CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

SECRET
SECURITY INFORMATION

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This is UNEVALUATED Information

THE SOURCE EVALUATIONS IN THIS REPORT ARE DEFINITIVE.
THE APPRAISAL OF CONTENT IS TENTATIVE.
(FOR KEY SEE REVERSE)

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1. In 1927, Prof. Emanuel GOLDBERG [redacted] showed Mikrats, which had been made by means of a microscope with the use of chlor-silver emulsions [redacted] /Mikrat is the German term for a process similar to the process known as microdot in America/. They consisted of print-out emulsions which were used in light with direct blackening, without developing. The fixing was done in an ordinary toning bath, and an exposure of approximately twenty seconds was required for these emulsions. Portrait photographs were shown which were smaller than one square millimeter. GOLDBERG then expressed the idea that this method could be used to produce libraries where large amounts of material could be stored in very small space. The reading was to be done through microscopes or projectors.

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25 YEAR RE-REVIEW

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2. In 1937, [redacted] project, the purpose of which was the practical application of this idea for the creation of a miniature library. This required the development of a photo apparatus, a projector, and a light-reactive emulsion with a high resolving power. The latter was necessary because the sensitivity of the emulsion used by GOLDBERG was too low for practical purposes.

3. At first an emulsion was produced (described below) which with the equipment [redacted] /See Enclosure (A), Figure 1 7 was used for several experiments described in a report, published in the Zeitschrift fuer Angewandte Photographie (date unknown). 25X1

4. The light source is concentrated on the negative by means of the condensor. A point source or a sound-film 6 volt 5 amp. lamp was used as a source of light. The Mikroplanar or Mikrotar of Carl Zeiss with 15 or 20 mm. focal length was especially satisfactory. Focusing was done by a autocollimator [redacted] /See Enclosure (A), Figure 1 7. A negative which had been made with a small picture camera was used as the object. With this method, it was possible to photograph on about 1 sq. mm. a page size DIN A-4 which was clearly legible. This corresponds to a reduction of approximately 300 times (i.e. the reduction of original to film negative was 10 times and the reduction of film negative to Mikrat was 30 times). Half-tone pictures could also be reproduced satisfactorily. 25X1

5. An apparatus was then built in order to make 10,000 pictures on a plate, size 9 x 12 sq. cm. A film, which contained the negatives in small picture format (24 x 36 sq.mm.).(known as 35-mm film strip)was used as the object. [redacted] this apparatus /See Enclosure (A), Figure 2 7 the lens arrangement corresponds largely to that shown in Figure 1 /See Enclosure (A) 7 except that the mounting of the lens is different. The lens is placed in a housing which touches the Mikrat plate and can be so adjusted that the picture has the greatest sharpness. 25X1

6. The picture taking is done automatically. The film is moved jerkily by a Maltese cross. While it rests, the diaphragm opens the path of light for exposure. Simultaneously with the film movement, the Mikrat plate is also moved ahead. One hundred pictures in each of 100 lines are made on one plate. The movement is done electrically and is controlled by the film drive. With each switching operation, the lens housing is raised electromagnetically by a lever.

7. Several test pictures were made with this apparatus which showed that the principle is usable. The sharpness of the individual pictures was evenly good. There were some technical flaws which, however, were not eliminated, since the work was discontinued in about 1944.

8. Through the publication of the article in the Zeitschrift fuer Angewandte Photographie, the Sicherheitsdienst became interested, and [redacted] given the assignment of producing 25X1

Mikrat films (16 mm.) and of assisting the firm of Filmosto in Dresden in the production of a photo-apparatus and in the reproduction of equipment.

9. The apparatus of which several models were built in 1944 is shown basically in my drawing of it /see Enclosure (B)/. This figure shows the essentials of the optics which makes possible the reproduction of the negative, photographed as a small picture, on the Mikrat film. The lens is again mounted in an adjustable housing against which the Mikrat film is pressed.

10. In order to observe the finished Mikrats, a second system of light rays is used which shine through the Mikrats. Observing is done through a lens and ocular either directly or by means of projection on a screen or ground glass plate. It is also possible to make photographic enlargements on paper or film. In the latter case, the light sensitive film is inserted instead of the negative film.

11. [redacted] the Mikrat emulsion [redacted] 25X1
must have as high a concentration of silver bromide as possible and be as clear as possible. These are, [redacted] two requisites that contradict each other. The emulsion is a silver bromide emulsion with some (ca.2%) silver iodide. It must be prepared with a gelatine which inhibits grain growth as much as possible. In mixing there were two methods employed which gave somewhat the same results. The silver nitrate solution should be added in a stream to the 25X1
potassium bromide-containing gelatine solution or mixed slowly so that there is always a slight excess of silver ions, and only in the end should the mixture contain an excess of bromide ions. Pinachrom proved to be a better sensitizer than pinacyanol, but it is easily possible that other sensitizers are even better. Only a few sensitizers were available to us for research. The firm Mimosa, Dresden, produced according to our specified formula, Mikrat film, which required an exposure time of about three seconds with a good clear negative. [redacted] 25X1
[redacted] The film factory, Agfa Wolfen, succeeded in producing according to their own formula a higher sensitivity emulsion, with which under favorable conditions needed an exposure time of one second. This emulsion probably contained gold thiocyanate. [redacted] 25X1
their work was independent [redacted] This emulsion does not deteriorate but can be stored in a manner similar to other film. The Agfa film kept very well. Development was done with a normal Metol-Hydroquinone developer.

12. The security service (Sicherheitsdienst) wanted to stamp out each Mikrat with a machine so that the approximately 1 sq.mm. print could be transmitted as a single item. They also tried removing after exposure the emulsion from the backing. [redacted] 25X1
[redacted] they probably used the stamping process instead of the removal of the emulsion from the backing. For the stamping process, they used a backing with a thickness of about 1/10 mm. The emulsion removal idea could probably be made to work satisfactorily today. [redacted] 25X1
[redacted]

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13. [redacted] the army used the GOLDBERG emulsion mentioned earlier and was able to make somewhat smaller pictures with their equipment. The GOLDBERG film [redacted] has better resolution, than either my film or Agfa's. The details of this emulsion were published by GOLDBERG in Zeitschrift fuer Technische Physik, 1926, 7:500 in an article entitled "Herstellung von starken Verkleinerungen." /See Theory of the Photographic Process by C.E.KENNETH MEES published by MacMillian, New York for additional references to both GOLDBERG's and FRIESER's work./ 25X1 25X1

14. [redacted] 25X1

15. The Soviets showed very little interest in [redacted] Mikrat work. Two men came [redacted] at Ostashkov, and presented themselves as scientists from the Soviet Academy of Science. [redacted] 25X1

They did not ask detailed questions about the emulsion and, [redacted] gave no details on the emulsion in the paper. [redacted] they would have had no need for emulsion data, as they had taken over Agfa Wolfen. and must have obtained the emulsion data from them. [redacted] 25X1 25X1

ENCLOSURE (A): Automatic Mikrat Apparatus

ENCLOSURE (B): Commercial Mikrat Apparatus

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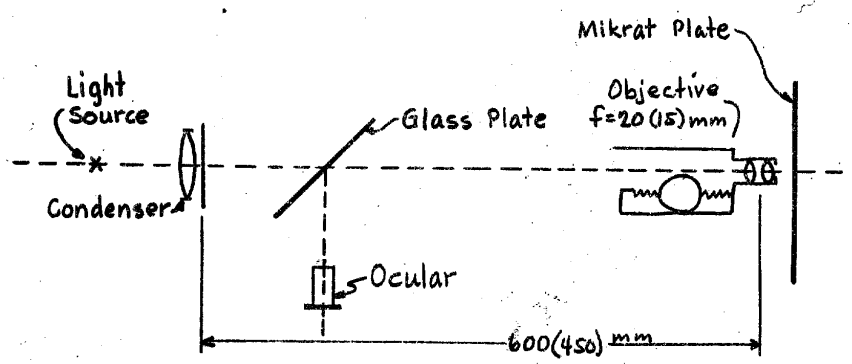

Laboratory Model Mikrat Apparatus

Figure 1

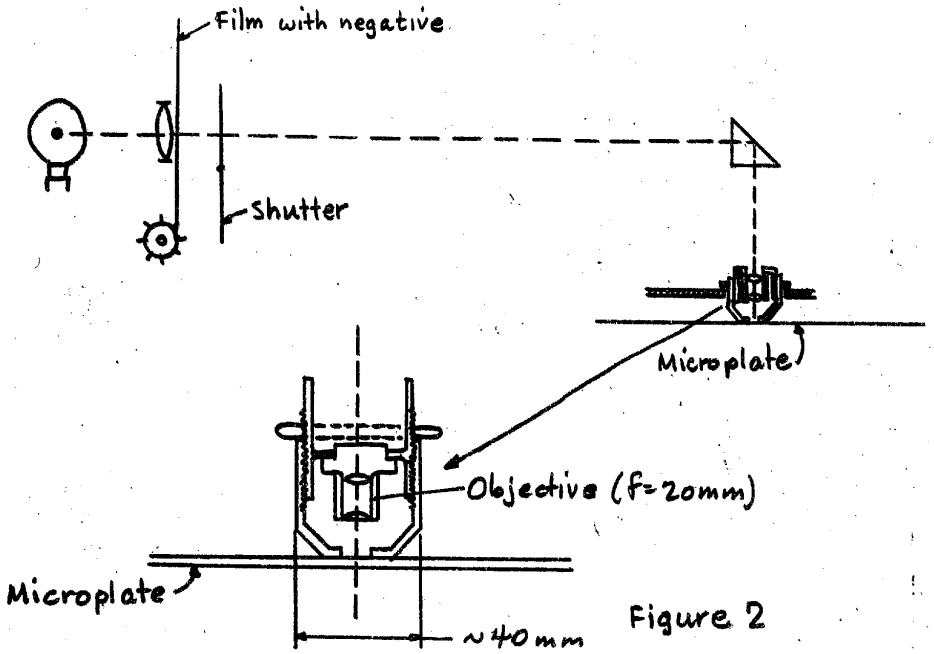

Figure 2

AUTOMATIC MIKRAT APPARATUS
10,000 PAGES ON ONE 9×12 PLATE

Enclosure (A)

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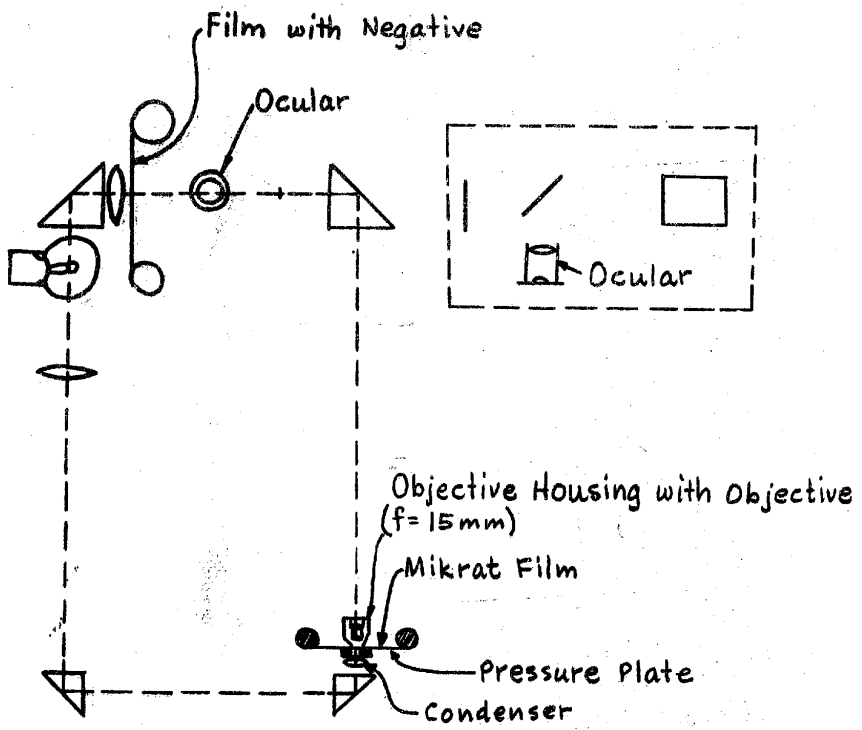

COMMERCIAL MIKRAT APPARATUS

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(diagram in area surrounded by dotted lines is not a part of the apparatus, but rather a way of showing another view of ocular, reflection plate, prism and film, since their relationship was not evident in one view.)

Enclosure (B)