2. Iconoscopes (Telefunken - Bad Liebenstein)

2.1. The work on iconoscopes was undertaken by Telefunken mainly for the purpose of television. It was also required for military use in connection with a guided projectile, the transmitter being placed in the nose of the projectile. This equipment was designed by the Reichpost at Klein Machnow (later evacuated to Ach near Bodensee). A model of the equipment had been made up and had been tried in an aircraft, a film being taken of the result as seen in the receiver. Professor Schröter had seen this film and he thought that Dr. Weiss of the Reichpost may have a copy of it. Samples of the tube used, which was a type of supericonoscope, were sent to the Reichpost at Ach in March, 1945. Professor Schröter thought that the transmission was by frequency modulation in the region of 50 cms., and the picture definition was 441 lines 50 frames interlaced.

Telefunken were asked by the German military authorities to attempt to push the photo-sensitivity of the super-iconoscope towards the infra red region, but little progress had been made and this requirement lapsed owing to pressure of other work.

The limit of resolution of present mosaics was of the order of 100 lines per cm.

2.2. The Standard Iconoscope

Three sizes of the standard iconoscope have been developed. The design calls for little comment, being in accordance with standard practice. The mosaic was caesium on silver oxide, and the photo-sensitivity was normal for this surface. An attempt had been made by Dr.Gold at Marburg University to prepare an antimony mosaic by decomposition of antimony hydride. (SbH_3). Professor Schröter stated that this work appeared to be promising, although definite results have not yet been achieved. Blowing particles of Ag oxide on to mica plates also looked promising.

In Paris (See section on orthicons) 3kV. had been used on iconoscopes for 1000 line definition. The French were also trying silver mosaics deposited on Al_2O_3 on an Al signal plate.

Figures 1 and 2 are photographs of the standard large and small size iconoscopes, and the arrangement of base connections is shown in figure 3.

2.3. Super Iconoscope

The work on this tube had been done by Dr.Theile, but he was not available, and the following information was given by Prof. Schröter, who claimed that this tube had roughly 10 times as much sensitivity as the standard iconoscope, and attributed this mainly to the excellent storage properties of the mosaic used. Figure 4 shows a diagram of the super-iconoscope, and a photograph of the tube itself is shown in figure 6. The tube uses an electrostatic image focussing system, and to compensate for the known curvature of the image surface in such an arrangement, the photocathode is deposited on a curved end plate of about 70 mm. radius of curvature.

The optical image is maintained in focus over this curved surface by a special optical arrangement devised by Telefunken, and Messrs. Leitz at Wetzlar. This is shown diagrammatically in figure 5. While this optical system corrects for focus erros it causes cushion distortion in the final image, and the correction of this effect has not yet been accomplished. Prof. Schröter suggested that it could be corrected either by an adjustment of the scanning waveform or perhaps by curvature of the mosaic surface, e.g. on glass or Al base.

Two forms of electron lens systems were used for reproducing the electron image on the tube mosaic. The first, which was identical with that used by the AEG in their "Bildwander" tube, was not really suitable for the super-iconoscope because it was designed to operate at a much higher voltage (20,000V). A sketch of this system is shown in figure 7. The second arrangement, which had been employed was a simple two tube lens, and this was stated to be much more suitable for the super-iconoscope application. A high order of accuracy in alignment was required in order to obtain a good image.

The photo electric surface of the super-iconoscope was of semi-transparent antimony activated with caesium. This was usually deposited during the processing of the tube, although Prof. Schröter stated that it can be made before the processing by a separate operation.

The mosaic of the tube was made of magnesium oxide on mica, made by evaporating Magnesium on to the mica through a series of meshes to make the deposit uniform, andthen oxidising by an electric discharge in a few mm. of oxygen. This was done in a separate apparatus before assembly in the super-iconoscope. Prof. Schröter stated that this mosaic has very good storage and insulation properties, and can store up images for several seconds. He also stated that an attempt had been made to use aluminium oxide on aluminium instead of magnesium oxide on mica and that this appeared to be as good as mica providing the thickness was maintained very accurately. The thickness of the oxide should be about 15 to 16 μ in order to obtain the best results. He also stated that they had tried to use the Malter effect for picture storage, but that no success had been obtained.

2.4. Construction and Processing

The signal plate of the tube is made separately before processing, and all the silver surfaces in the iconoscope are produced by an evaporation technique. The electrode lens and mosaic are then assembled in the envelope and the electron gun, which is a simple magnetic focussing arrangement, is inserted. The antimony photo-cathode is generated from a mixture of caesium chromate and zirconium. After the photo-cathode has been sensitised, and while the tube is still on the pumps, it is tested roughly by throwing an image on to the photo-cathode and observing the resultant picture.

The processing has apparently not yet been standardised in any way, and Prof. Schröter stated that a number of variations were still being tried. After construction subsequent bake at 150-200°c for short time often effected improvement in performance.

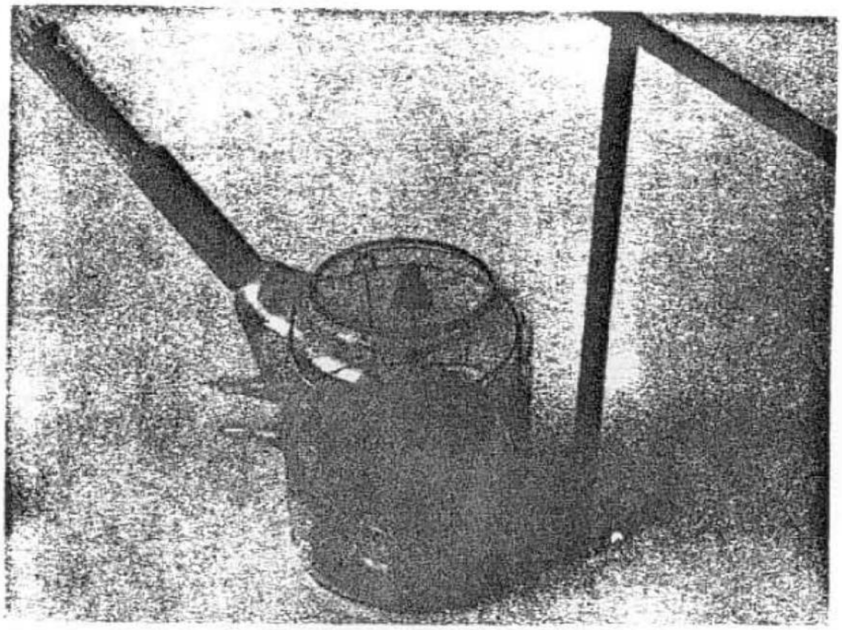


Fig. 1. Large Iconoscope.

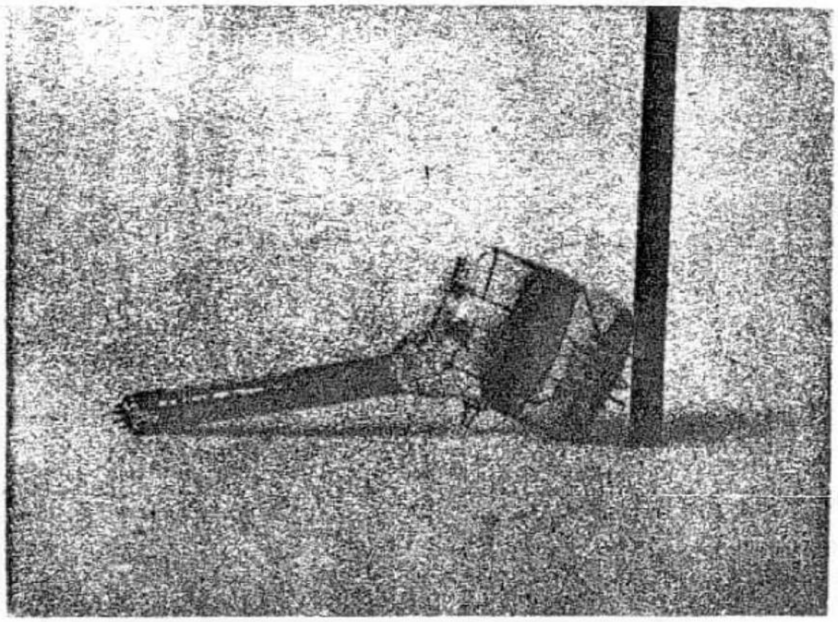


Fig. 2. Small Iconoscope.

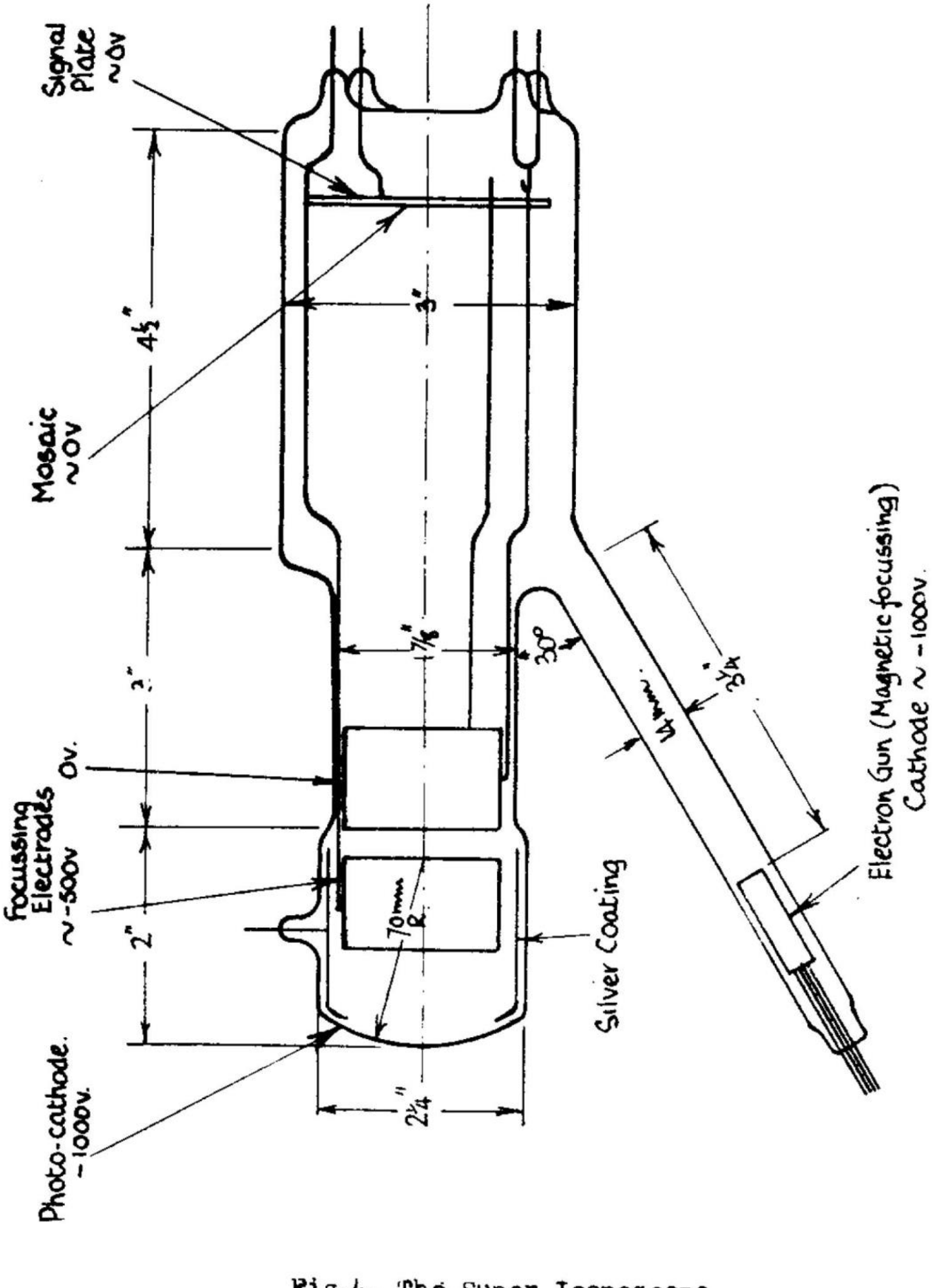
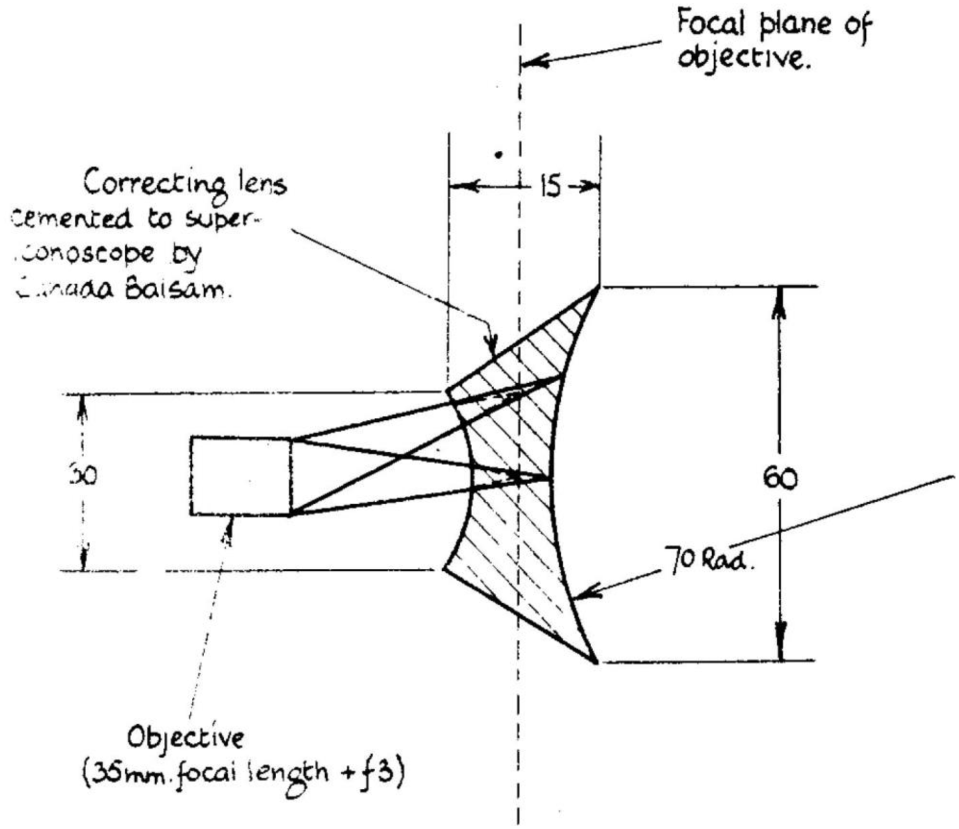


Fig.4. The Super Ioonoscope.



Dimensions in mm.

Fig.5. Optical System for Super Iconoscope. (Leitz)

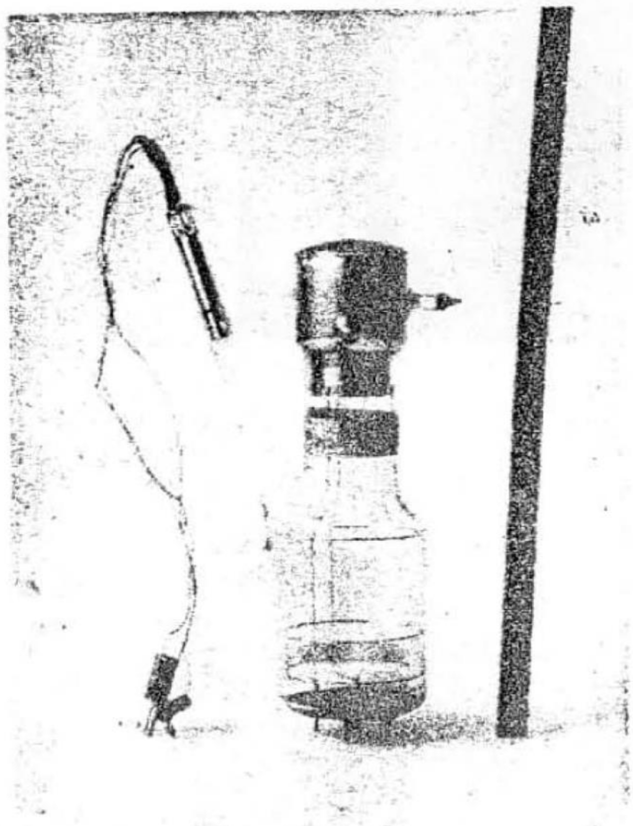


Fig. 6. Super Iconoscope Telefunken Lens.

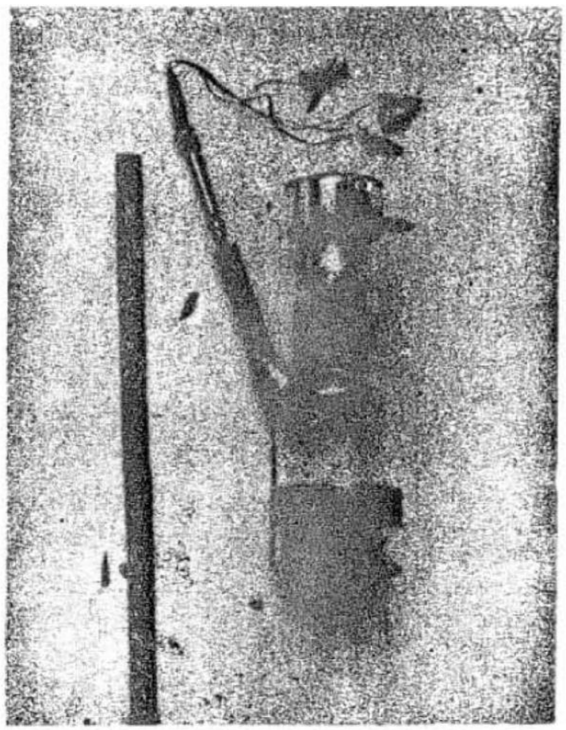


Fig.6a. Super Iconoscope AEG Lens.