as Todd H. Rider tries to mention all relevant German-speaking scientists and engineers and their scientific fields up to 1945 in this mammoth project. In this form, nobody has dared to do this before. The author deserves my full respect for this. I am pleased that we were able to support him in his research."

Thomas Köhler, Peenemünde Historical-Technical Museum historian and head of the archive

"*Forgotten Creators* is an examination of mid-twentieth-century German science and technology, studying the question of how this era came to be so productive. Using extensive reproduction of original materials and source accounts, the author is not only able to provide an overview of what is known about wartime activities, but is also able to indicate avenues for future historical research. The careful and comprehensive referencing permits the materials presented to be used in academic studies. A notable feature of this work is the fluid format provided by online publication, allowing revisions and new materials to be added. An especially important emphasis of the book is what can be learned from both the German-speaking scientists and the World War II era in general that could improve scientific productivity and creativity now."

Thomas Kunkle, Los Alamos National Laboratory, retired

"With his work, based on very comprehensive, thoroughly researched sources, Todd Rider has presented an astonishing study of the history of German science, especially in the first half of the twentieth century, which also reveals many connections that have been unjustly forgotten or little noticed. This also applies to numerous persons whose achievements are hardly known."

Günter Nagel, author of *Wissenschaft für den Krieg, Himmlers Waffenforscher, Atomversuche in Deutschland,* and *Das geheime deutsche Uranprojekt 1939-1945*

"A very valuable part of the book is devoted to the development of nuclear weapons in Germany during WWII, 1939-1945. While the histories of both the US/British Manhattan Project and the Soviet atomic project have been to a large extent declassified, little is actually known about the German work. Rider has done historians a favor by marshalling all of the evidence he could find in US, German, and Russian archives regarding the German atomic project. The inescapable conclusion is that the Germans were much farther advanced in nuclear weapons development than is generally thought."

Lee Pondrom, Professor Emeritus of Physics, University of Wisconsin-Madison, author of *The Soviet Atomic Project: How the Soviet Union Obtained the Atomic Bomb*

"*Forgotten Creators* by Todd Rider is an extraordinary work of detailed research and new insights into the technological advances contributed by German-speaking scientists. His lengthy and in-depth study of history often overlooked or not even seen in more cursory reviews is a refreshing read. His attempt to create the fullest account possible has resulted in a fine reference book that also serves to introduce new research for the reader. Rider's contention, right up front in the Executive Summary—that inventions and discoveries had their highest concentration of revolutionary innovations from scientists and engineers from the German-speaking central European research world in the nineteenth and early twentieth centuries—demands the reader's attention. He then fills an enormous amount of over 4,000 pages with supporting details. Amazing subject matter and new revolutionary insights dug up through meticulous research make *Forgotten Creators* a 'must read' for serious historians and curious researchers alike."

D. Ray Smith, Oak Ridge National Lab Historian, retired

"This truly voluminous study provides an in-depth overview of techno-scientific achievements and innovations which originated from the German-speaking world. It is a rich and fascinating history of the transnational circulation of knowledge over a period of no less than two centuries."

Helmuth Trischler, Head of Research, Deutsches Museum, Munich

"A most important and deserving book. Todd Rider's research on the German rocket and nuclear programs in World War II is especially impressive because of the number and depth of the sources cited and the meticulousness of their evaluation. Really pioneering work has been done here!"

Matthias Uhl, Deutsches Historisches Institut, Moscow, author of *Stalins V-2: Der Technologietransfer der deutschen Fernlenkwaffentechnik* and *Die Organisation des Terrors: Der Dienstkalender Heinrich Himmlers 1943-1945*

"Todd Rider has produced a meticulously researched and cogently argued *tour de force* on the men and the circumstances that drove the modern German Renaissance in science and technology. Brought out of the long shadow of the Third Reich, the story of this Golden Age of human enquiry is convincingly shown to have as much relevance to our present times as it did then. A remarkable achievement."

Stephen Walton, Senior Curator, U.K. Imperial War Museum

Dr. Todd H. Rider

riderinstitute.org

Fundamental Limitations on Plasma Fusion Systems Not in Thermodynamic Equilibrium

by

Todd Harrison Rider

S.M., Nuclear Engineering, MIT, 1994
S.M., Electrical Engineering and Computer Science, MIT, 1991
S.B., Electrical Engineering, MIT, 1991

Submitted to the Department of Electrical Engineering and Computer Science in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 1995

Signature of Author ______ Department of Electrical Engineering and Computer Science May 19, 1995

Certified by ______ Lawrence M. Lidsky, Professor of Nuclear Engineering, Thesis Supervisor

Accepted by ______ Frederic R. Morgenthaler, Chairman, Department Committee on Graduate Students

Fundamental Constraints on Large-Scale Antimatter Rocket Propulsion

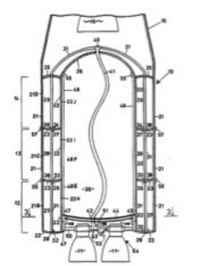
Broad-Spectrum Antiviral Therapeutics

A B Cell–Based Sensor for Rapid Identification of Pathogens

Fundamental limitations on plasma fusion systems not in thermodynamic equilibrium

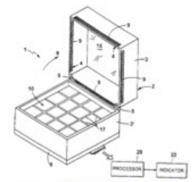
United States Patent — Rider — Patent Number: 4,723,736 — Date of Patent: Feb. 9, 1988

ROCKET STAGING SYSTEM



United States Patent — Rider — Patent Number: 6,087,114 — Date of Patent: Jul. 11, 2000

OPTOELECTRONIC SENSOR



United States Patent — Rider — Patent No.: US 7,566,694 B2 — Date of Patent: *Jul. 28, 2009

ANTI-PATHOGEN TREATMENTS

Relativistic Quantum Field Theory

Todd H. Rider thor@riderinstitute.org 13 November 2019

Any suggestions for improvements would be greatly appreciated.

Three quarks for Muster Mark!

–James Joyce, *Finnegans Wake (1939)*

I think I can safely say that nobody understands quantum mechanics.

–Richard Feynman, *The Character of Physical Law* (1965)

Overview

Relativistic quantum field theory (or field theory, for short) combines special relativity, which describes very fast things, and quantum mechanics, which describes very small things. The resulting theory correctly predicts the behavior of fundamental particles, which are small and often move at high speeds (or are in bound states with relativistic energies). A "toy theory" of spinless particles will be used to first introduce some of the basic techniques and results of field theory, since the spin of real particles makes calculations more complicated. Field theory will then be applied in succession to each of the four fundamental forces. Quantum electrodynamics is a field theory describing the electromagnetic force; it is relevant to phenomena such as Compton scattering and electron-positron annihilation. The field theory of the weak nuclear force describes phenomena such as the decay of neutrons (beta decay) and muons. Quantum chromodynamics describes the strong nuclear force and thus is relevant to the behavior of the quarks that compose particles like protons, neutrons, and pions. Finally, it will be shown that general relativity is equivalent to applying field theory to gravitation, although there remain obstacles to developing a complete quantum theory of gravity.

Biochemistry

Todd H. Rider thor@riderinstitute.org 13 November 2019

Any suggestions for improvements would be greatly appreciated.

Near the further end a low arched passage branched away from it and led to the chemical laboratory. This was a lofty chamber, lined and littered with countless bottles. Broad, low tables were scattered about, which bristled with retorts, test-tubes, and little Bunsen lamps, with their blue flickering flames. There was only one student in the room, who was bending over a distant table absorbed in his work. At the sound of our steps he glanced round and sprang to his feet with a cry of pleasure. "I've found it! I've found it," he shouted to my companion, running towards us with a test-tube in his hand. "I have found a re-agent which is precipitated by hoemoglobin, and by nothing else." Had he discovered a gold mine, greater delight could not have shone upon his features.

"Dr. Watson, Mr. Sherlock Holmes," said Stamford, introducing us.

–Arthur Conan Doyle, *A Study in Scarlet* (1887)

"It was all done that evening and night. While I was still sitting under the sickly, drowsy influence of the drugs that decolourise blood, there came a repeated knocking at the door... It was my landlord, with a notice of ejectment or something... For a moment he gaped. Then he gave a sort of inarticulate cry, dropped candle and writ together, and went blundering down the dark passage to the stairs... I shall never forget that dawn, and the strange horror of seeing that my hands had become as clouded glass, and watching them grow clearer and thinner as the day went by, until at last I could see the sickly disorder of my room through them, though I closed my transparent eyelids. My limbs became glassy, the bones and arteries faded, vanished, and the little white nerves went last. I gritted my teeth and stayed there to the end. At last only the dead tips of the fingernails remained, pallid and white, and the brown stain of some acid upon my fingers... I went and stared at nothing in my shaving-glass, at nothing save where an attenuated pigment still remained behind the retina of my eyes, fainter than mist. I had to hang on to the table and press my forehead against the glass. It was only by a frantic effort of will that I dragged myself back to the apparatus and completed the process."

–Griffin, in H. G. Wells' *The Invisible Man* (1897)

Overview

Biochemistry covers the chemical molecules and reactions that are important in biology. Most biological molecules fall into five categories: (1) nucleic acids such as deoxyribonucleic acid (DNA), ribonucleic acid (RNA), and their component nucleotides; (2) proteins and their component amino acids; (3) lipids such as fatty acids, triglycerides, and cholesterol; (4) carbohydrates such as simple sugars and various polymers composed of them; and (5) iron- or magnesium-containing porphyrins in hemoglobin, chlorophyll, etc. Most biochemical reactions have many steps, each of which is catalyzed by different enzymes, proteins that act as specialized molecular machines to greatly speed up and control reactions. Some major types of biochemical reactions include the synthesis (production) or catabolism (degradation) of proteins, nucleic acids, lipids, carbohydrates, and porphyrins. Other important biochemical reactions include respiration, in which energy is produced by combining hydrogen from biomolecules with oxygen from the air to form water; fermentation, in which smaller amounts of energy are extracted from biomolecules without oxygen; and photosynthesis, basically respiration run in reverse so that light energy is absorbed and stored by splitting water into more oxygen for the air and more hydrogen in biomolecules.

Fluid Mechanics and Aerodynamics

Todd H. Rider thor@riderinstitute.org 13 November 2019

Any suggestions for improvements would be greatly appreciated.

On aircraft:

"There is as much pressure exerted by a substance against the air as by the air against the substance.

"Observe how the beating of its wings against the air suffices to bear up the weight of the eagle in the highly rarefied air which borders on the fiery element! Observe also how the air moving over the sea, beaten back by the bellying sails, causes the heavily laden ship to glide onwards!

"So that by adducing and expounding the reasons of these things you may be able to realize that man when he has great wings attached to him, by exerting his strength against the resistance of the air and conquering it, is enabled to subdue it and to raise himself upon it."

On parachutes:

"If a man have a tent made of linen of which the apertures have all been stopped up, and it be twelve braccia across and twelve in depth, he will be able to throw himself down from any great height without sustaining any injury."

On helicopters:

"I find that if this instrument made with a screw be well made–that is to say, made of linen of which the pores are stopped up with starch–and be turned swiftly, the said screw will make its spiral in the air and it will rise high."

Advice for test pilots:

"This machine should be tried over a lake, and you should carry a long wineskin as a girdle so that in case you fall you will not be drowned."

–Leonardo da Vinci, *The Notebooks* (ca. 1500)

Overview

Fluid mechanics and aerodynamics concerns the motion of liquids and gases or their interactions with objects such as pipes or aircraft. One fundamental factor affecting how to model the behavior of a fluid is whether the fluid is compressible, or in other words whether its density changes significantly when its pressure its increased. Another fundamental factor is viscosity, or whether the particles of the fluid seem to stick to each other and pull on each other. Therefore, it is most convenient to divide models of fluid behavior into four categories: (1) incompressible, inviscid fluids, (2) incompressible viscous fluids, (3) compressible inviscid fluids, and (4) compressible viscous fluids. Important applications of fluid mechanics include the design of ships and submarines, as well as helicopters, airplanes, parachutes, and spacecraft reentering the atmosphere. Other applications include fluids in pipes and lubricants in machinery, pressure and circulation in the ocean and atmosphere, and sound waves and shock waves.