

June 10, 1955

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

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Summary:

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

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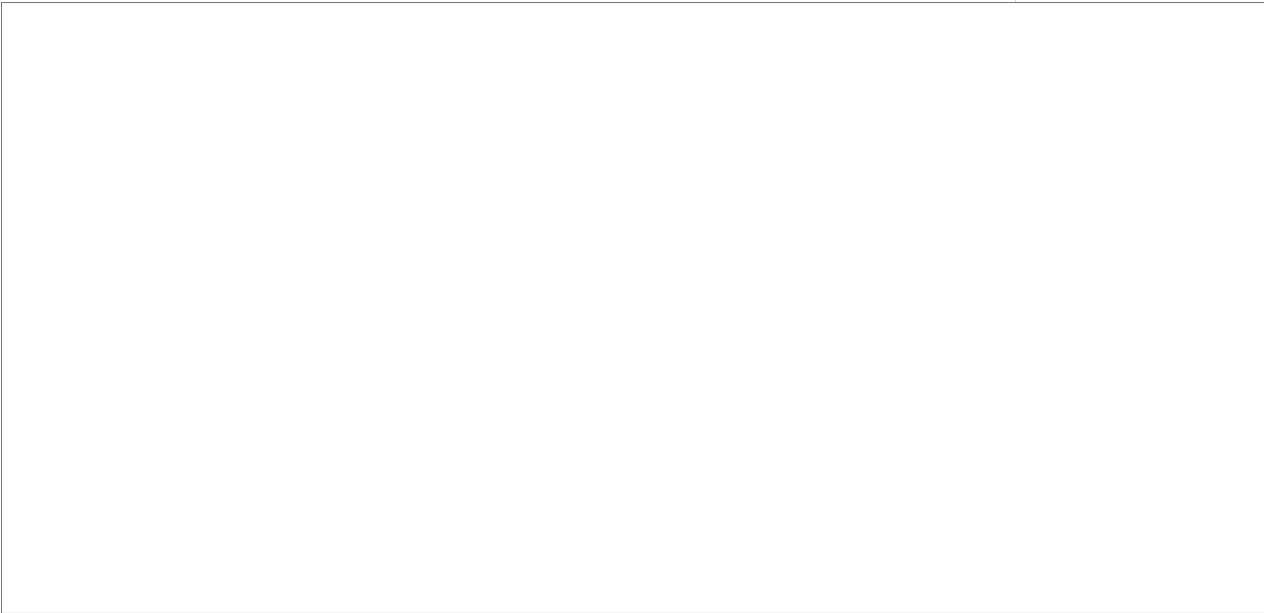
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REMARKS

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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. Trattmann (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 UF₆ 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 Käein	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. Rpms 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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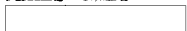
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Neureuther (fnu) graduate engineer, physicist, Department 1

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

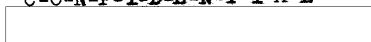
Dr Robert Trattner, Austrian formal deputy of Steenbeck, Department 3

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

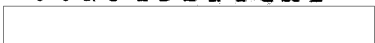
Ludwig Ziehl

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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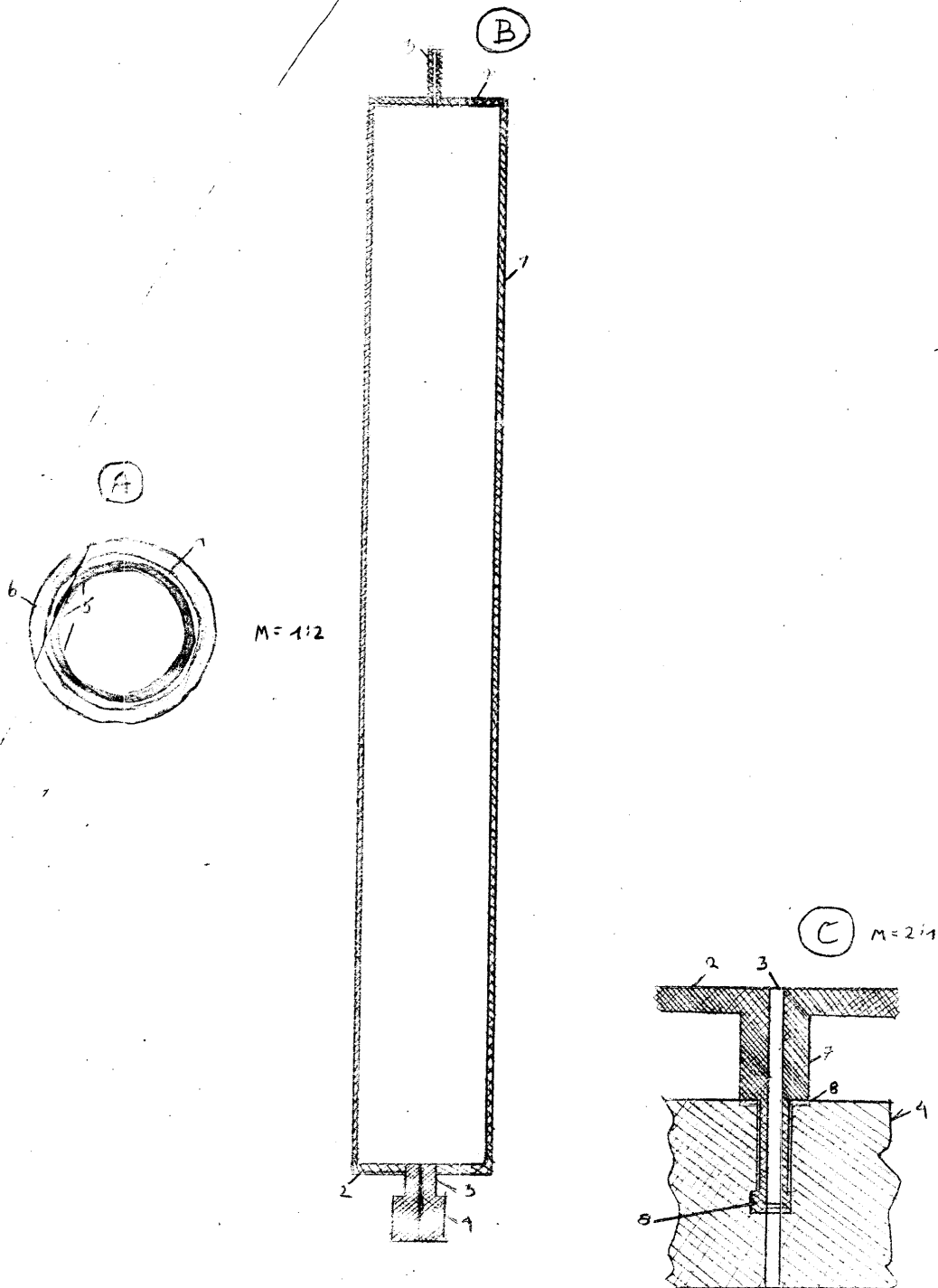
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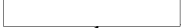
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Legend.

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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