FINAL REPORT No. 201
ITEM No 1, 7, 21

Visit to C. H. F. MÜLLER, A. G.
RÖNTGENSTR. 24
BAHRENFELD, HAMBURG.

BRITISH INTELLIGENCE OBJECTIVES SUB - COMMITTEE.

LONDON - H.M. STATIONERY OFFICE.

VISIT TO C.H.F.MULLER, A.G.
RÖNTGENSTR. 24
BAHRENFELD, HAMBURG

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BRITISH INTELLIGENCE OBJECTIVES SUB-COMMITTEE
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Personnel of Team

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VISIT TO C.H.F.MÜLLER A.G.

1. Firm — 8 Oct 45

C.H.F.Müller A.G.

2. Location

Zahrenfeld-Hamburg, Röntgenstr. 24

3. Personnel Interviewed

Dr. Fenr, Assistant to Manager
Dr. Kuntke, High Voltage Physics.

4. Plant

Undamged - owned by Philips. Until 1938, all development work was done by Philips, but then the foreign influence had to be disguised. After the start of the war, basic design was also done in Hamburg.

5. Interesting Items

Fixed anode tubes:- Target is sintered tungsten block, which has copper anode cast onto it. The copper is cooled carefully to produce if possible one crystal and thereny obtain better heat conduction. Copper is then chrome plated to decrease the possibility of electrons being given off.

6. Aluminium Housing

Cast aluminium housings had been used, but it has been found that fabricated housings areless expensive and more oil-tight. Aluminium is drawn, then put into mould with rubber liner inside aluminium and 120 atmospheres preesure applied. Fittings are welded on. It was admitted that brass, if available, would be easier to work with.

7. Rotating Anode Tubes

This idea is not new though thelarge disc model was a war-time development. This tube will dissipate 40 kw for 1/10th second. Smaller ones will dissipate 30 and 15 kw. Smaller one has target of tungsten ribbon edge-wound with copper moulded around it. Ribbon is

used to avoid buckling with the uneven heating.

The speed of rotation is 3000 rpm, brought about by two-pole motor, either capacitor-type or shaded-pole type, with windings located outside the glass wall of the tube.

Larger ones have tungsten anode with molybdenum steel shaft joining them to the rotor of themotor. Heat dissipation is by radiation in this type. Focus spot is 2 x 8, which, when viewed from the side, gives a 2 x 2 mm square.

Small one has 1.2 cm square. Glass-to-metal seals:- Steel with 25% chrome is used. This is heated red hot and glass from a tube is melted around the edge. Then the glass cylinder is butted onto it and the joint heated. The highly specialized workman who does the job gets 1.6 marks/hour.

8. VACUUM-TYPE RECTIFIERS

Both air-cooled and oil-immersied rectifiers are made, the latter up to 220 kv.

9. Mercury-Vapor Rectifiers

A new type of rectifier employs several hollow electrodes for distributing the potential along the arc stream (see figure 1). External capacitors are used to distribute the voltage evenly, these being silver sprayed on bakelite and having a capacity of 40 cm. (See figure 2).

Three sections (3 gaps) are used for	100 kv.
9	200 kv
13	300 kv

Tube, capacitors, and a series resistor are immersed in oil. The overall dimensions for the 300 kv tube alone are approximately 2½ feet long by 1¼" diameter. 300 kv unit was made for 10 - 20 ma. continuous, while the 100 kv one is made for 1 ampere intermittent for high intensity diagonostic X-ray. This type of tube was developed in 1940 - 41 from original idea, which came from Eindhoven. Dr. Kuntke claimed that it could be used only at higher frequencies (400 - 500 cps) but Philips at Eindhoven uses it at 50cps.

10. High Voltage DC Sources

Müller had built several high voltage sources employing voltage multiplying circuits. 1.5 million volts was the highest built, though a 2.5 million volt unit was planned.

1.5 million volt unit employed nine capacitors and nine rectifier tubes each 300 kv. Filament power (10 watts) for each rectifier tube was supplied by a separate a-c generator driven by an insulated shaft.

Voltage drop in this type of source = $\Delta e = \frac{k. n^3 i}{f.c.}$

Where Δe = Kv drop

K = constant = 2/3 approximately

n = number of stages (5 in this case)

i = Ma. current

f = frequency

c = capacity in microfarads.

A shield ring was found necessary from scale model tests for the 2.5 million volt unit to improve the uniformity of the voltage gradient.

A peculiar effect was notedwith the 1.5 million volt source in that flashovers sometimes occurred at values lower than theoretical. It was found that a 5 mm. needle suddenly stuck out from the high voltage electrode caused a non linear curve, whereas the same electrode in a constant position gave a linear curve. This effect was observed only when the electrode was positive.

11. Betatrons.

Müller had built in conjunction with a Norwegian scientist, a 15 million volt Betatron. This has been moved to Wrist. Dr. Fehr stated that this had been experimented with for the Luftwaffe with the hope (?) of obtaining a death-ray for anti-aircraft work.

A smaller 2 million volt betratron had been built.

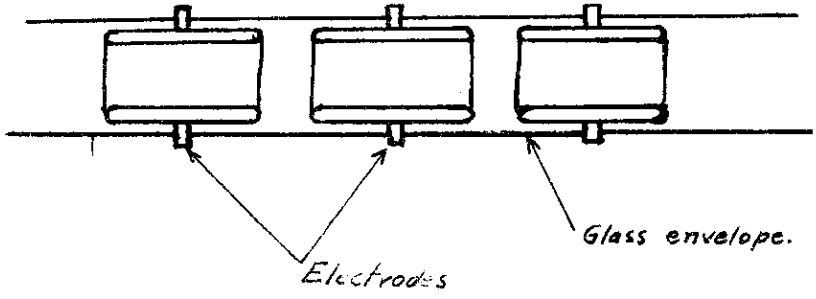
Glass envelope.
Electrodes

Fig. 1.

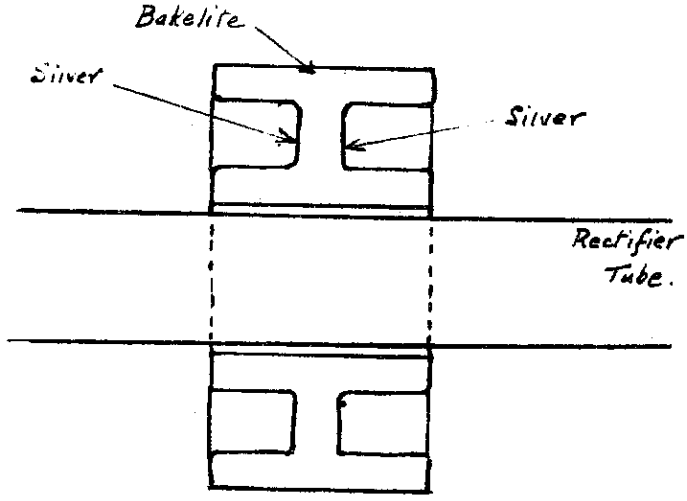
Bakelite
Silver
Silver
Rectifier
Tube.

Fig. 2