FMG 39T (C) (WÜRZBURG) GL RADAR

Type FMG 39T (C) is a modification of the basic Würzburg design. It has a rotating dipole with synchronous antenna and indicator switching. Three CRT's are used: one large one with circular timebase for range measurement, and two smaller ones (azimuth and elevation tubes). Minimum angle of elevation for cover is 5° and for height-finding is 10° above the optical horizon for inland sites. A hand-rotated circular scale, calibrated from 2 to 16 km, is also provided. Setting the pointer of this scale to the same range as that indicated in the range tube brings the correct echoes into the smaller tubes for aiming.

There is also a push button by means of which the operator can change the pulse repetition frequency from 3,750 to 5,000 cps in order to enable the aircraft IFF to function.

Type FMG 39T (C) is used at most Seetakt sites in northwest Europe. It is used mainly for Flak control, for searchlight control (via the plotting instrument "Malsi"), height-finding for aircraft reporting, or as stand-by in interception control.

This set was introduced into service in 1941.

The characteristics of this equipment are as follows:

RANGE (miles): From 1 to 25.

FREQUENCY RANGE (mc): "A" band, 550 to 580; "B" band, 470 to 490; intermediate band, 545 to 555; 520 to 590 also reported.

PULSE RECURRENCE FREQUENCY (cps): 3,750 increased to 5,000 when used with IFF.

PULSE LENGTH: 1 to 2 microseconds.

ANTENNA: Sheet-metal paraboloid 10.1 feet in diameter, with wide-band dipole of sheet-metal blades; blade-fixing holes slotted for adjustment at approximately 21.2 inches or 25.2 inches working. Alternative narrow-band dipole on some specimens. Front reflector is 3.2-inch strip of sprayed metal on bakelite disk, 3.1 inch in front of dipole. Common T&R.

POWER SOURCE: 90 to 380 volts, 40 to 60 cycles a-c from power lines or standby motor-generator set or both.

SIMILAR SETS: Würzburg: FMG 39T (A) and (D) and FMG 39T Riese (Giant).

POWER INPUT REQUIRED: 3.3 kw.

POWER OUTPUT: 7 to 11 kw (peak).

TUBES (type and number): 75 tubes in transmitter-receiver unit FuSE 62 as follows: One LS 80, twelve LS 50, twelve LS 20, four LD 2, thirty-four RV 12, one LV 1, two LG 1, one LG 2, one LB 13/40, one LB 7/15, four neon lights TE 4, one quartz crystal OEK 1, and one stabilizer STV 150/15.

TRANSPORTATION: Mobile; it can be carried in truck or trailer.

TYPE OF PRESENTATION: Three CRT's: one large, with circular timebase for range measurement and two smaller ones, elevation and azimuth tubes.

DATA OBTAINED: Range, elevation, and azimuth.

ACCURACY: Of range, 137.5 yd; of azimuth, 0.2°; of elevation, 0.2° (estimated).

	Height	*Width*	*Length*
Over-all dimensions of set:	102 in.	120 in.	211 in.

Type FMG 39T (D) is the latest model of the small Würzburg. It was introduced into service in 1942.

Like types (A) and (C), it is equipped with IFF. In addition, it has the facility for *precision range* finding, provided by an additional CRT.

When the IFF is in operation, the PRF is changed from 3,700 to 5,000 cps; this apparently makes the radar completely inoperative during interrogation. The signal at 5,000 cps actuates FuG 25, which transmits a 20-mc signal with keyed 1,000-cycle modulation which is received on two dipoles mounted on either side of the paraboloid. From these antennas, the signal passes through a commutator to insure that the signal is from the plane at which the paraboloid is pointed. A normal receiver is then used to give aural indication (headphones) and visual indication (meter). A small antenna placed on the paraboloid indicates by means of diode rectification and a meter that the set is transmitting; a PS 62 test transmitter is used to show that the receiver is in operation.

The transmitting tube is a triode, type LS 180, with approximately 8-kw peak output power. The receiver is a double superheterodyne.

This type of Würzburg is probably used for detecting surface vessels. It is used also for Flak fire control, gun-laying, searchlight control, and height-finding for aircraft-reporting and as stand-by in ground control of interception.

The characteristics of the FMG 39T (D) are as follows:

RANGE (miles): 1 to 25.

FREQUENCY RANGE: (mc): "A" band, 550 to 580; "B" band, 470 to 490; intermediate band, 545 to 555; 520 to 590 also reported.

PULSE RECURRENCE FREQUENCY (cps): 3,750, increased to 5,000 when used with IFF.

PULSE LENGTH: 1 to 2 microseconds.

ANTENNA: Common T&R. Sheet-metal paraboloid 10.1 feet in diameter with side-band dipole of sheet-metal blades; blade-fixing holes slotted for adjustment at approximately 21.2 inches or 25.2 inches working. Alternative narrow-band dipole on some specimens. Front reflector is a 3.2 inch strip of sprayed metal on bakelite disk 3.1 inches in front of dipole.

POWER SOURCE: 90 to 380 volts, 40 to 60 cycles ac from power lines or standby motor-generator set or both.

SIMILAR SETS: Würzburgs: types FMG 39T (A), (C), and FMG 39T Riese (Giant).

POWER INPUT REQUIRED: 3.3 kw.

POWER OUTPUT: 7 to 11 kw (peak).

TUBES (type and number): 75 tubes in transmitter-receiver unit FuSE 62 as follows: one LS 80, twelve LS 50, twelve LS 30, four LD 2, thirty-four RV 12, one LV 1, two LG 1, one LG 2, one LB 13/40, one LB 7/15, four neon lights TE 4, one quartz crystal OEK 1, and one stabilizer STV 150/15.

TRANSPORTATION: Mobile, mounting similar to Freya Limber model.

TYPE OF PRESENTATION: Four CRT's, for azimuth, elevation, and range as in types (A) and (C). A fourth tube has been added for finer range readings; it has a single horizontal trace on which, by means of a control knob, an enlargement of any given sector of the range tube can be displayed and range in km read off in a small window indicator.

DATA OBTAINED: Range, elevation, and azimuth.

ACCURACY: Range accuracy approximates 11 yard; D/F accuracy 0.2° at all ranges. Precision ranging is accomplished by phase-shifter operating on the sinusoidal (30-kcps crystal-controlled) deflector voltage of the range strobe tube.

A variant of the FMG 39T is the FMG 41T, which resembles the FMG 39T (D), except that the paraboloid sometimes has a scooplike extension at the bottom, presumably to cut out ground echoes.

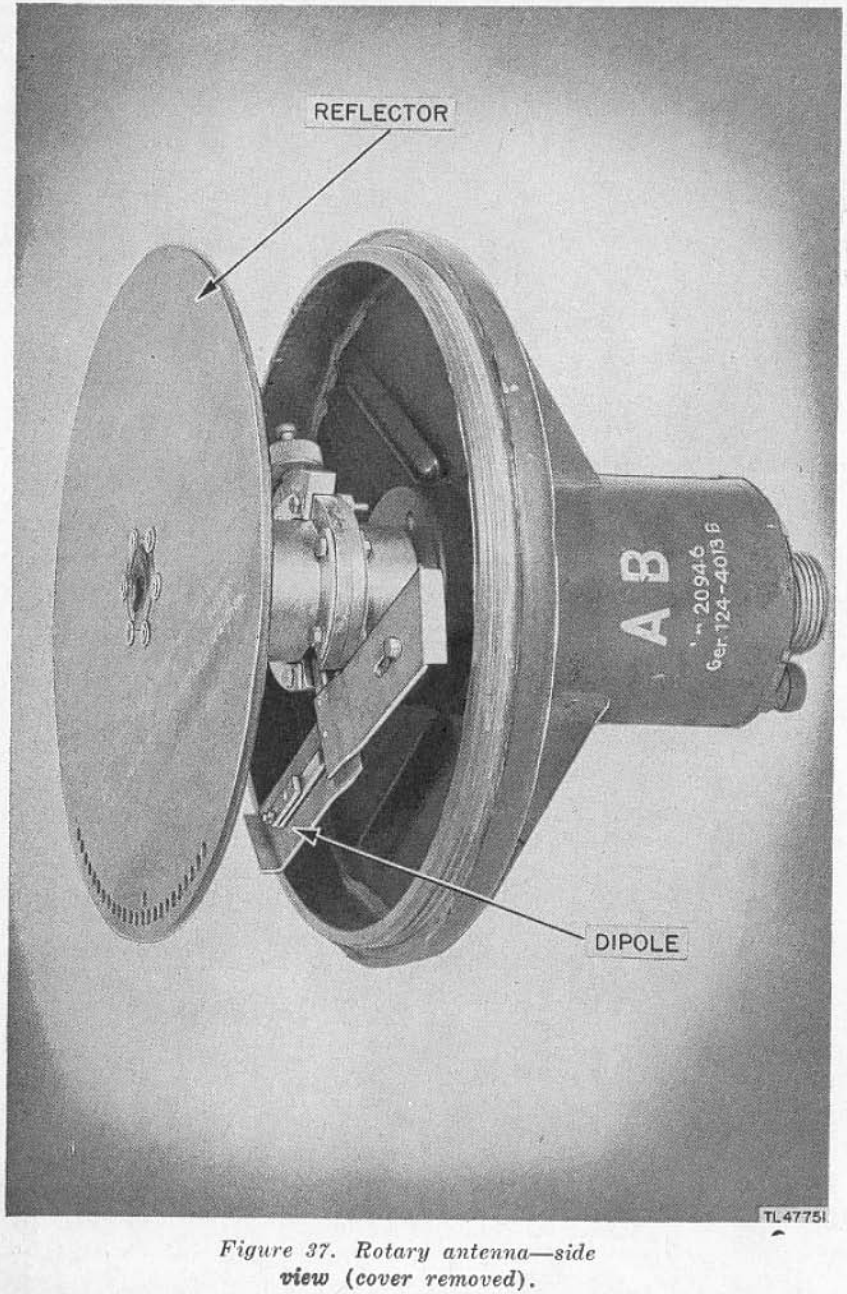

Figure 37. Rotary antenna—side ***view*** *(cover removed).*

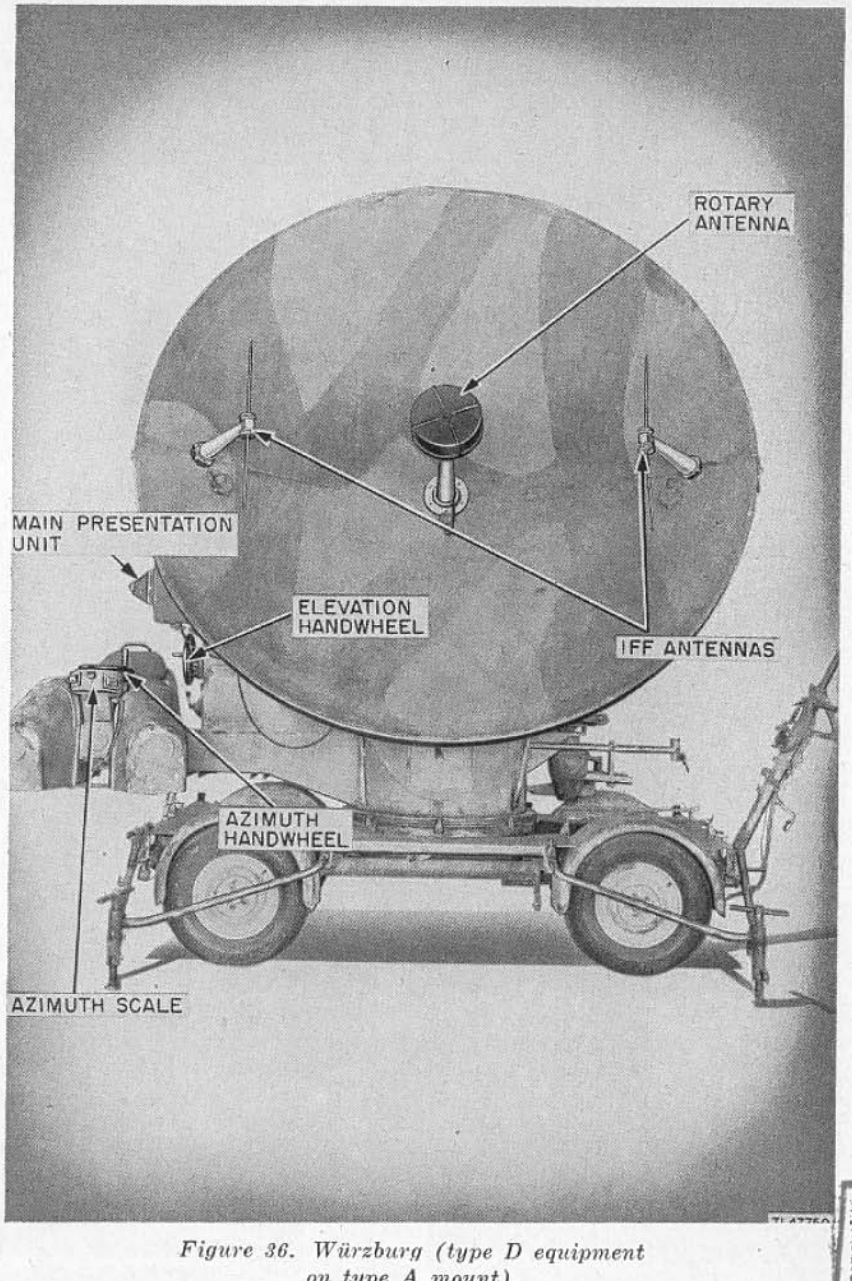

Figure 36. Würzburg (type D equipment on type A mount).

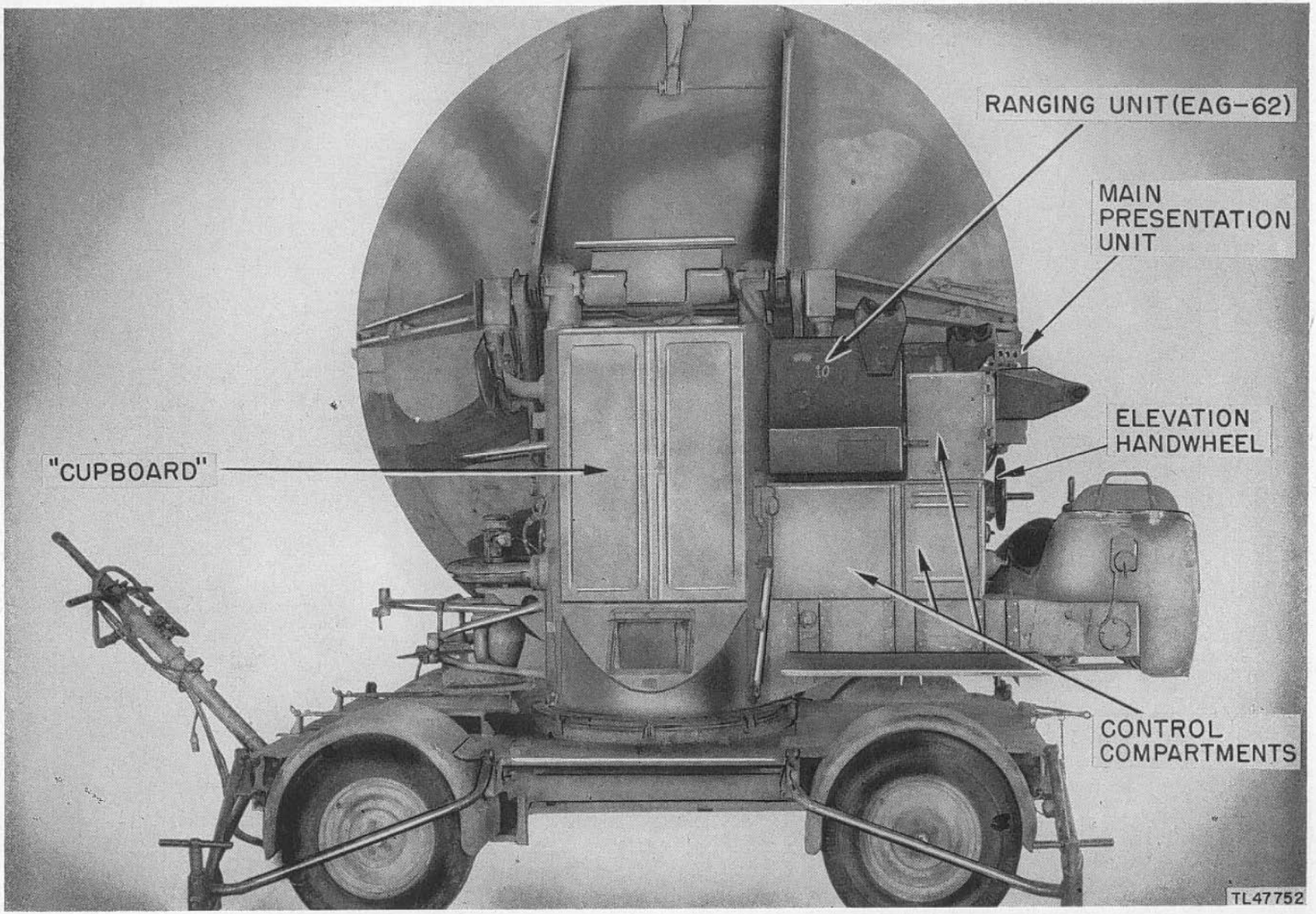
RANGING UNIT (EAG-62)
MAIN PRESENTATION UNIT
ELEVATION HANDWHEEL
"CUPBOARD"
CONTROL COMPARTMENTS
TL47752

Figure 38.

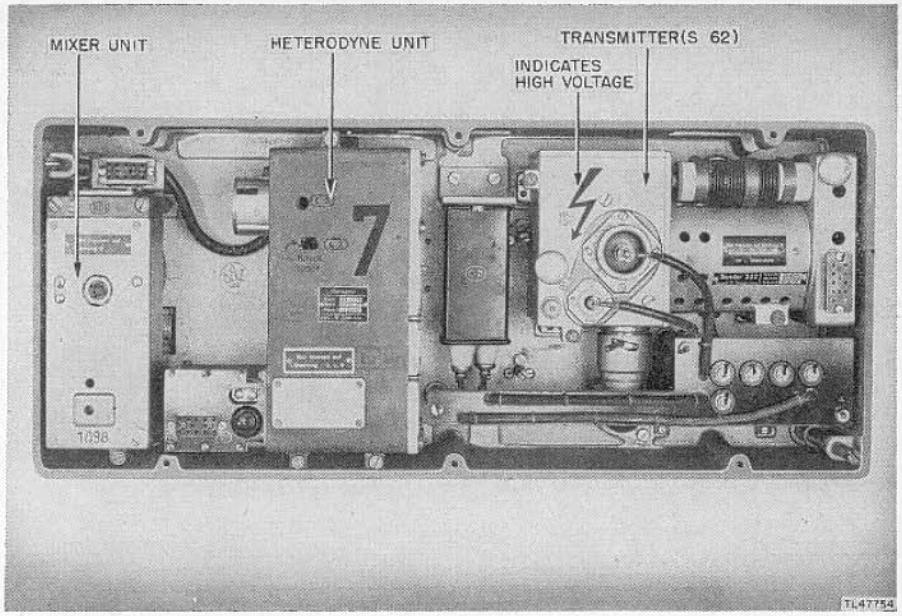

Figure 40. Würzburg mixer—transmitter unit (SU 62)—front view.

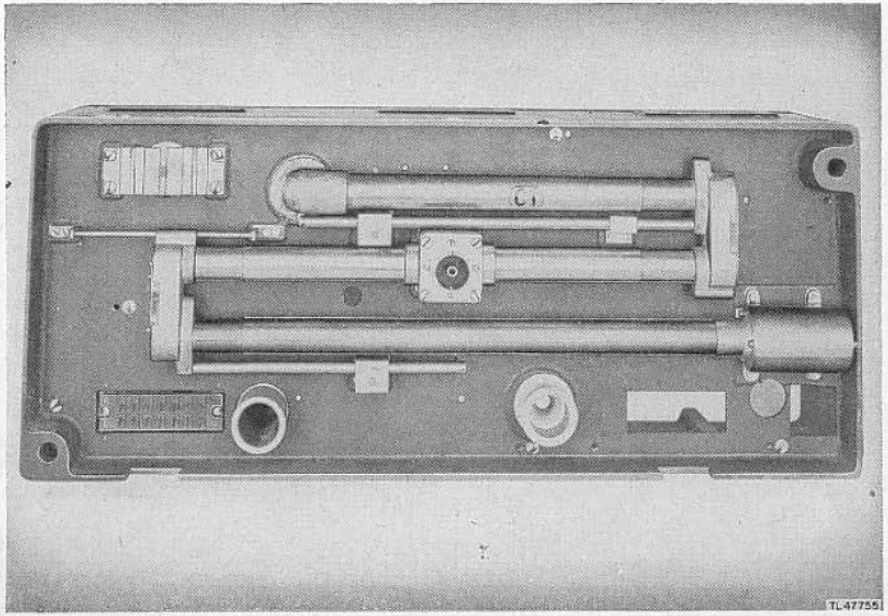

Figure 41. Mixer—transmitter unit (SU 62)—rear view, showing T-R box.

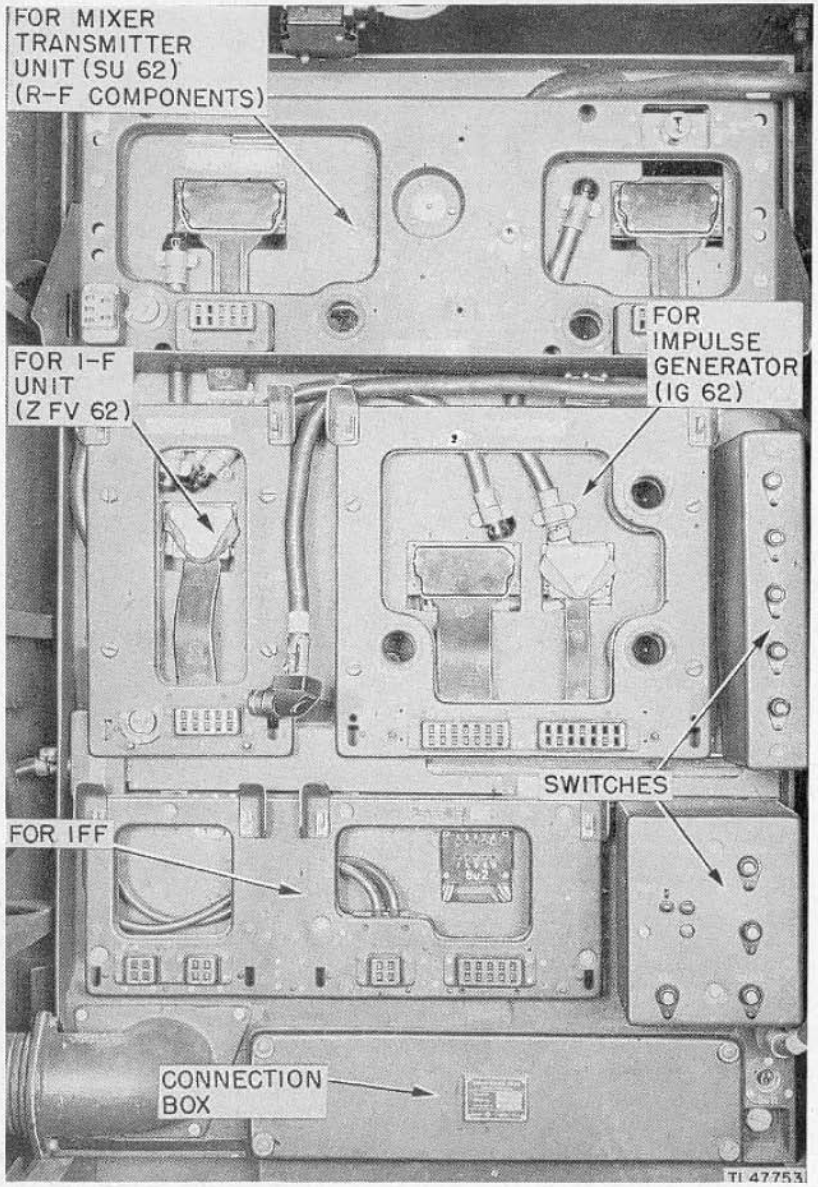

Figure 39. Würzburg "Cupboard"—units removed.

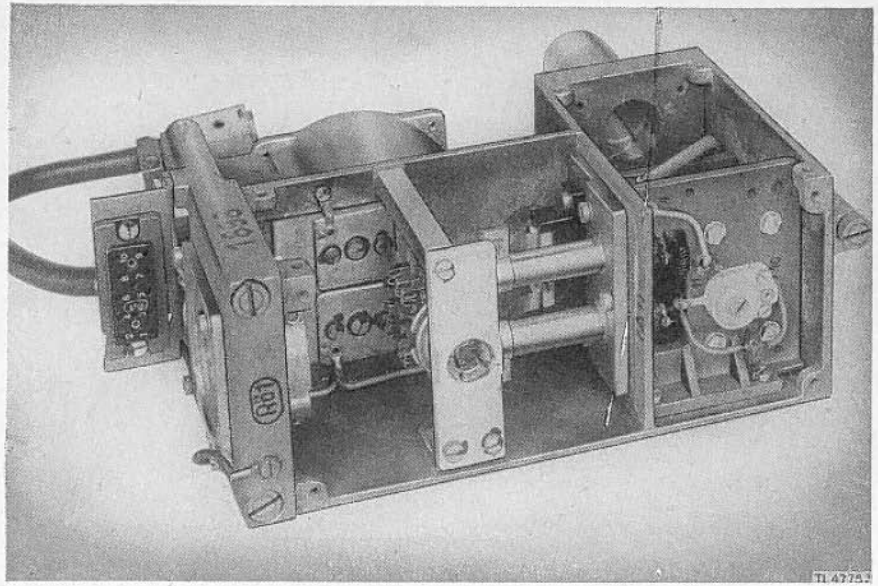

Figure 43. Mixer unit—front view.

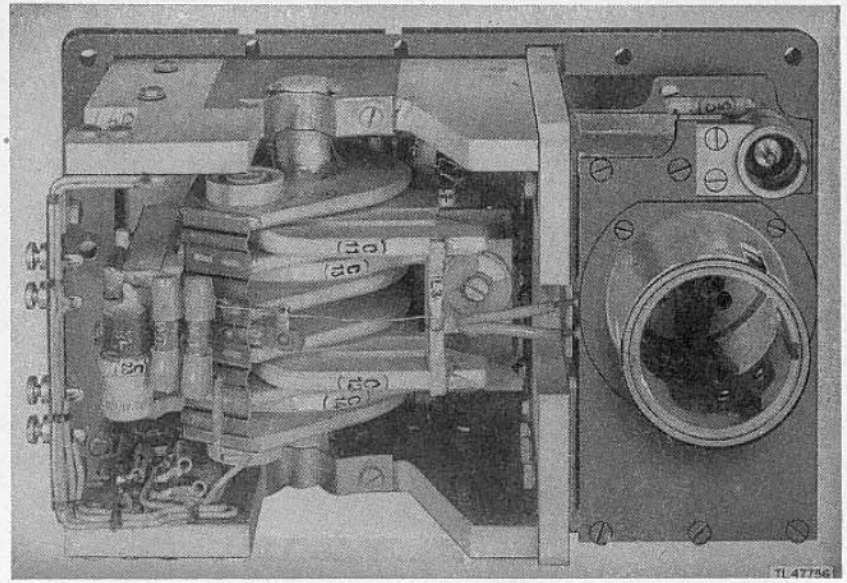

Figure 42. Heterodyne unit—face view.

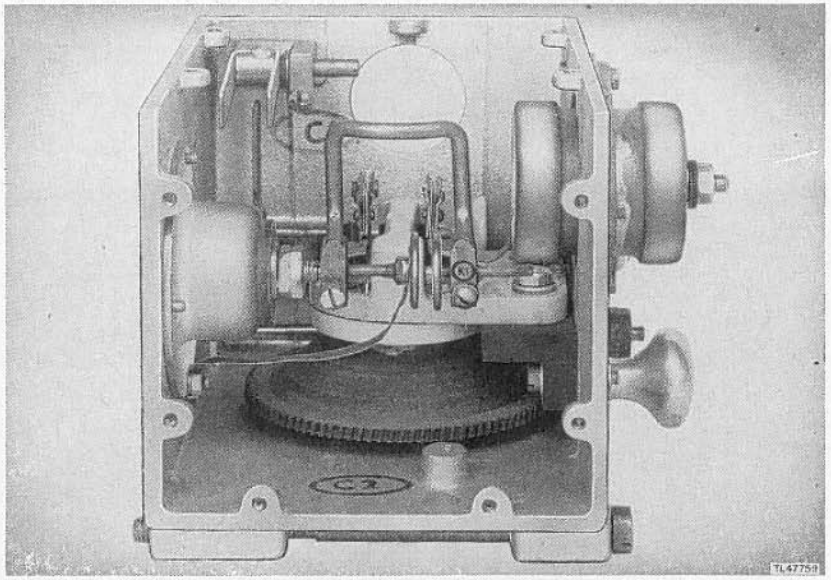

Figure 45. Transmitter (S 62)—end view.

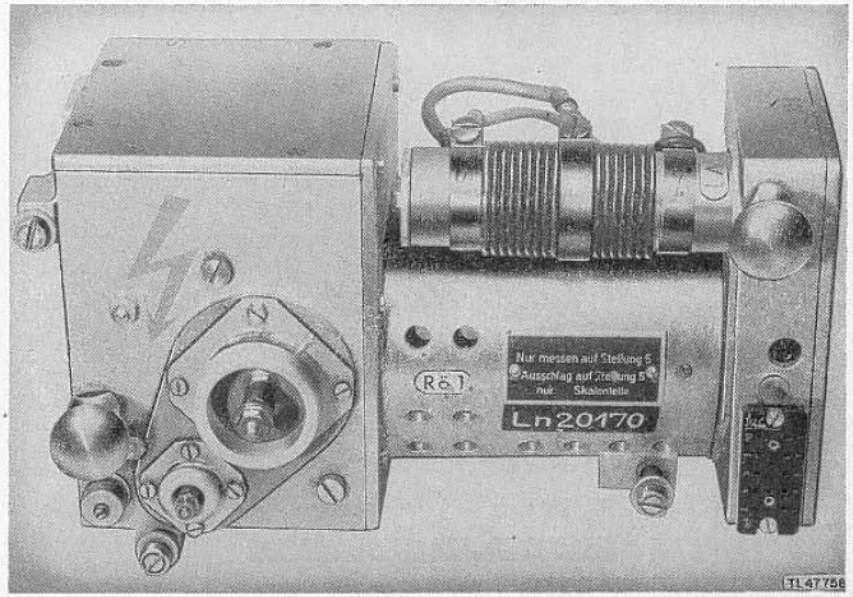

Figure 44. Transmitter (S 62)—front view.

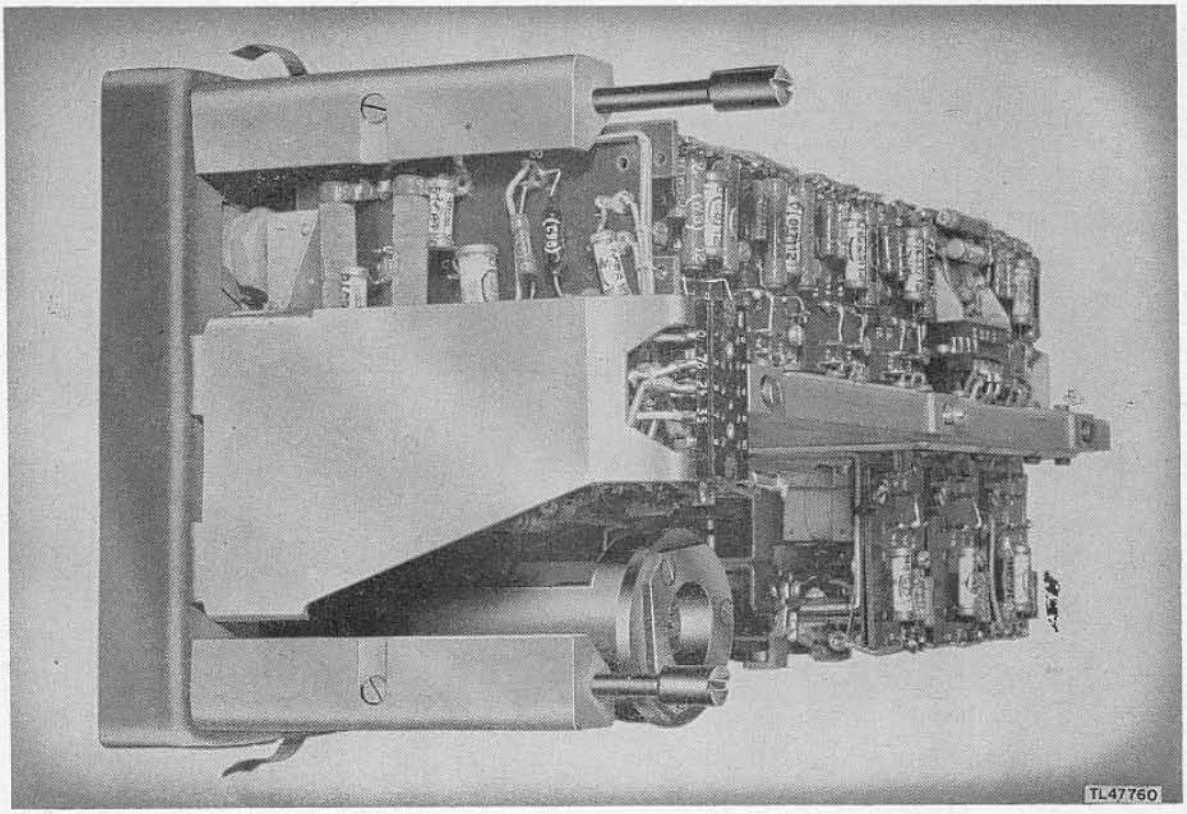

Figure 46. Würzburg i-f unit (ZFV 62)—end view.

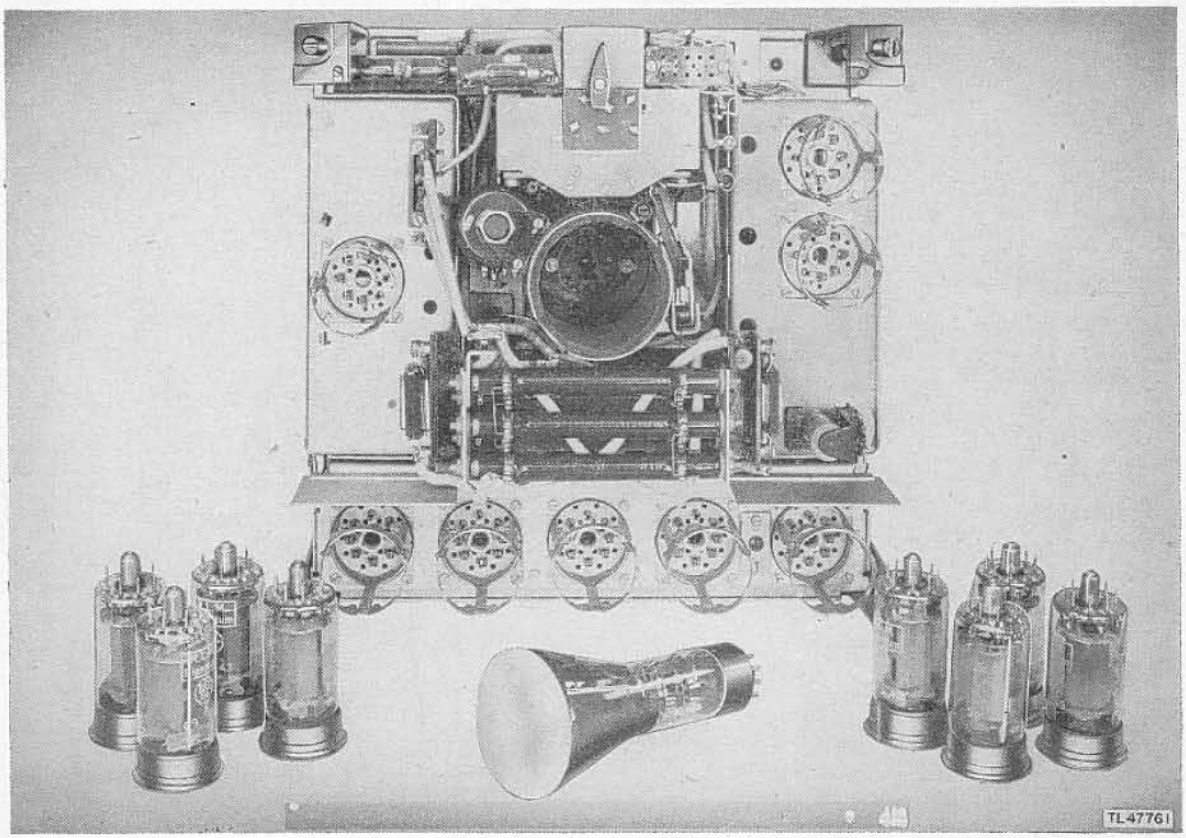

Figure 47. Würzburg impulse generator (IG 62)—front view.

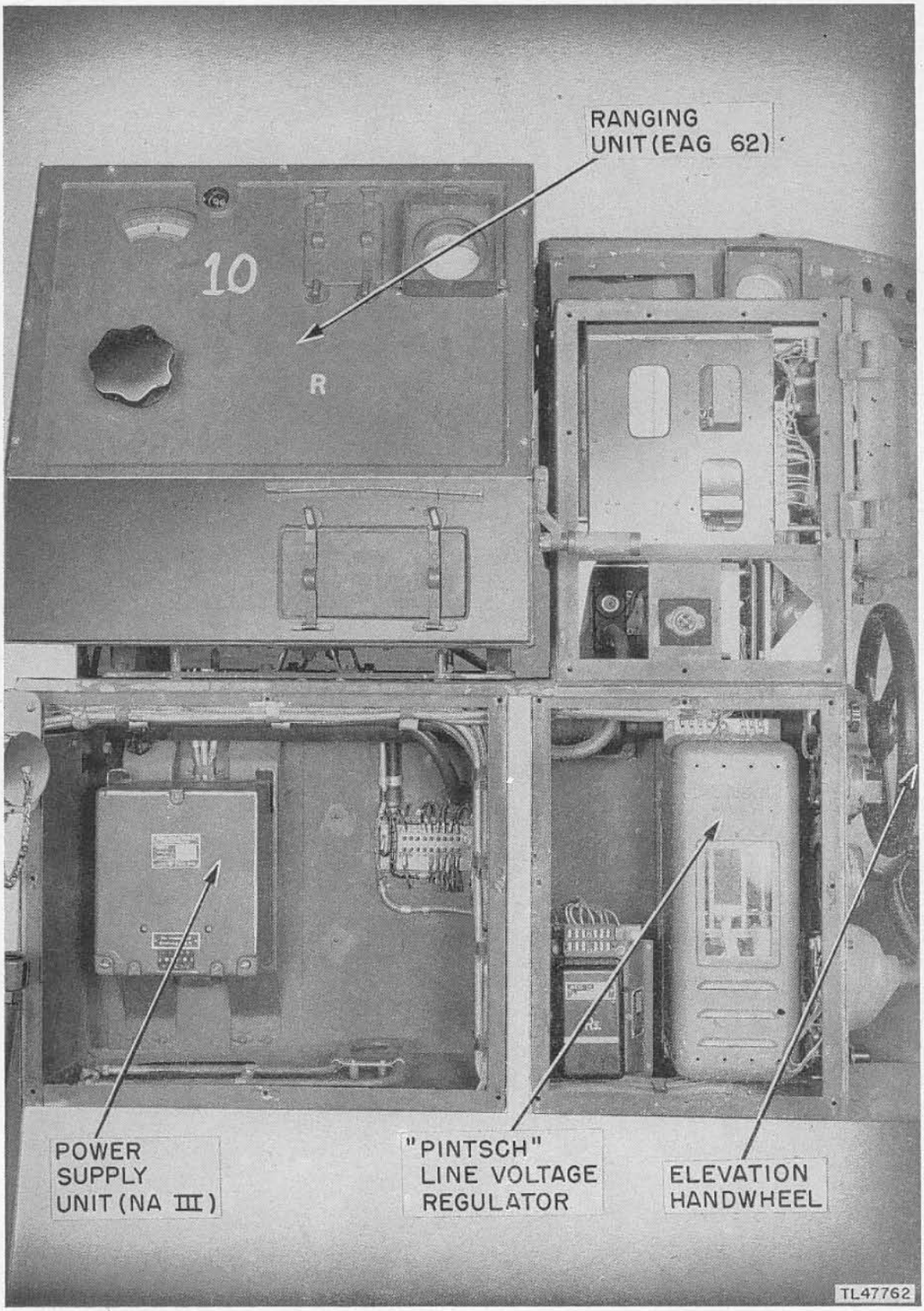

Figure 48. Würzburg control compartments.

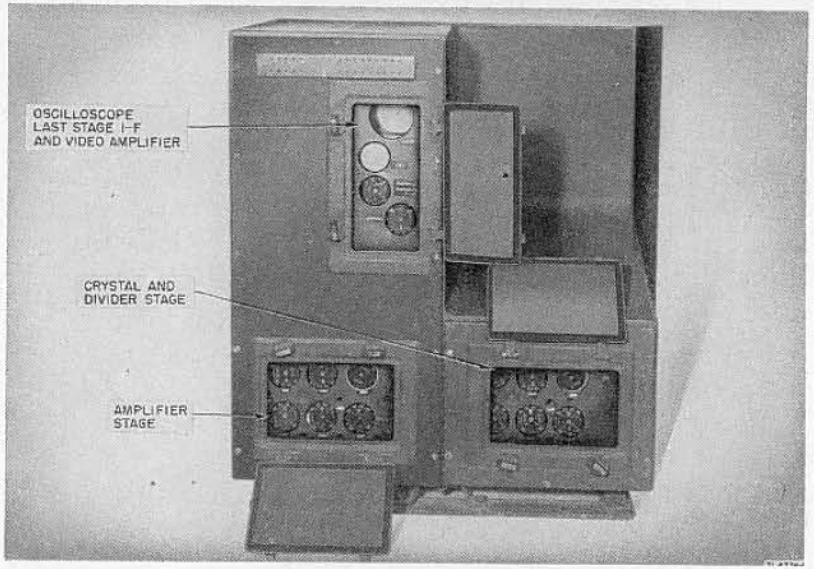

Figure 50. Würzburg ranging unit (EAG 62)—rear view.

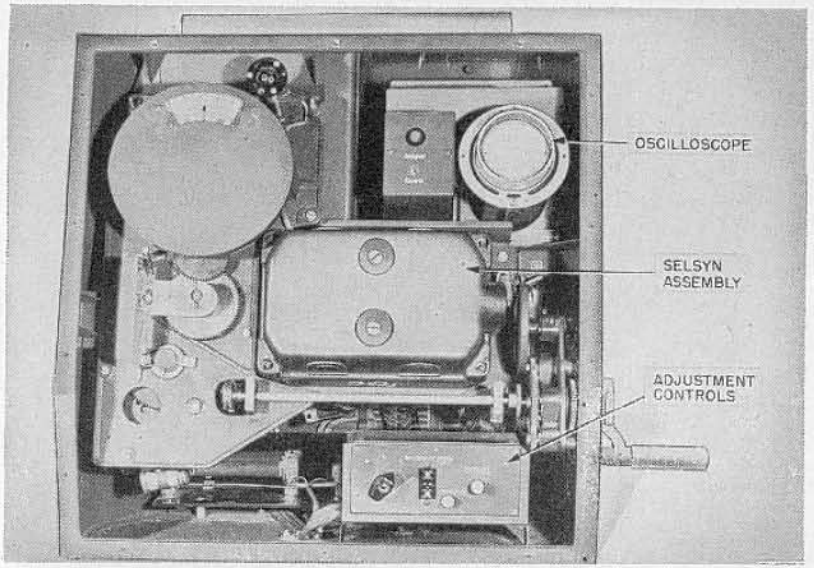

Figure 49. Würzburg ranging unit (EAG 62)—front view.

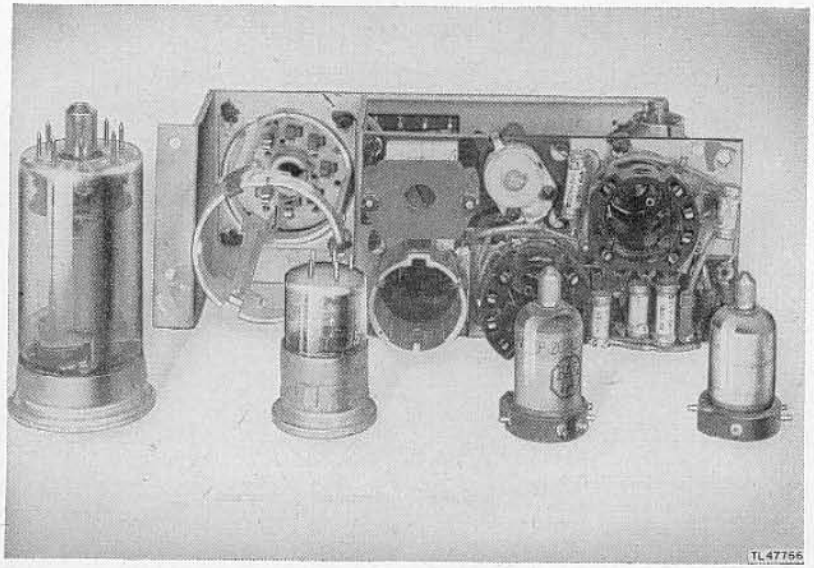

Figure 52. Würzburg ranging unit (EAG 62)—Oscilloscope, last stage i-f and video amplifier.

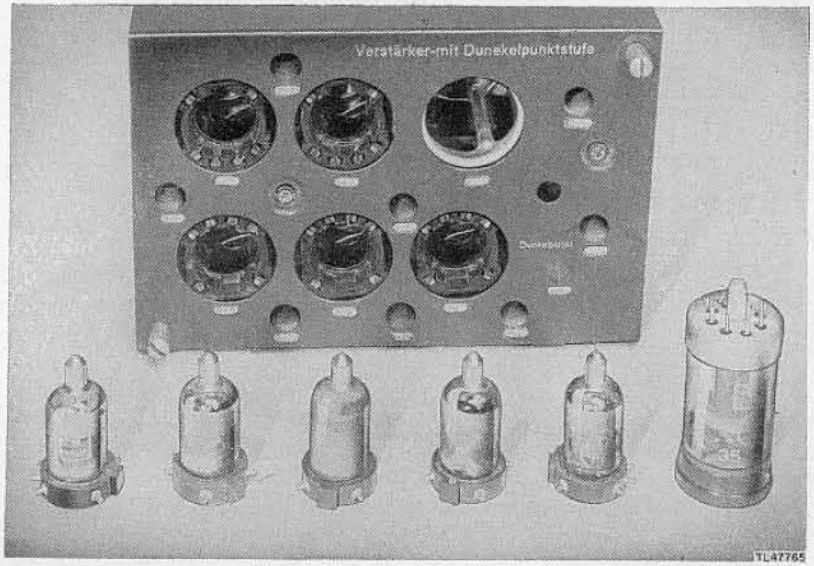

Figure 51. Würzburg ranging unit (EAG 62)—Amplifier stage (front view).

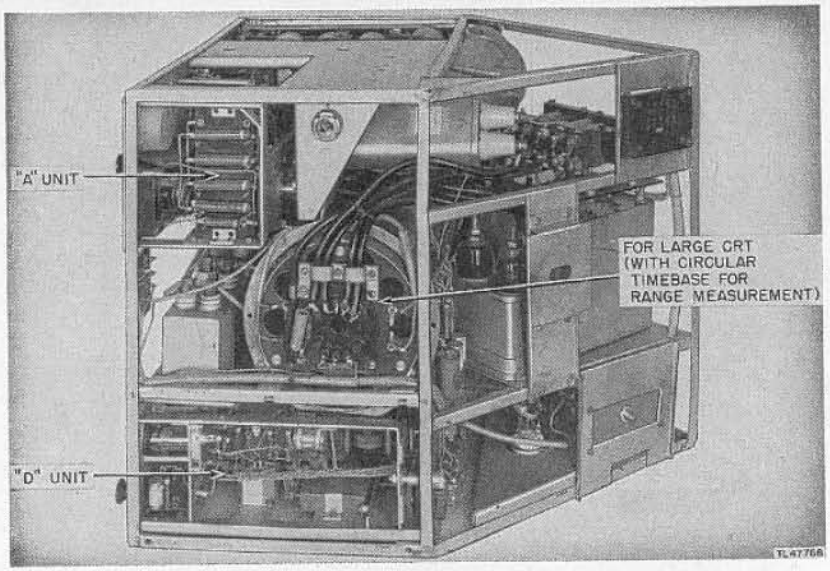

Figure 54. Würzburg main presentation unit—rear view.

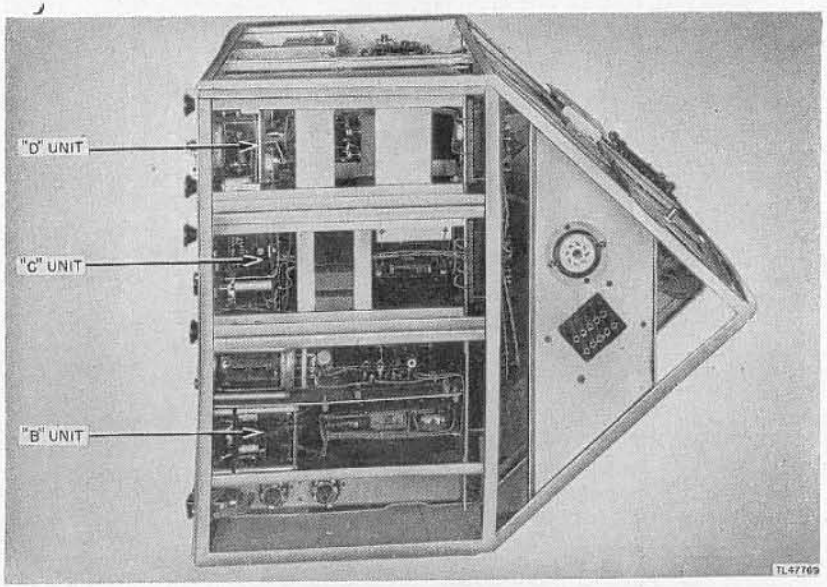

Figure 55. Würzburg main presentation unit—bottom view.

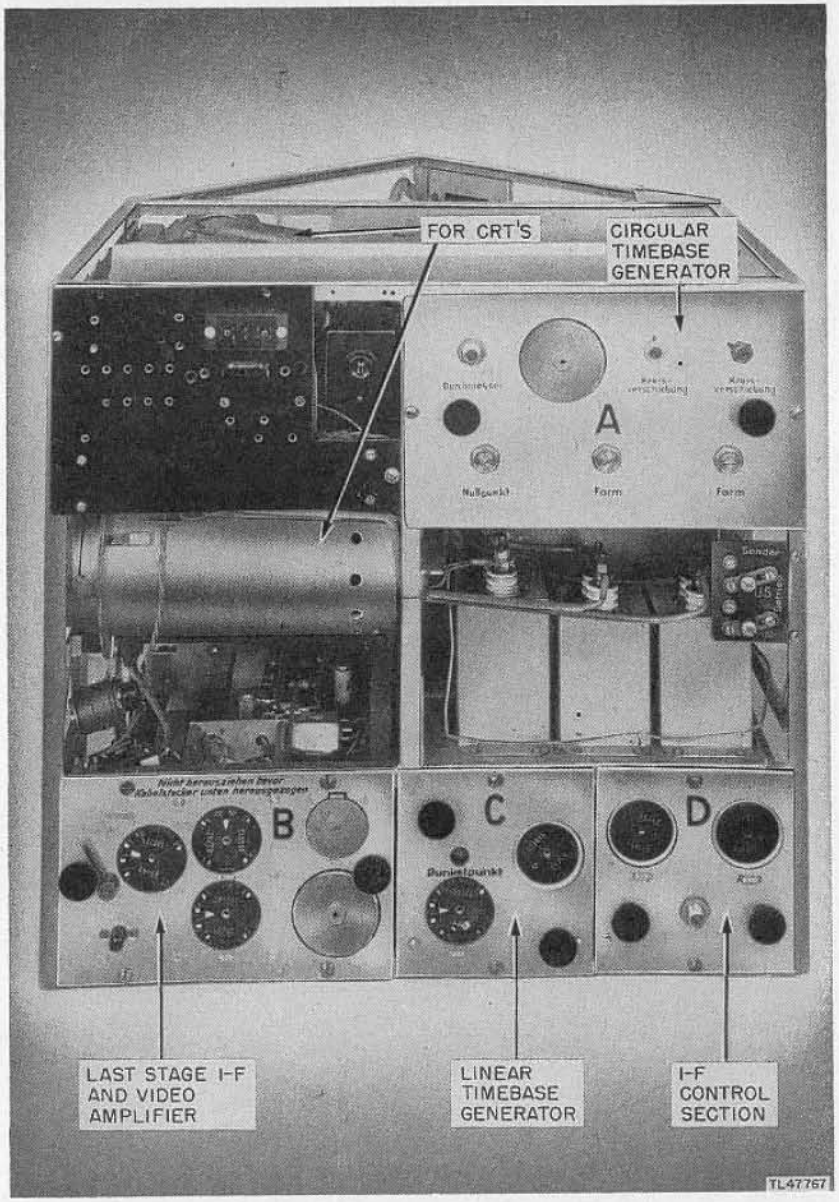

Figure 53. Würzburg main presentation unit.

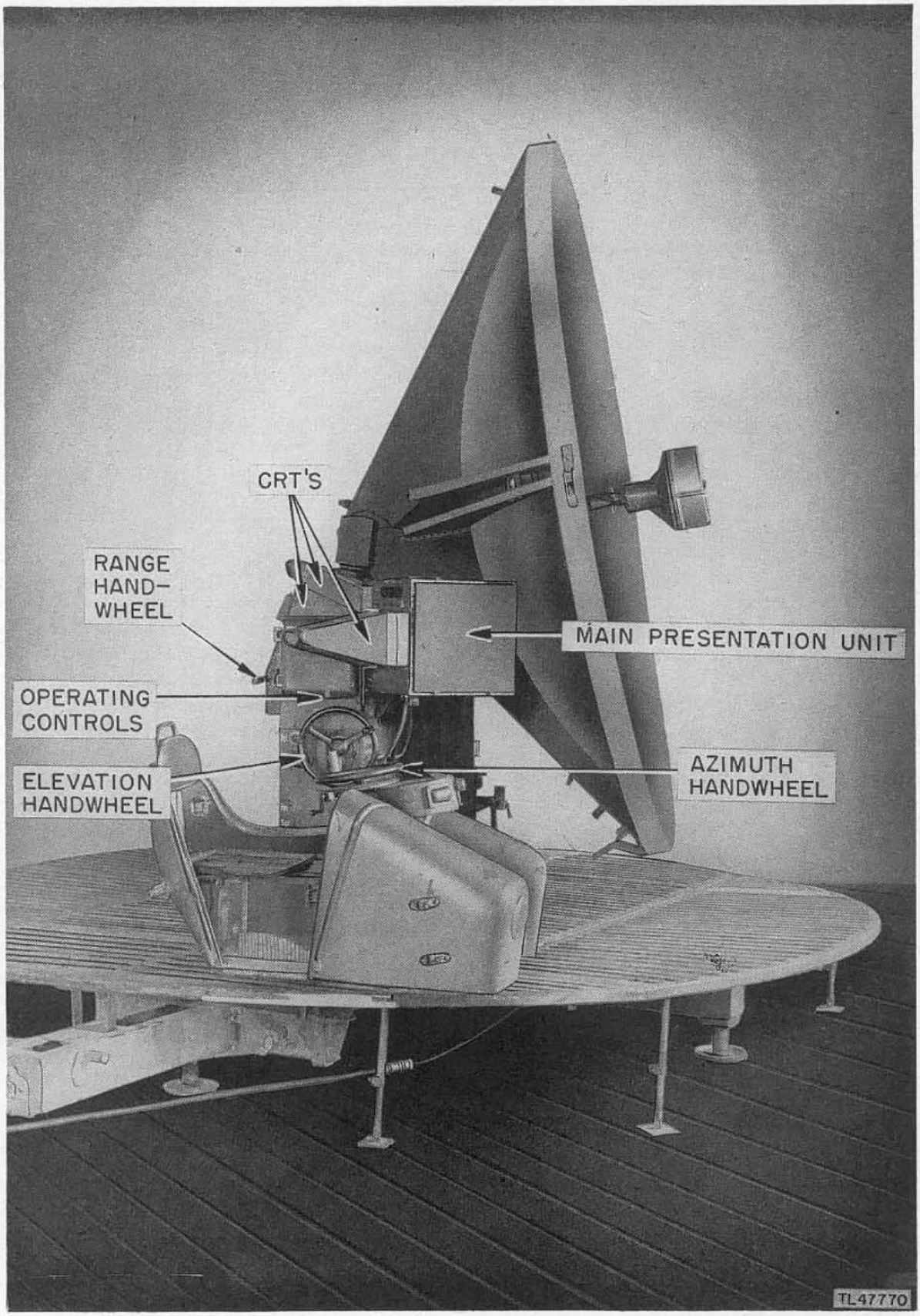

Figure 56. Würzburg type D.

FMG 39T RIESE (GIANT WÜRZBURG) GCI AND GL RADAR

The Giant or "Basket" Würzburg is a normal Würzburg modified by a large (14 times the wavelength) parabolic reflector of wire mesh which is capable of working up to 50 miles and of giving accurate height measurements by virtue of its narrow beam (7°). Like other Würzburgs, it uses a common receiving and transmitting dipole at the focus of the reflector.

From a recently captured unit, it was learned that the Giant Würzburg may be tuned to one of three wavebands, each waveband containing three spot frequencies. The bands are identified by the letters A, B, and C, and the spot frequency settings of each band by the numbers 7, 4, and 1, which are marked at appropriate positions on a dial.

Giants and ordinary Würzburgs are sometimes used for sea watching in conjunction with the standard 80-cm set. When so used, polarization is horizontal, and pulse recurrence rate is 1,500 cps.

One of the earliest functions of the Giant was in fighter control (GCI) stations, the major components of which consist of one Freya, two Giants, one type (C) Würzburg for stand-by, one communication radio-receiver, stand-by power facilities, radio beacon, and plotting room equipment (Seeburg Tizch). The Giants are used for interception, one to follow the target and the other to follow the night fighter. A total of from 120 to 150 men is needed to operate the station, 18 being used for each Würzburg set.

Giants are capable of good performance as early-warning sets against low flyers, the actual performance being governed by the elevation of the site. With the Giant at less than 100 feet and the aircraft at 2,000 feet, the range of pick-up would be 60 miles; corresponding figures for sites above 200 feet would be 80 miles and up. At 500 feet, large vessels could be picked up at 38 miles and small ones at 27 miles.

The radio portions of the Giant were manufactured by Telefunken, the mechanized parts by Luftschiffbau Zeppelin and Weserhutte, and the turning gear by Allgemeine Elektrizität Gesellschaft (AEG). This set was introduced into service in 1941.

The characteristics of the Giant Würzburg are as follows:

RANGE (miles): From 37.5 to 50.

FREQUENCY RANGE (mc): Three bands, A, B, and C, between 500 and 600 mc.

PULSE RECURRENCE FREQUENCY (cps): 1,750.

PULSE LENGTH: 1.0 microsecond.

ANTENNA: Common T&R type, using a single wide-band dipole of sheet metal blades with blade-fixing holes slotted for adjustment to 21.2 inches or 25.2 inches working. Front reflector consists of a strip of sprayed metal on bakelite disk 3.1 inches in front of dipole. Used with a 24.6-foot diameter parabolic reflector of sheet metal or wire mesh.

POWER SOURCE: Power lines, 90 to 380 volts, 40 to 60 cycles ac, or stand-by motor-generator sets.

SIMILAR SETS: Other Würzburgs: types (A), (C), and (D). The main difference between the Giant and the small types is in the size of the reflector.

POWER INPUT REQUIRED: For the apparatus, 3.3 kw; for the turning gear, 12 kw.

POWER OUTPUT: 8 to 11 kw (peak).

TUBES (type and number): 75 tubes in transmitter-receiver unit FuSE 62 as follows: one LS 80, twelve LS 50, twelve LS 30, four LD 2, thirty-four RV 12, one LV 1, two LG 1, one LG 2, one LB 13/40, one LB 7/15, four neon lights TE 4, one quartz crystal OEK 1, and one stabilizer STV 150/15.

TO REPLACE IN PART: Coastwatcher (for medium-range EW) and small Würzburg (for fire control).

TRANSPORTATION: Fixed installation.

TYPE OF PRESENTATION: Four displays: two Class A range tubes with a dark strobe adjustable to range of target, and two Class B tubes for elevation and azimuth respectively.

DATA OBTAINED: Range, elevation, and azimuth.

ACCURACY: The Giant measures height accurately down to about 2.5° of elevation. This limit corresponds roughly to 5,000 feet at 20 miles, 10,000 feet at 40 miles and 12,000 feet at 50 miles.

OVER-ALL WEIGHT (without foundation): 13.3 tons.

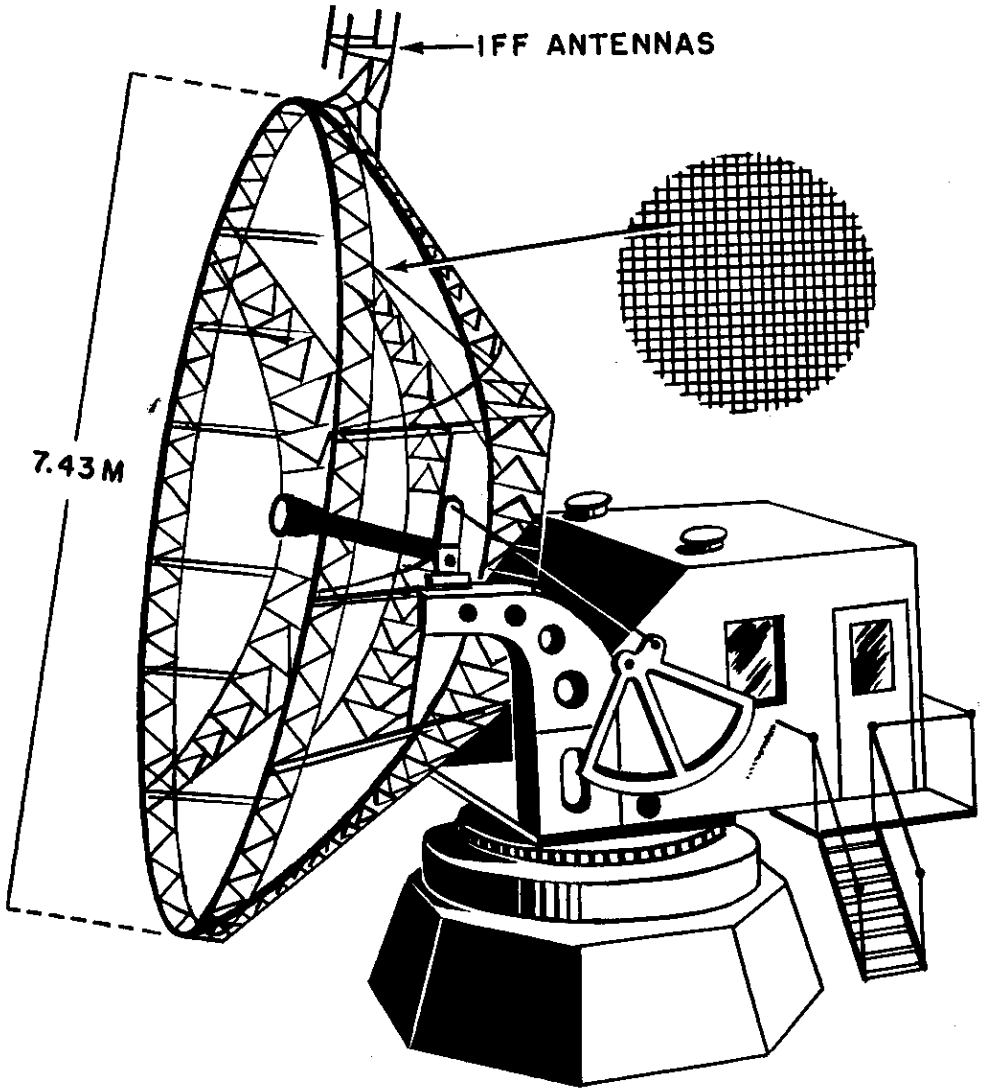

Figure 57. Giant Würzburg.

GLOSSARY

AI. Air Interceptor, Interception, or Airborne Interceptor (detection of an airplane from another airplane).

ASV. Airplane-to-surface-vessels detector, or aircraft locating surface vessels (detection of ships from aircraft).

CRT. Cathode-ray tube.

D/F. Direction-finding (or azimuth determination).

Do. Dornier.

EW. Early-warning.

FMG or *FuMG.* Funk Mess Gerät. Radio-measuring apparatus (radar set).

FuG. Funk Gerät. Radio set (similar to SCR).

FuSE. Funk Sender Empfanger. Transceiver.

FW. Focke-Wulf.

GCI. Ground Controlled Interception.

GL. Gun-laying.

He. Heinkel.

IFF. Identification of Friend or Foe.

Ju. Junkers.

Me. Messerschmitt.

PRF. Pulse recurrence frequency.

T/R. Transmit-receive (switch or box).

T&R. Transmitting-receiving (antenna).