

**June 10, 1955**

**Central Intelligence Agency Information Report, 'The  
Development of an Ultra-Centrifuge at the Nuclear  
Institute of Manfred von Ardenne in Sinop'**

**Citation:**

"Central Intelligence Agency Information Report, 'The Development of an Ultra-Centrifuge at the Nuclear Institute of Manfred von Ardenne in Sinop'", June 10, 1955, Wilson Center Digital Archive, CIA Records Search Tool (CREST), CIA-RDP80-00810A006600620005-9. Contributed by William Burr and included in NPIHP Research Update #7.  
<https://wilson-center.drivingcreative.com/document/115168>

**Summary:**

CIA report describing the construction process of ultra-centrifuges in the Soviet nuclear institute of Sinop and the personnel working there.

**Credits:**

This document was made possible with support from Carnegie Corporation of New York (CCNY)

**Original Language:**

English

**Contents:**

Original Scan

CENTRAL

**INFORMATION REPORT**

CD NO.

COUNTRY USSR (Abkhazskaya ASSR)

DATE DISTR. 10 June 1955

SUBJECT The Development of an Ultracentrifuge  
at the Nuclear Institute of Manfred  
von Ardenne in Sinop

NO. OF PAGES 9

PLACE  
ACQUIREDNO. OF ENCLS.  
(LISTED BELOW)

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DATE OF  
INFO.SUPPLEMENT TO  
REPORT NO.

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STATE	X	NAVY	X	NSRB		DISTR													
ARMY	X	AF	X	NSA		SEC	X												

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COUNTRY	USSR	REPORT	25X1
TOPIC The Development of an Ultracentrifuge at the Nuclear Institute of Manfred von Ardenne in Sinop			
EVALUATION		PLACE OBTAINED	25X1
DATE OF CONTENT			25X1
DATE OBTAINED		DATE PREPARED	14 January 1955
REFERENCES			25X1
PAGES	2	ENCLOSURES (NO. & TYPE)	
REMARKS			
This is UNEVALUATED Information			

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1. Ultracentrifuges were developed by Dr. Steenbeck at Department 3, the mechanical department, of the nuclear institute in Sinop. In addition to his nominal deputy Dr. Trattner (fnu), Steenbeck had Dr. Steudel (fnu) as a practical deputy. The latter controlled the development of the ultracentrifuge which he continued after Kaiblinger left in 1947. Prior to 1947, two development stages were apparent. These were based on mechanical metallurgical problems with the rpm figures being the essential development problem.
2. During Stage A of the development, Kaiblinger was ordered to construct the rotor unit of several cover layers of metal foil strips. On a lathe he wound the foils at a slanting angle to the axle of rotation around a core which was to be removed afterwards. During winding process, the layers were also soldered. The finished winding was 0.2 mm thick. The lids were also produced as foil packages under pressure and were provided with canulas soldered into the lid. All rotor units, even if the thickness of their walls varied, had an external diameter of 50 mm and a length of 400 mm. The first rotor units constructed were driven by means of specially constructed gears powered by standard engines operating at about 5,000 rpm. The maximum speed obtained was 80,000 rpm which was about the limit the gears could stand. Since the heat produced by the rpm rating was too high, the following listed foil materials were tried in succession: Copper, brass, nickel, aluminum, chromium, silver, gold and others. 100,000 rpm turned out to be the critical speed. The development program, therefore, requested 150,000 rpm partly in order to overcome the critical figure and also to obtain a figure high enough to effect isotope separation. Since these figures were not obtained with the foil rotors, an entirely different system was adopted for the production of rotor units.

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3. Stage B. Dr. Ziegler (fnu) developed a special aluminum alloy, the formula of which was unknown. Kaiblinger was given an ingot of this material from which he turned the new rotor, 400 mm long, 50 mm external diameter and 47 mm internal diameter and subsequently 1.5 mm thick. The blank was then machined in a cold process by a specially manufactured tube rolling mill and finally reinforced. The apertures were provided with screw lids into which standard canula needles with a external diameter of 2.5 mm and an enforced upper part were inserted. The internal walls of the rotor were lined with permanent magnets. In long lasting processes, Kaiblinger gradually eliminated all unbalances of the rotor using machinery and instruments of the precision mechanical workshop of Ingenieur Klein (fnu). The construction was delayed by the time-consuming production of needle bearings by Kaiblinger. Sleeve bearings were fitted at three places of each each of the two capillary tubes-type canules. The end of a canula was bedded against the front part and the side of the tube and the stronger end against the front. White metal was used as bearing material. The entire bearing system was cooled by chambers of liquid air. The rotor was driven asynchronously by a high frequency transmitted via a continuous winding wrapped around the rotor chamber and no longer by a synchronous motor. Two improved models were constructed with a primary rpm rating of 115,000 which was increased to 130,000 rpm and finally reached 150,000 rpm without any defects.

4. [redacted] In addition to the original design of the ultracentrifuge which included a simple hollow rotor unit with one upper and one lower capillary tube, other models were designed with additional lead-ins which were specially heat insulated under glass. Thermal control equipment for the thermodiffusion of the gas stream within the centrifuge was also installed. The final result however was obtained only by an improved cooling system involving air and water.

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5. In 1947, the results obtained in the diffusion of UF<sub>6</sub> were 2 percent. Kaiblinger had frequently discussed this figure with Dr. Steudel but was not quite sure whether the latter had given this figure or not. Steudel also repeatedly mentioned during these conversations that it could not actually be expected that the centrifuge system would ever be applied on an industrial level.

[redacted] Comment. For a table of organization and list of personnel employed at the nuclear institute of Manfred von Ardenne in Sinop, status 1946/1947, see Annex.

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Table of Organization and List of Personnel of the NxiNuclear Institute in Sinop

The Sinop institute included three departments. Manfred von Ardenne was chief of the entire institute and also of Department I.

Department 1 : Department of Electro Physics  
Manfred von Ardenne

Department 2 : Department of Chemistry  
Professor Thiessen (fnu)

Department 3 : Mechanical Department  
Professor Steenbeck (fnu)

These three departments included the following personnel:

Ernst Richard Apitzsch	chief of the electric workshop Department 1
Alexander Bergengruen	general administration (Bergengruen was Ardenne's father-in-law)
Erwin Alfred Becker	glass blower, Department 3. Becker also constructed the glass temperature caps for the switching unit of the centrifuges.
Dr. Karl Bernhard	Chemist, Department 2
Dr. Ernst Busse	chemist, Department 2
Dr. Delvendahl (fnu)	meteorologist and mathematician
August Deutsch	mechanical engineer, Department 3, constructed a circular spinning frame for laboratory material at Sinop. He is allegedly in Ilinskaya at the present time.
Kurt Fliegner	blacksmith, Department 3
Gustav Fliegner, K.Fliegner's son	electrician, Department 1
Hermann-Fritz Florek	laboratory assistant of Dr. Steenbeck, Department 3
Heinz Ernst Froehlich	engineer, Department 1 in "House D" working in the field of magnets
Dr. Guenter Fuchs	physicist, Department 1

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Heinz Gaedicke  
(from Duesseldorf) chief mechanic, Department 2, constructed  
with assistants all chemical testing  
equipment for Professor Thiessen

Hermann Geri  
(from Freiburg/Breisgau) electrician for Apitzsch, Department 1

Werner Goldbach laboratory assistant, Department 3,  
working for a Soviet Professor of  
Steenbeck's group

Helmut Hepp graduate engineer, physicist, Department 1

Kurt Heppner chemist, laboratory assistant, Department 2

Gerhard Hoenow laboratory assistant, Department 2

Ferdinand Kafka engineer, Department 1

Siegfried Klein precision mechanic working in an independent  
department equipped with a complete workshop  
brought from Berlin

Margot Koerber assistant, Department 2

Kretzig (fnu) designing office, Department 2

Krueger (fnu) chief electro mechanic, Departments 1 and 3.  
Among other equipment he constructed electric  
measuring instruments for the development  
of the centrifuges. Rpm's were measured  
electrically.

Gerda Langsdorf at first second secretary of Ardenne, later  
institute librarian

Emil Lorenz glass blower, constructed glass caps for  
the lead-ins to the centrifuges

Mauler (fnu) Material supply and administration

Wladimir Maydel graduate engineer, physicist, Department 1

Fritz Mainhardt mechanic in Sille's group

Dr Kurt Meloun physicist, Department 1

Dr Eberhard Melchior mathematician, now in Ilinskaya

Dr Gotthard Mueller high frequency physicist, Department 1.  
Constructed mains for the mass spectrographs  
and was allegedly involved in research  
activities of his own. Worked previously  
at the Lorenz Firm in East-Berlin.

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Neureuther (fnu)	graduate engineer, physicist, Department 1
Franz Heinrich Pottmeier	laboratory assistant, Department 2
Dr Gerd Praetorius	expert in high voltage, Department 1 and also expert for electron photography
Dr Herberg Reibedanz	physicist, Department 1
Hans Artur Richter	precision mechanic of Klein's group
Dr med Kurt Rintelen	laboratory assistant, Department 2
Hans Fritz Schlesing	laboratory assistant, Department 3
Hermann Schmahl	engineer, Department 1
Horst Schroeder	laboratory assistant, Department 2
Schrottke (sen) (fnu)	laboratory assistant, Department 1
Mrs Schrottke (fnu)	second secretary of Ardenne
Schulze (fnu)	mechanic in Sille's group
Karl Heinz Sille	engineer, had his own group for the installation and technical control of all workshops
Walter Sommerfeldt	engineer, Department 1
Wolfgang Socke	precision mechanic in Klein's group
Dr Eberhard Steudel	working under Steenbeck's control as manager of all departments of physics, among other activities on the construction of the centrifuges
Miss Striepling	laboratory assistant, Department 2
Else Suchland	first secretary of Ardenne
Erwin Suckow	engineer, Department 1 in "House D", working in the field of magnets, was repatriated to Meddersheim near Sobernheim
Dr Robert Trattner, Austrian	formal deputy of Steenbeck, Department 3
Gustav Treff	mechanic, Department 3
Ludwig Wetzlar	electro mechanic, Department 3, his work included the winding of the centrifuges

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Victor Winkler, ethnic German  
from Yugoslavia

student, Department 2

Dr Werner Wittstadt

chemist, Department 2

Elfriede Zabel

assistant, Department 1

Guenter Zawadil

Dr Steudel's assistant, Department 3

Dr Ziegler

metallurgist, Department 1, worked  
on hardening experiments, was  
transferred, his whereabouts are  
unknown

Ludwig Ziehl

graduate engineer, chemist,  
Department 2

Dr Gerhard Zippe

mechanical physicist, Department 3,  
worked on preliminary experiments  
for the development of the centrifuge  
and other fields

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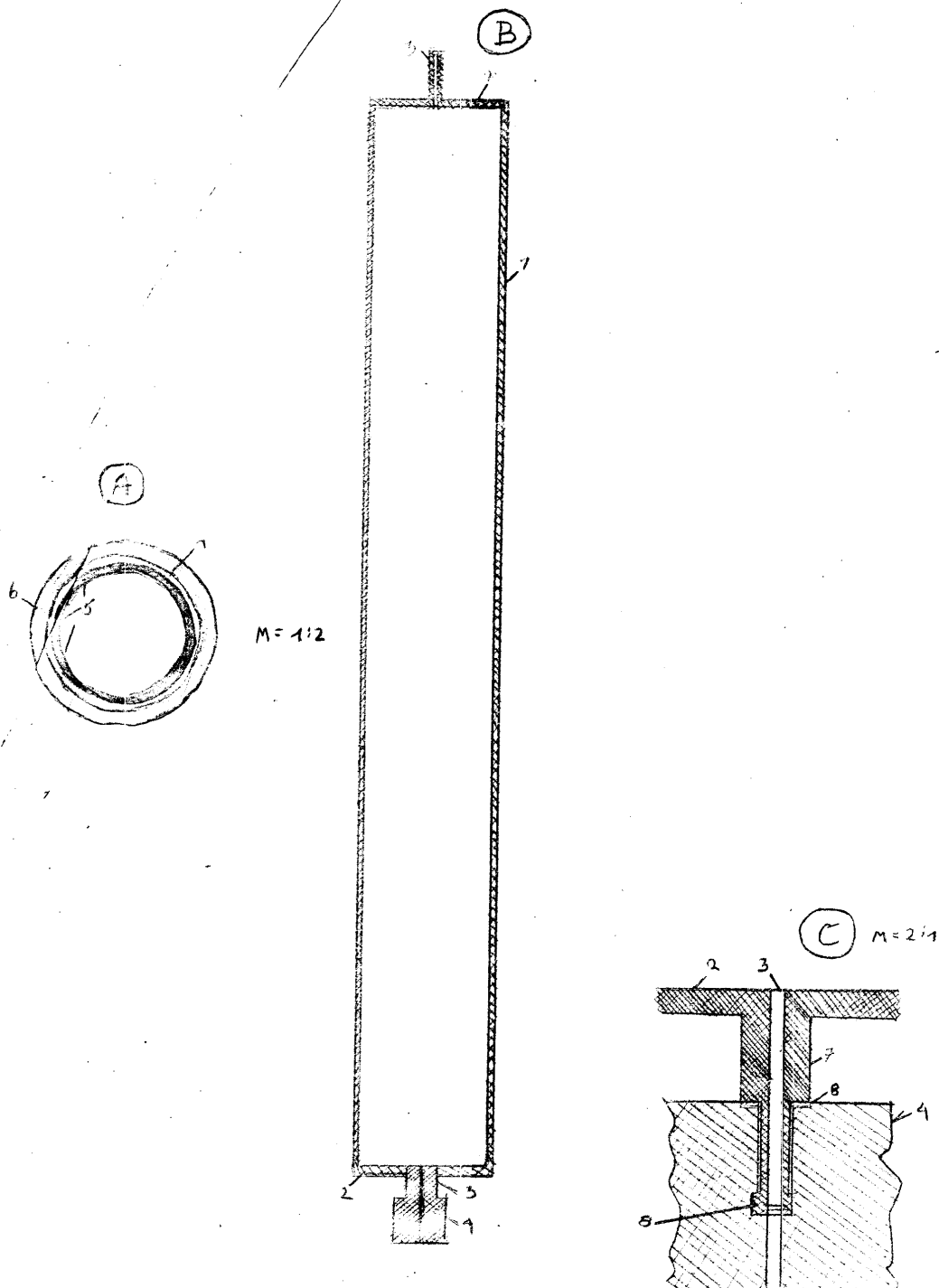


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Legend.

Diagramm of the Ultracentrifuge, scale 1 to 2 and 2 to 1

- A Cross section, scale 1 to 2
- B Longitudinal section, scale 1 to 2
- C Lower needle bearing, scale 2 to 1

- 1 Rotor unit, external diameter 50 mm  
internal diameter 47 mm  
walls 1.5 mm thick  
length 400 mm

For the preliminary experiments the unit was manufactured of wound metal foils with walls 0.2 mm thick

- 2 Screwed in lid
- 2 Needle canula, external diameter 2.5 mm
- 4 Socket for needle bearing
- 5 Permanent magnets, steel plates
- 6 Continuous field winding around outer coat
- 7 Inforced canula over the bedding
- 8 Bearing material

Operational procedure:

The rotor tube functioned as motor armature. The continuous field winding around the outer coat was fed by a high frequency transmitter. No additional information was obtained. Lead-in and discharge was effected through the canulas. In addition to the product of inertia, thermal diffusion was to be effected.

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