## GERMAN INFRA RED DRIVING AND FIRE CONTROL EQUIPMENT

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#### BRITISH INTELLIGENCE OBJECTIVES SUB-COMMITTEE

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GERMAN INFRA RED DRIVING AND FIRE CONTROL EQUIPMENT

#### PART I

TECHNICAL REPORT ON GERMAN INFRA RED EQUIPMENT SEEN AT FALLINGBOSTEL, GERMANY.

#### Frepared by

COMBINED INTELLIGENCE OBJECTIVES SUB-COMMITTEE

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#### PARTII

TECHNICAL REPORT ON GERMAN INFRA RED EQUIPMENT

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#### TABLE OF CONTENTS

#### PART

# TECHNICAL REPORT ON GERMAN INFRA RED EQUIPMENT SEEN AT FALLINGBOSTEL, GERMANY.

<u>Subject</u>		Page No.	} 
	Introduction	4	
2.	Terrain	4	
5.	Equipment	4	
<b>3</b> .1	Vampir	4	
3.2	FG 12/50	5	
3.5	FG 12/52	6	
<b>3.4</b>	Falke	6	
<b>3.5</b>	Puma	5	
<b>5.</b> 6	Uhu	6	
3 <b>.</b> 7	ZG 1221		
3.8	Binoculars	. 8	
41.	Concluding Remarks	8	

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PART II

#### TECHNICAL REPORT ON GERMAN INFRA-RED EQUIPMENT

Section		Page No.
	GENERAL INFORMATION	
•	A. General Information B. Mechanical Characteristics C. Technical Characteristics D. Operating Instructions	15 15
ŢŢŢ	REPORT ON THE ZIELGERAT	2.4
	A. General Information B. Mechanical Characteristics C. Technical Characteristics D. Operating Instructions	24. 24
IV	AIRCRAFT EXPERIMENTAL MODEL (MUECKA General Information	

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# TECHNICAL REPORT ON GERMAN INFRA RED EQUIPMENT SEEN AT FALLINGBOSTEL, GERMANY.

#### I. INTRODUCTION.

The undermentioned pieces of equipment all consisted basically of transmitter and receiver. The former was a source of light screened to transmit only I.R. radiation; the latter comprised an image converter to form a visible image of the I.R. picture. The several pieces of equipment differed fundamentally only in size. Different code names or numbers were employed according to the size of the gear, the application to which it was put, or the vehicle to which it was fitted. The image converters are of the caesium electronic focussing type, operating from a high tension source.

It was understood that information and samples of all this equipment had been sent freely to the Japanese.

## 2. TERRAIN.

A demonstration showed that with the exception of the ground used for the short range demonstration of Vampir (see below), it consisted of a very open stretch of sandy ground, clear of vegetation for at least 1,000 yds., and free from "dead ground". The sand was grey, streaked with lighter patches.

For the demonstration of Vampir, the ground was uneven, and covered by coarse grass and birch shrubs.

## 3. EQUIPMENT.

## 3.1 <u>VAMPIR</u>. (Figs (1) and (2)).

This is a manborne equipment intended for use with the MP44 carbine (Sturmgewehr) and resembles the American sniperscope. The transmitter is a 35 watt: lamp of diameter about 5 in. and the

receiver a telescope of unit magnification about 14 in. long and  $2\frac{1}{2}$  in. diameter. The two together weigh about 5 lb. and are mounted on the carbine. Power for transmitter and receiver is drawn from a power unit carried in a pack. This power unit weighs about 30 lb. and has a life on one charge of 3-5 hours. The high tension unit for the receiver produces 11 kilovolts.

Performance. The immediate impression in the demonstration was of great brilliance and good contrast in the picture. British and German troops were used as targets with the following results:

Range	Remarks
30 yds.	Men standing and lying clearly visible.
50 yds.	Men standing clearly visible. Men lying difficult to discern.
80 yds.	Men standing just discernible, especially when moving.

The equipment was said to have been used operationally with very good results. The particular use to which it had been put was for protecting vehicles from infantry attack at night. Two men equipped with Vampir were stationed on the rear of the vehicle for this purpose.

It was considered by the investigators that the special gear had been fitted to a weapon which was too heavy for protracted use.

## 3.2. F.G.12/50. (Figs. (3), (4) and (5).)

This is equipment analogous to VAMPIR, but larger in scale fitted to an MG42 gun carried on a SDKFZ251/20 half-track vehicle. The transmitter is a 200 watt lamp, resembling a large motor car head-lamp, of diameter 8 in. The receiver is a telescope of length 20 in. and diameter 5 in. Power is supplied from a power pack (Fig.6) operated from the vehicle battery.

Alternative methods of presentation are available. In the arrangement most frequently used.

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unit magnification is obtained with a large viewing lens which enables both eyes to be used. An auxiliary lens can be inserted to give enlarged, monocular vision. A graticule is fitted for aiming.

#### Performance.

Men standing were clearly discernible at 400 yds. The beam width appeared to be adequate.

## 3.3 F.G.12/52. (Figs. (3), (4), (5) and (7).)

This is the transmitter and receiver only of F.G.12/50 intended for night driving. For this purpose a 100 watt lamp is used in the same lantern, and a diffusing glass is fitted to give a wide beam. An early form of this equipment was termed SPANNER.

#### Performance.

The equipment was seen in action on a Volkswagen. It showed great brilliance and contrast, but the lack of stereoscopic vision and the distortion at the edges of the picture made its use difficult over rought terrain. The German drivers were, however, able to maintain a high speed on roads where progress was as fast as with normal headlamps.

## 3.4 FALKE. (Fig. 5)

This term is applied to the Sd.Kfz 251/20 vehicle equipped with both FG.12/50 and FG.12/52.

#### 3.5 PUMA.

This term is applied to the Panther tank fitted with 7.5 cm. gun KwK42L/7l equipped with FG.12/50.

## 3.6 UHU. (Figs (8), (9) and (10)).

This is the largest German Army service equipment, consisting of a screened 60 cm. searchlight as transmitter and a telescope giving 10 times magnification, of length about 24 in. and diameter about 10 in., as receiver. The receiver has an objective of 40 cm. focus and relative aperture f/1.4, and resembles the telescope found at Brest.

The latter instrument may well be a pre-production form of the Uhu receiver. The equipment is mounted on an unarmed Sd.Kfz 251/20 vehicle which also carries an 8 kilowatt generator for the searchlight. The vehicle is intended for reconnaissance purposes and to illuminate targets which could be engaged by Puma. The searchlight has a beam width of approximately  $3^{\circ}$ , and consumes  $5\frac{1}{2}$  kilowatts. Two filters are used.

The searchlight and receiver are mounted in permanent alignment, on a mounting which includes the observer's chair, and which can be traversed through 360°. An arrangement for altering the elevation is also provided.

#### Performance.

A half-track vehicle was used as target, at a range of 1,000 yds, and the apparatus was trained on the vehicle by the German crew. On observing through the telescope, the investigators questioned the accuracy of adjustment, as the target was indistinct. The adjustment was confirmed by a member of the crew, but it was subsequently found that the beam had not in fact been trained on the vehicle, but on some other object. The vehicle, when properly illuminated, was well seen by one of the team. These circumstances are reported in some detail since they illustrate a feature of Whu which had already been noticed, namely that the beam is narrow.

UHU and PUMA in combination were said to have been used by two units on the Eastern Front with immense success; it was claimed that 67 Russian tanks had been knocked out in one night. These two units and the unit captured were said to be the only three German units equipped with I.R. gear. Gear for other units was, however, said to be in existence hidden in various places.

## 3.7. ZG.1221.

This is a 36 cm. searchlight which has been produced only on an experimental scale. Its performance was not assessed.

#### 3.8 BINOCULARS.

This is a pocket receiver, without transmitter, developed experimentally. It is the smallest equipment available. One half of the instrument is a night glass, the other half an I.R. receiver. Its performance was not assessed.

## 4. CONCLUDING REMARKS.

It was indicated that the equipment had been used by small groups on the Eastern front, but that full reports were lacking. When asked why the equipment had not been used on the Western front, it was stated that this policy had been laid down by Guderian. Two reasons can be suggested.

- (a) The use of "artificial moonlight" on a considerable scale by the Allies.
- (b) The fact that the Germans knew that the British had an infra red receiver of sompact and simply design, which could have been used for detection of search-lights.

Lieut-Commander A. Elliott, R.N.V.R. (A.R.L.)

4th June 1945.

1944.

TECHNICAL REPORT ON GERMAN INFRA-RED EQUIPMENT.

#### SECTION I

#### GENERAL INFORMATION

The text of this report covers three types of infra-red equipment, namely, Nachtfahrgerat (night driving equipment), Zielgerat (rifle sighting mechanism), and an Aircraft Experimental Model (called Muecka, which means, Mosquito). The three pieces of equipment will be considered as individual units in this report. A certain amount of the information in this report comes from Kurt Procknow, a German research technician; however, caution should be observed in accepting all his statements.

#### SECTION II

#### REPORT ON THE NACHTFAHRGERAT

- A. General Information.
- l. Name of Manufacturer: This equipment was made by Kurt Procknow, research technician at the Forschungsanstalt des Reichs-Postministers (Research Institute of the Reichs Postmaster).

This Institute employed nearly three hundred people, to clarify problems directly and indirectly connected with the Reichs-Postmaster. The Institute had six sections, one of these sections devoted to television, later changed to infra-red research. Infra-red research was also carried out at the AEG Laboratories in Berlin. Production of later models was carried out at Leitz, in Wetzlar. They are reported to have produced several hundred infra-red units. Production was begun about 1943.

- 2. Date of Manufacture
- 3. Condition of Equipment.....Excellent.

- B. Mechanical Characteristics.
  - 4. Length of infra-red receiver....16 11/32"
  - 5. Diameter of body of tube..... 4 16/32"
  - 6. Diameter of objective lens holder 4 16/32"
  - 7. Diameter of ocular holder..... 4 23/32"
  - 8. Focal length of objector..... 9 cm
  - 9. Magnification of ocular...... 3 x
- C. Technical Characteristics.
- 10. Bildwandlerrohr picture transformer tube (referred to as Type 160, as it is 160 mm long).
- 11. Infra-red sensitive screen 50 mm diameter.
  - 12. Fluorescent screen 35 mm long.
- 13. Power pack Forschungsanstalt der Deutschen Reichspost IV B 3 (This is an old experimental model. Some of the newer HV power packs have motor generators, instead of vibrators).
  - 14. Input: 12 V, 15 watts.
  - 15. Output: 14,000 V.

- 16. Infra-red light source 100 or 200 watt lamp with infra-red plate and Fresnel lens to disperse light along the road. Also, a pair of infra-red filters to cover car headlights.
- 17. The red filter is inserted to protect the infra-red sensitive screen. If bright light strikes the screen, it will destroy it eventually. This screen is composed of some transparent caesium compound, which took the Institute a few years to develop. When infra-red light strikes the screen, electrons are emitted.

18. The image on the caesium screen is inverted, due to the objective. The high potential is applied to give an erect image on the fluorescent screen by bringing the electron beams to a focus somewhere inside the tube, and also, to accelerate the flow of electrons to give a brighter picture on the fluorescent screen.

- 19. The power pack consists of a vibrator and an automobile type speed coil, used as a step-up transformer. Selenium rectifiers are used with condenser filter. The supply has two output voltages, one of 6,000 volts, DC, and the other, 8,000 volts, DC. In the positive B supply, a rheostat controls the value of the primary voltage.
- 20. The first optical system (ocular) forms a real image on the infra-red screen, with a magnification of 9/25. In other words, with an eye at the conventional 25 cm from the screen, the angle subtended at the eye by this image on the infra-red screen is one-third of the angle which the original object would subtend at the eye without any system in between.
- 21. The real image formed on the second screen (fluorescent) by the electrical system is 9/10 the size of the first image.
- 22. The second optical system (ocular) forms a vertical image somewhere inside the receiver, but with a magnification of about 3. The net result is that if the eye is held about 15 cm from the outside surface of the ocular, the image seen subtends the same angle, at the eye, as the original object would in ordinary light, without any system in between, and a true interpretation of the surrounding objects is formed. If the eye is moved further or closer than 15 cm from the Nachtfahrgerat, the object appears larger and smaller. This is due to the fact, that the final vertical image is not at the same place, in distance, as the original object, but closer, although with the eye at 15 cm from the instrument, it subtends the same angle at the eye as the original object.
- 23. The equipment on hand is an older experimental model for test purposes. Similar equipment

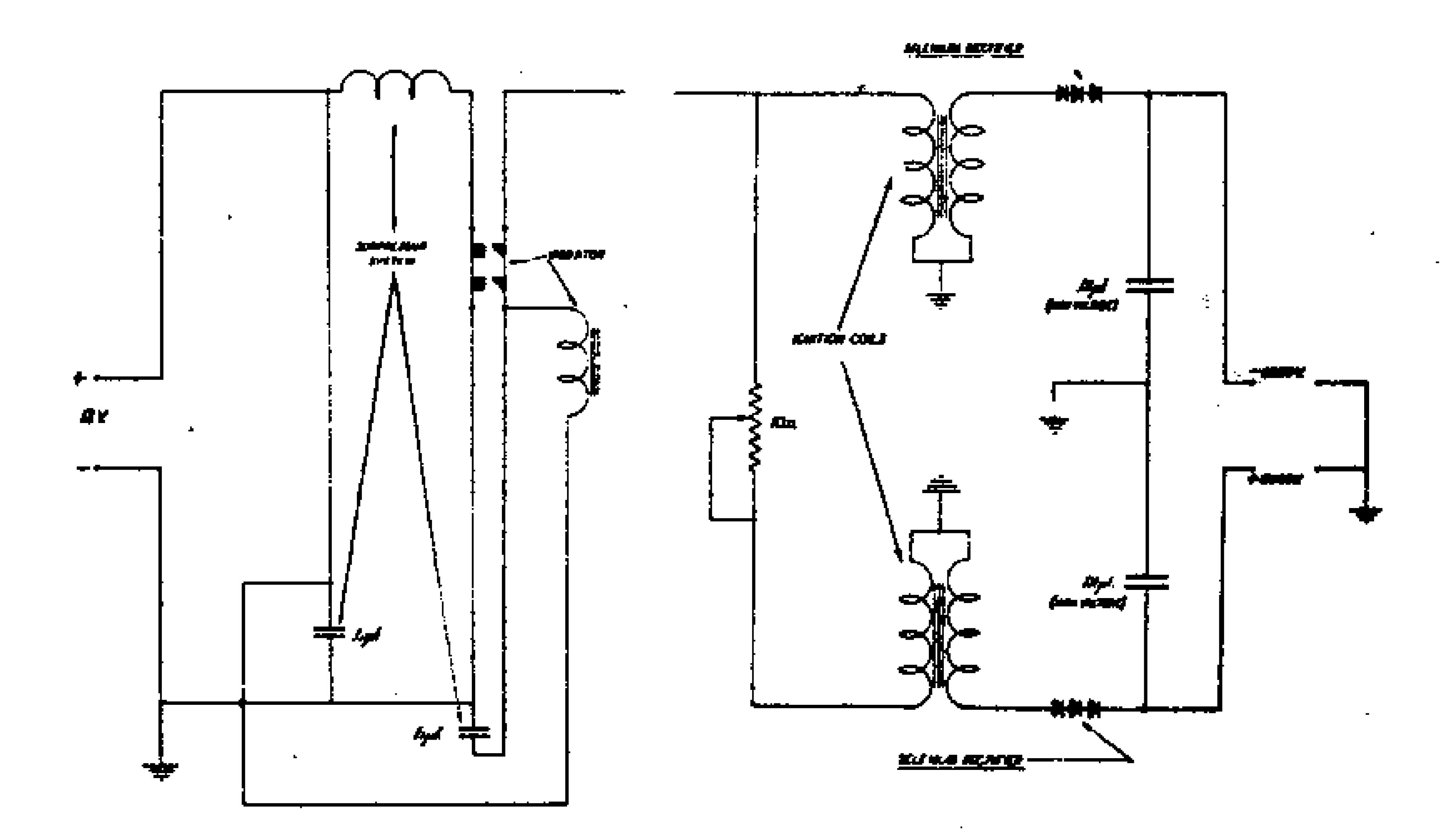
has been produced to be mounted on tanks, with a few small changes. There are cross-hairs, an attachment that can be screwed on the front end of the receiver. The tube (Bildwandlerrohr) had prongs to plug into a socket, whereas this one has wires to attach to caps on the outside of the tube.

- 24. This device is used for driving in complete blackout at any rate of speed the vehicle can maintain and for firing at objects without the use of flares. The roadway is illuminated clearly for 100 meters and it is claimed that most objects can be seen at 200 meters. After a little practice, with the instrument, the driver can easil become accustomed to its use.
- D. Operating Instructions.

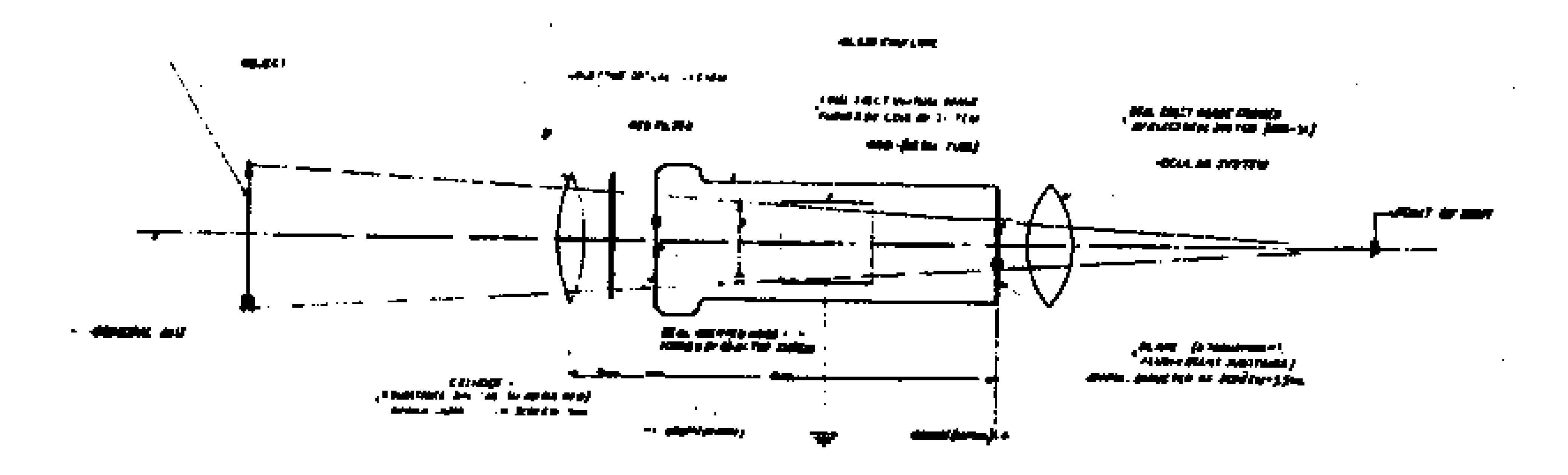
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25. In the automobile there were two on-off switches. One put the infra-red light beam on and the other turned on the high voltage power supply.

#### FORSCHUNGSANSTALT der DRPIZ-B3 (POMER SUPPLY & "NUCHTFAHRGERÄT")



### BILDWANDLERROHR - TYPE 160 (ACTURE-TRANSFORMER TUBE) - Home lange



#### SECTION III

#### REPORT ON THE ZIELGERAT

A. General Information.

- l. Name of Manufacturer: Leitz, Wetzlar. Power pack made by Noekec, Berlin.
  - 2. Date: March, 1945.
  - 3. Condition of Equipment: Excellent.
- B. Mechanical Characteristics.
- 4. Receiver: 10 18/32" long, mounted on any rifle in place of telescopic sights.
- 5. Type 7D tube, 70 mm long (Gerat Nr HSG 1229) Werk ur - 27, L b q.
- 6. H V Power Supply: Contained in a regular gas mask holder, 7 volt input, 4 watts.
- 7. Infra-red light source. This is mounted on top of receiver. Light is supposed to be good for 100 yards. This device enables a saboteur or sniper to pick off a man at night.
- C. Technical Characteristics.
- 8. The receiver operates on the same principles as the receiver used with the Nachtfahrgerat. The only difference is that the receiver can still be used for about fifteen seconds after the HV power supply is turned off. The reason for this, is that a larger value condenser is used for a greater time constant, with the result that the value of the applied voltage gradually decreased. All that is needed is a high potential to be built up since there is practically no current drain, the time of total discharge is about fifteen seconds.
- D. Operating Instructions.
  - 9. There is a small button on the bottom of the

power supply. When this button is depressed, the power is on. When the view begins to fade from the fluorescent screen, the button has to be depressed again. In this way, the rifleman must stop periodically to apply H V, but, he has ample time to sight and aim. The infra-red light beam is worked separately and is probably kept on all the time. It is fitted so that the light beam is thrown on the same point at which the rifle is aimed. This device is supposed to have been used on the Russian front with very good results.

#### SECTION IV

## AIRCRAFT EXPERIMENTAL MODEL (MUECKA)

#### General Information:

- l. Length of Receiver: 5½" long.
- 2. Power Supply: 24 volts input, 4 watts, 9,000 volts output.
  - 3. Name of Manufacturer: Leitz, Wetzlar.
  - 4. Date of Manufacture: March, 1945.
- 5. This is an experimental model and has not been put into production as yet. No infra-red light source was captured with this equipment. It was said that it was intended to have infra-red lights installed on the planes (wing tips), so that the pilot could use the receiver to identify or locate planes near him at night. The receiver is small and it seems that the field of view could be very limited. The receiver could be mounted with the fire control instruments of the airplane.