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'FOLIO'

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... members are asked to send their contributions for publishing in the FORUM section of FOLIO postmarked no later than March I, 1980
March I, 1980
March I, 1980

A collection of the classics

I had to work late.
I was too tired when I got home.
It's raining.

The Society is run by a 'C L I Q U E ' anyway.

I have a headache.
I hate making decisions.

They'll think I'm stupid to ask such questions.

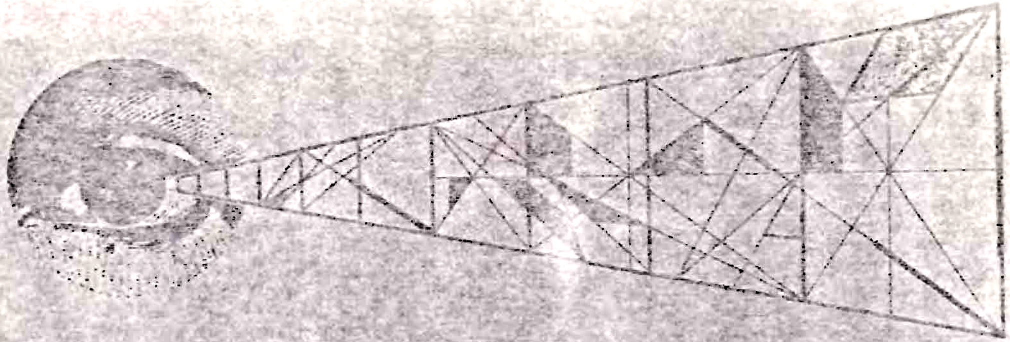
I had to study for a test.
I'm moving anyway.

I prefer to just belong.
I prefer to criticize and knock.

I broke my glasses.

I was out of town.

I forgot.



S C R I B B L E S & Q U E R I E S
(membership forum)

... inclosed in this FOLIO is a membership application form, members are requested to vigorously pursue the finding of additional candidates for membership.

... in what year was this symbol officially registered as the TRADEMARK of the Carl Zeiss Companies ???

write --- NICHOLAS GROSSMAN

(Credit for securing the first WOMAN member will receive a ZEISS gift.)

... do you have ZEISS DISPLAY MATERIAL in your collection ? items such as posters, window display, metal sculpture, salesman material, this 'n that; please describe .

... in reviewing the membership applications it was a constant joy to note the ZEISS expertise in many areas held by our members.

Such talent and knowledge makes for very fine articles for publication in FOLIO. I am asking the ZH membership to come forth with proposals for 'manuscripts' on their favorite area of ZEISS, to use the well worn cliché --- "it is better to light one candle than curse the darkness." [illegible] SPEAK UP !!!

Precious ZEISS PHOTO'S or pictures of your unique ZEISS Instruments or Accessories make fine material for FOLIO, send them in soon.

..... the new book 'ZEISS IKON CAMERAS / 1926-1939 by D.B. Tubbs should be reviewed for FOLIO ---- is their a member who will volunteer to be our BOOK REVIEWER ???

..... the ZEISS HISTORICA ARCHIVE was immeasurably enriched recently by gifts of ZEISS PUBLICATIONS from HUBERT NERWIN and DR. FRED MATTHIES. After processing these items will be made available for reference and research.

..... why not indeed search thru your collection of original ZEISS publications and donate a copy to the ARCHIVES where you have duplicates and triplicates ? Your name will be affixed to the Honor Roll, and you will have achieved Immortality.

[illegible] the next issue of FOLIO [illegible] 1980 . Bet on it.

ZEISS HISTORICA
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E D I T O R

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ERNST ABBE in Memoriam

Hans Gause

The 23rd January of this year was the 125th anniversary of Professor ERNST ABBE, and in the same month, on the 14th January, there have elapsed 60 years since the death of this outstanding scientist, inventor and master in the field of theoretical and practical optics. His shining example, his humanitarian and creative achievements in the field of optics, should surely be sufficient reason to think of him not solely on special occasions. For many people in JENA, who every day pass the monument created by VAN DE VELDE, MEUNIER and KLINGER on the Carl-Zeiss-Platz, which leads to the world-famous workshop created by Zeiss and himself, this is certainly the case. In addition, however, a great deal has been written and spoken about ERNST ABBE, for the general pleasure of all those who regard humanitarian thinking and feeling as the main impetus for the progressive development of human culture. We find publications about him written by his own close colleagues, friends and pupils, such as S. CZAPSKI, M. v. ROHR, F. AUERBACH and O. LUMMER, in which personal impressions and ideas are reflected, and also literature by biographers, such as H. BOEGHOLD – who was, incidentally, one of the last students at his lectures on light diffraction – and P. GÖRLICH, H. LUCAS, R. TIEDEKEN and W. SCHUMANN, and his colleague P. G. ESCHE, who have further discussed his scientific and socio-political position, from the documentary material still available, and who have, as far as possible, implemented the already existing knowledge of his life's work, and evaluated his achievements in accordance with new criteria. It is not, therefore, easy in this instance to make an appropriate selection from the large amount of factual material, in order to represent his person and his work in a suitable manner for a specific occasion.

The career and development of ERNST ABBE were at one and the same time eminent and a typical example of the life of an extremely intellectual and gifted child of the working class. His capability gained him the support of his father's employers: that he became a physicist with a special bent is probably exclusively on account of his own merits and those of his teachers. It can hardly be assumed that ERNST ABBE intended to devote himself exclusively to optics after finishing his university studies. His thesis, which he had been set by WILHELM WEBER, was entitled "The Empirical Foundation of the Law of Equivalence

Fig. 1: ERNST ABBE as a young lecturer in Jena

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Fig. 2: ERNST ABBE with his fellow professors at the "Referier-abend" 1894. First row from left to right: MÜLLER, WINKELMANN, ABBE, v. BARDELEBEN, HÄCKEL and STAHL, FÜRBRINGER, KNORR, BIEDERMANN and DETMER.

between Heat and Mechanical Work"; and in his thesis, submitted in 1863, to the Philosophical Faculty of the University of Jena, his dissertation was entitled "On the Laws of Distribution of Error in Observation Series". This subject is still of great importance to-day, especially since the combination of measurement and production essentially influences and directs the processes in modern production shops, particularly in scientific instrument construction.

At the age of 34, i. e. in 1874, ABBE delivered his first lecture on an optical subject at the Physical Institute of Jena University. He continued his lectures until 1898 as an Honorary Professor, usually discussing optical subjects. Although ABBE wrote a large number of individual works which were subsequently published by CZAPSKI and his colleagues, he did not unfortunately compile his lectures, on the theory of optical instruments and the theory of image occurrence in the microscope, in book form. This was first carried out by his pupils CZAPSKI and LUMMER and published by them. The theory of optical instruments was then duly revised and published by scientists from the Jena precision-mechanical optics workshop. BOEGEHOLD, a senior scientist in optical theory, who still lives in Jena, and who also knows best the work of ERNST ABBE, – and to whom the author of this article is indebted for much friendly advice – states that the beginnings of his optical work dated back to April, 1869. ABBE had, however, earlier come into contact with CARL ZEISS, the university mechanical engineer and successor of FRIEDRICH KÖRNER, when he had his physical apparatus repaired, or new equipment built, which was required for his lectures.

Probably one of the most important of ERNST ABBE's inventions was the Apochromat. It is to-day more than 80 years since ABBE designed this and the optical workshops of CARL ZEISS in JENA produced this new type of microscope objective, together with the respective eyepieces, using special glass from the glass technological laboratory (SCHOTT & GEN.) for practical operation. It should be mentioned here that ABBE and ZEISS have not applied for any protection for this invention. This type of objective still represents at the present day, a special class, which due to its excellent image quality as compared to other types, has become generally used in practical microscopy, despite the image-field curvature. They are surpassed in the image quality only by Plane-field Apochromats, which are based on the primary calculations of H. BOEGEHOLD.

In a leaflet of 1886, six objectives of this type with various apertures are already offered, namely, three dry systems, with apertures 0.30, 0.60 and 0.95, a water immersion of aperture 1.25, and two homogeneous immersions with apertures 1.3 and 1.4. The dry system of aperture 0.95, as well as the water immersion

Ueber Verbesserungen des Mikroskops mit Hilfe neuer Arten optischen Glases.

Von

Dr. E. Abbe,

Carl Zeiss Bibliothek

CARL ZEISS JENA Bibliothek

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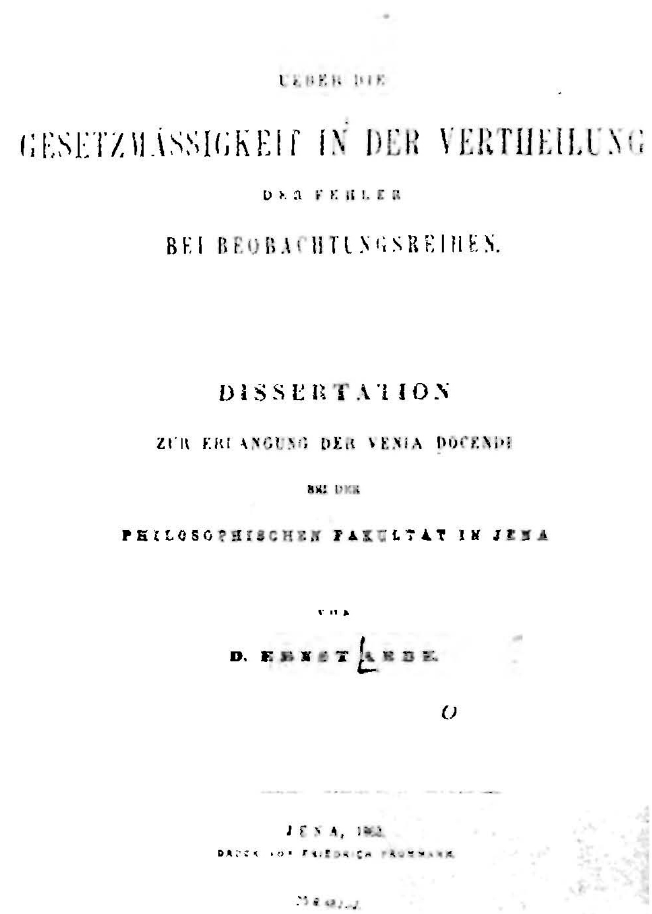

UEBER DIE

GESETZMÄSSIGKEIT IN DER VERTHEILUNG

DER FEHLER

BEI BEOBACHTUNGSREIHEN.

DISSERTATION

ZUR ERLANGUNG DER VENIA DOCENDI

BEI DER

PHILOSOPHISCHEN FACULTÄT IN JENA

VON

D. ERNST ABBE.

JENA, 1863.

DRUCK VON FRIEDRICH FROMMANN.

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Fig. 3: Title page of a reprint of the lecture "On improvements in the microscope with the aid of new types of optical glass", with a handwritten dedication by ABBE

Fig. 4: Title page of ERNST ABBE's Thesis

type, are both always provided with a corrective mount, in order to give due consideration, with these sensitive systems, to the correct thickness of the covering glass. With these objectives, the production of which required great mastery for translation into reality, the idea was first conceived by CARL ZEISS, and given effect by ERNST ABBE, to fulfil "technical construction exactly in accordance with the data of the theoretical calculations, under the strict control of all elements in the various stages of work and without any empirical assistance". At that time it was still necessary to produce objectives of various tube lengths, viz., for 160 mm (Continental tubes) and for 250 mm (English tubes). This shows how strong was at this time the influence of English microscope builders, and their theoreticians. It is intended that yet another article on ABBE's membership of the Royal Microscopical Society shall be written, so that we may dispense here with further details of these interesting relations.

In 1876, an international exhibition of scientific apparatus was held in London. ABBE visited the exhibition and has recorded this visit in writing. The trend of his thoughts not only throws light on the state of development of microscope construction at that time, but also represents an excellent testimony to the clarity and comprehension of ABBE's knowledge concerning all the problems of scientific and practical microscopy which existed at that time.

The variety of microscopes exhibited and the wealth of respective auxiliary equipment, originating from manufacturers, scientific institutes and private individuals, impressed ABBE very much. He regretted that there were no American microscopes at the exhibition, but was otherwise convinced that such exhibitions only rarely provide anything new. He regarded them as a demonstration of efficiency. In addition to mainly English manufacturers, the names of whom are no longer known to-day, with the exception of BECK and SWIFT, one found also German firms like SEIFERT, SCHMIDT und HAENSCH, CARL ZEISS, ERNST LEITZ and NACHET of Paris. ZEISS showed a microscope of Type I with an ABBE substage there, which was equipped with a coarse motion by means of toothed gears and drive, and a precision movement, which could be carried out with a micrometer. Furthermore, the stand was able to be tilted, so that it could be used for photomicrographic cameras in use at that time. The microscope had a collection of all objectives manufactured at that time, for 30 to 0.7 mm equivalent focal length.

The equipment invented and exhibited by WENHAM and STEPHENSON for binocular viewing also attracted great attention. In the further description, ABBE drew conclusions referring first to the mechanical equipment of the microscope, and secondly to its optical efficiency. He paid particular attention to observations which could result in further progress in the efficiency of the microscope. A decision as to whether Continental or English designs were to be preferred was not made by ABBE. He believed that such questions should preferably be decided by practical use, i. e., by those who carry out everyday microscopy. On optical problems, he discussed tube length and binocular observation, and then turned to the basic question of the physical theory of the microscope. Due to his very good knowledge of the state of affairs, he no longer believed in very great, i. e., overwhelming progress in microscopy, but tried very hard to indicate the directions in which improvements in progress might be expected. The generally uniform level of efficiency seemed to prove to him that the limit of efficiency of the microscopy had been approached. These trends of thought prompted him in this connection to go into detail concerning contributions on the theory of the microscope and microscopic observation published in 1873. These were at that time by no means recognised. He derived therefrom the following conclusions "in order thereby to solve the problems and reach the solutions required of practical optics of the future in a rational manner". Thus, he wanted primarily to achieve an increase in the aperture of the objectives, and only secondarily the scale value and dioptric perfection. Furthermore, he desired the introduction of more immersion systems, because of their obvious advantages. Incidentally, the first immersion-system computed by ABBE was produced by CARL ZEISS Jena in 1871. The aperture was 1.10. However, TOLLES from Boston, already at that time had computed one with an aperture of 1.18. ABBE discussed, furthermore, how, by the choice of certain types of glass in conjunction with suitable immersion liquids, the aperture generally may be increased. Here we may also find his thoughts on the possible use of the diamond as lens material. Furthermore, he elaborated on his thoughts concerning the influence of the variation of the wavelength of the light used, and finally, he turned toward remarks on the improvement of optical efficiency. The errors of the chromatic difference in spherical aberration, attracted his particular attention, and he stressed that these could be eliminated either by optical media, with a relatively low refractive index and high dispersion, or by a high refractive index with low dispersion. These considerations led him, therefore, perforce to demand new optical media with properties other than those hitherto available. He quite believed that glass with other specific properties must be possible of production, and that no natural law would prohibit this. Furthermore, he also found examples in nature as to what further treatment could be applied. He could not have guessed at that time that something would happen with regard to new types of glass so soon, because it was only in 1897 that OTTO SCHOTT contacted him with the request to test new glass melts, produced by him, and to measure their light refraction.

In 1886 ABBE reported, in the minutes of meetings of the Jena Association for Medicine and Natural Science, on a lecture delivered by himself at the meeting on the 9th July, on new microscopes. This lecture dealt with the experiment with new glass and its use in theoretical optics, carried out by him in association with OTTO SCHOTT, since 1881. But he not only studied this type of improvement of microscope objectives. He also knew very well the condition influencing the contrast of a microscopic image. Thus, K. BRATUSCHEK reported in 1892, in the Journal for Microscopy, on experiments suggested by ABBE, on the subject of light intensity changes in different directions of oscillation in lens systems with larger aperture angles, with reference to microscopic imaging.

It is also very interesting to study what other problems were met by ABBE in the design of microscope systems. H. BOEGEHOLD and his colleagues have pointed out, in a most meritorious work in the Jena Year Book, the time when ABBE used fluorite for the first time for optical purposes. ABBE himself reported on this in 1890, in the Journal for Instrumentation. We learn here that, at that time, only two minerals occurring in nature and available in a fairly adequate quantity, namely quartz and limespar, were actually used in optical instrument manufacture. It is to the great credit of ERNST ABBE that he not only recognised that the known aberrative chromatic residual errors can be eliminated by the use of fluorspar, but also attempted to study most thouroughly the consistency of such crystals themselves. He had determined that fluorspar, because of its low light refraction, is particularly suitable for providing – as he expresses it himself – a much wider latitude for the selection of types of glass as used for obtaining abundant compensation effects in order to eliminate spherical aberration in lens systems. Such an optical medium was required especially for the construction of microscope objectives with large aperture. Although SCHOTT tried to produce fluorine-containing glass, ABBE preferred to rely on fluorspar. The apochromats contained, therefore at the same time, the new type of glass, smelted by SCHOTT, and fluorite. Due to the excellent properties of these types of objectives, they were at that time imitated by other famous optical experts.

It is also interesting to learn that ABBE had himself at that time visited one of those famous, but unfortunately soon to be exhausted, fluorspar deposits in Switzerland, at the Alp Oltcheren. There in 1832, large, usually water-clear crystals of more than 100 cwt. are alleged to have been found. Despite great efforts ABBE's endeavours to obtain this mineral from the initially lost, but later rediscovered deposit, remained unsuccessful. His recommendation to keep on trying to obtain this mineral was faithfully observed in the years which followed. The obtaining of fluorite in optical quality, i. e., free from occlusions, water-clear and without fluorescence, has, however, become increasingly difficult in the course of the years. It is, therefore, understandable that in places where fluorite lenses had been ground into optical systems, the synthetic production of fluorite was most intently followed. This demand became even more intensive when this material was also required in large quantities for apochromatically-corrected photographic optics.

ABBE's successors in Jena have a great reverence for his person, they hold his far-sightedness in esteem, and also in every way observe his scientific legacy. Especially in recent times, considerable success has been achieved in the field of microscopy and general technical optics. In this respect alone, names like ZERNIKE, BOEGEHOLD, M. v. ROHR, BEREK, BURCH, LEBEDEFF, to name but a few, may be recalled. Despite the success connected with these advances, the work of ERNST ABBE will never pass forgotten; on the contrary the later success frequently only became possible on the basis of ABBE's fundamental work.

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Reports from various fields, Letters Patent, speeches in memoriam). Verlag Gustav Fischer, Jena 1906.

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Theorie der optischen Instrumente (Basic principles of the theory of optical instruments). 3rd edition, revised by ERFLE and BOEGEHOLD, I. A. Barth, Leipzig 1924.

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	ERNST ABBE
1840	born on 23 January at Eisenach, was the son of a factory worker.
1846	primary school.
1850	change-over to the secondary school for Latin, modern languages, and sciences, at Eisenach.
1857	passes final examination with distinction. – Studies at Jena University. Hears CARL SNELL on mathematics and physics, HERMANN SCHAEFFER on mathematics, JAKOB SCHLEIDEN on botany, E. E. SCHMID on crystallography, DROYSEN on modern history, KUNO FISCHER on philosophy, and VOLKMAR STOY on education.
1859	continues his studies at Göttingen. Attends the mathematical classes of BERNHARD RIEMANN, WILHELM WEBER's and Professor STERN's lectures on physics.
1861	passes his examination for a doctor's degree with the highest mark. – Becomes assistant at the Göttingen observatory. – Lecturer for the Physikalische Verein (Physical Society) at Frankfort-on-the-Main.
1863	qualifies himself for lecturing in Jena University as a private lecturer.
1866	joins the opto-mechanical workshop established by CARL ZEISS 1846 at Jena as the First Scientific Assistant but keeps up his activities at the university.
1867	designs a focimeter for determining the focal length of microscope objectives.
1869	develops the illumination system (a large-aperture condenser with adjustable, variable-size iris diaphragm). – Invents the refractometer and the apertometer. – Begins his studies of optical laws – the task assigned to him by CARL ZEISS.
1870	Professor extraordinarius at Jena University.
1871	established the theory of image formation and diffraction, which he verifies by experiments. In this theory he solved the problem of image formation of non-luminous objects so thoroughly that it could be applied to many other optical instruments as well (Abbe's sine theorem). – Marries ELSE SNELL, the daughter of CARL SNELL, his teacher and supporter.
1872	introduces water immersion.
1873	elected member of the Kaiserlich Leopoldinisch Carolinische Akademie der Naturforscher (Imperial Leopoldinian Carolingian Academy of Natural Philosophers) at Halle.
1874	attempts to obtain new types of glass.
1875	enters into partnership with Carl Zeiss.
1877	director of the Jena observatory.
1878	elected honorary member of the Royal Microscopical Society, London. – His nomination to be ordinary professor at Jena University. – Introduces homogeneous oil immersion.
1879	gets in touch with Dr. OTTO SCHOTT.
1880	close collaboration with Dr. OTTO SCHOTT, induces the latter to systematically investigate the effect of the composition of the raw material on the various physical properties of the types of glass produced; succeeds by adding lithium, phosphorus and boron to obtain the desired perfect types of glass.
1882	elected honorary member of the Société belge de microscopie, Brussels.
1883	nominated Dr. med. h. c. of the university at Halle-Wittenberg.
1884	is awarded the Hausorden der Wachsamkeit oder vom weissen Falken 1. Klasse (insignia of vigilance or of the white falcon, 1st class) by the Grand Duke CARL ALEXANDER. – Co-founder of the Jena 'Freisinningen Verein' (society of latitudinarians). – Together with Dr. OTTO SCHOTT, CARL ZEISS and RODERICH ZEISS he sets up a 'glass engineering laboratory'.
1886	completes his calculations of apochromatic lenses which represented an advance in scientific research.
1887	nominated member of the curator's office of the Physikalisch-Technische Reichsanstalt.
1889	establishes the Carl Zeiss Stiftung.
1891	The Carl Zeiss Stiftung acquires by purchase the Firm of CARL ZEISS. ABBE himself becomes a member of the firm's Board of Management and Mandatary of the Carl Zeiss Stiftung.
1896	Revision of the Statute of the Carl Zeiss Stiftung. – Elected corresponding member of the Royal Academy of Sciences, Berlin, physics-mathematics class. – Nominated Dr. jur. h. c. of Jena University.
1899	elected honorary member of "The Royal Photographic Society of Great Britain".
1900	elected foreign corresponding member of the Imperial Austrian Academy of Sciences, Vienna, mathematics-science class.
1901	elected honorary member of the Sächsische Akademie der Wissenschaften (Saxon Academy of Sciences). – Elected honorary member of the Gesellschaft der Wissenschaften at Göttingen. – Elected corresponding member of the Optical Standard Committee, Sub-Committee on Optical Glass, Birmingham.
1903	nominated honorary member of the Isis-Gesellschaft für Naturkunde (Isis Society of Natural Sciences) at Dresden. – Nominated member of the Royal Order of Maximilian for Science and Arts in Bavaria. – Recedes from his position as member of the Board of Management of the Firm of CARL ZEISS.
1905	ERNST ABBE dies on 14 January, a few days before his 65th birthday.

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Jena Review I965/I ...pp.7I-75 and Supplement I975,A study on
ERNST ABBE on the occasion of his I35th birthday;p.II/
Zeiss Information Nr.52 - p.40 / FOTO's J,K,L with data.

... the C O N T A F L E X camera on the microscope.

In 1953, ZEISS IKON AG of Stuttgart introduced a camera which was to become one of the biggest successes in camera history, the CONTAFLEX. It was the starting point which led to single-lens reflex cameras conquering the market.

In the years that followed, the CONTAFLEX was continuously improved, and its latest version, the CONTAFLEX-Super BC, offers the most recent advances in the field of camera manufacture, namely TTL measurement (through-the-lens light metering) by means of a cadmium sulfide cell. (The letters BC stand for "Blitzautomatik" – automatic flash control, and CdS meter.) In spite of the fact that it was continually being perfected, the CONTAFLEX remained within a price bracket which was quite within the reach of many amateur photographers. It is obvious that this camera cannot be as universal as a camera equipped with a focal-plane shutter, selling for double the price. But on the other hand, the CONTAFLEX is smaller and lighter and faster for routine operation due to its automatic controls; in short, it is the top model for the non-professional photographer.

The microscope is entering ever new fields as a valuable aid, and more und more people come to know the "marvels of the microcosm". Many of them would like to record these marvels photographically, but cannot afford a costly photomicrographic outfit. The following explanations are therefore intended to give CONTAFLEX owners a few hints on how to use their camera on a microscope. By analogy, these remarks also apply to similar camera types such as the VOIGTLAENDER Ultramatic and Bessamatic cameras.

Every CONTAFLEX owner knows that interchangeable lenses are used to cover different angular fields. Similarly, the light beam emerging from the microscope eyepiece has a certain angular field which is a function of the size of the eyepiece stop and the eyepiece focal length. This field angle can be made visible with the aid of a powerful lamp and, for instance, smoke (Fig. 1). Its numerical value is usually given in the pertinent microscope literature, for example:

ZEISS 8 x compensating eyepiece approx. 30°
ZEISS 8 x Kpl eyepiece approx. 33°
ZEISS 12.5 x Kpl eyepiece approx. 36°
ZEISS 12.5 x Kpl wide-angle eyepiece approx. 50°

Since for reasons of size and weight only the standard lens of the CONTAFLEX will be used for photomicrography and since the 50 mm ZEISS Tessar f/2.8 covers an angular field of approx. 45°, it is evident that ordinary microscope eyepieces will not completely fill a 24 x 36 mm frame (Fig. 2). Consequently, if the circular image is found disturbing, selective enlargements will have to be made. If the wide-angle eyepiece with an angular field of 50° is available, however, the image will fill the entire negative or slide (Fig. 3). But this again will be the case only if the distance between camera lens and microscope eyepiece is such that the mount and iris diaphragm of the camera lens do not vignette the beam emerging from the eyepiece. Two facts should therefore be kept in mind:

1. The camera lens should be as close to the eyepiece as possible, and
2. The camera diaphragm should be set to maximum aperture (f/2.8; see exception below).

A simple test may be used to determine whether the camera produces a certain vignetting effect as in Fig. 4:

Mount the camera without film and without its back on or above the microscope.

Set the shutter to B, keep the shutter release depressed (or keep the shutter open by means of a cable release with lock) and from the corners of the camera film gate look at the spot of light above the eyepiece. If this spot of light (which is the exit pupil) remains visible from the corners of the field, unvignetted pictures will be obtained even if the circular exit pupil is flattened into a pointed oval.

At this point, it is also advisable to take a look from the center of the film aperture towards the exit pupil of the microscope. The latter should not be surrounded by luminous circles caused by reflections at mounting parts, because such spots or circles would also appear in the photograph (remedy: "Koehler illumination", see microscope literature).

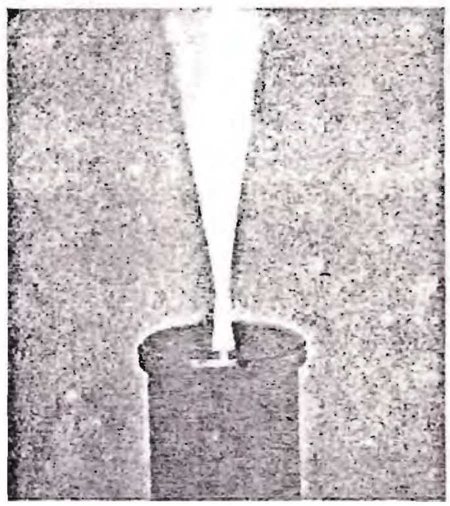
Fig. 1: Light beam emerging from a microscope eyepiece, made visible by smoke. The point of constriction is called the exit pupil. This is where the entrance pupil of our eye is located when the microscope is used for visual observation. The eyepieces illustrated differ by their eye relief, i. e. the distance of the exit pupil from the top of the eyepiece, and their field of view. The first photo shows an ordinary eyepiece, the second one a wide-angle eyepiece for spectacle wearers, with long eye relief.

Fig. 2: Only partly filled negative area due to the use of an eyepiece with an angular field of 33°. (Histological section, cross section of cat's tongue, unstained, embedded in L 25. 16 x, N. A. 0.32 Planachromat, 8 x Kpl eyepiece, Nomarski interference contrast. CONTAFLEX Super BC. Magnification 70 x).

Fig. 3: Completely filled negative area due to the use of an eyepiece with an angular field of 50°. (Pleurosigma diatoms in Canada balsam, 16 x Planachromat, 12.5 x Kpl wide-angle eyepiece, Nomarski interference contrast. CONTAFLEX Super BC. Magnification 150 x).

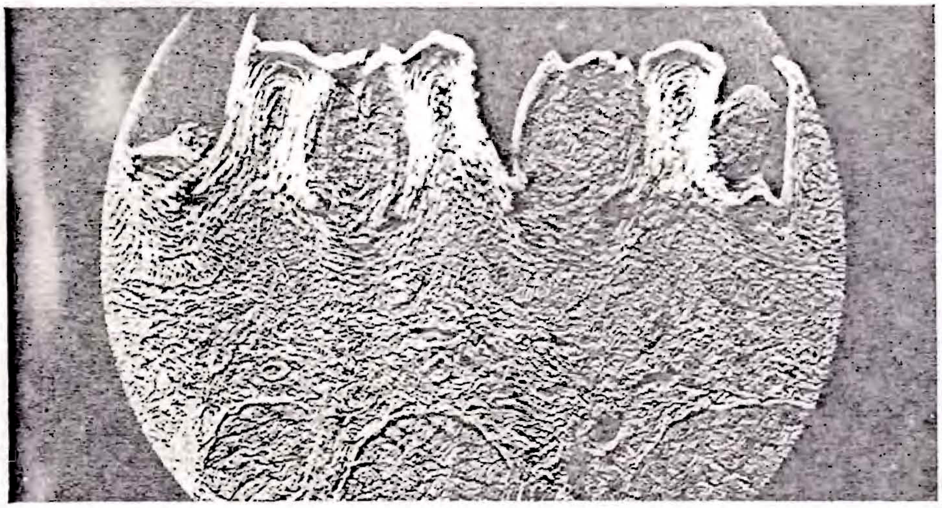
Fig. 4: Unsharp cut-off edges like these are always caused by the camera. Moreover, the pentagonal shape of the image indicates that the vignetting is caused by the iris diaphragm of the camera. Remedy: move the camera closer to the eyepiece and open up the diaphragm further. (Same data as for Fig. 2, but with 5 x eyepiece. Magnification 44 x).

1 a

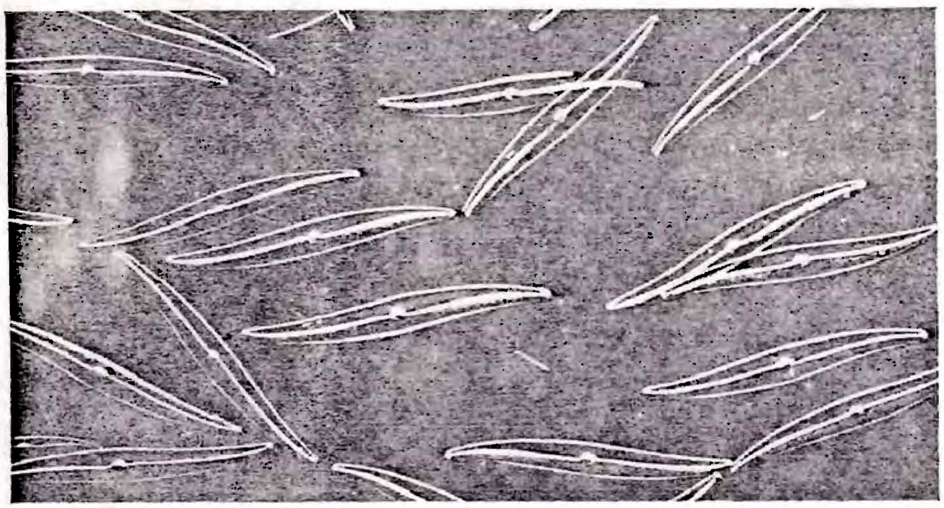


1 b

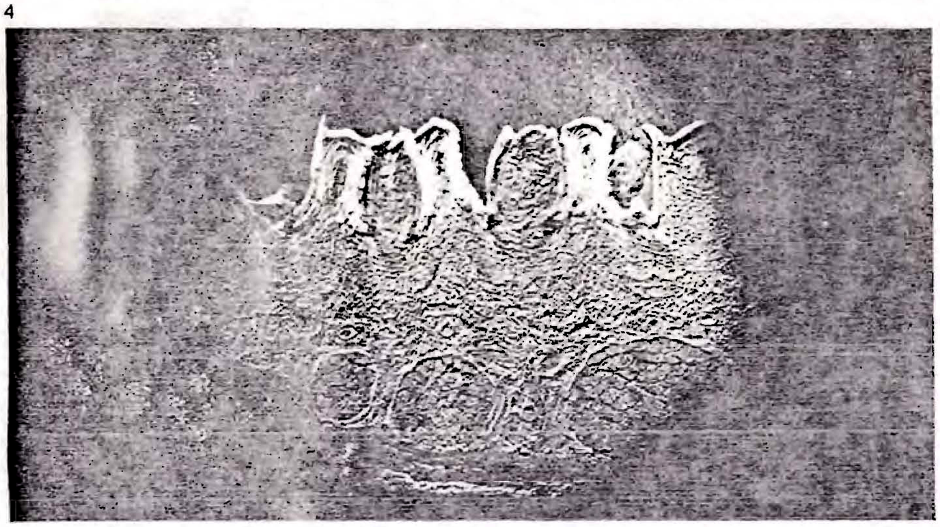
2



3



4



As regards the mechanical connection between the microscope and the camera, the following may be said:

If it is feared that camera shake caused by pressing the shutter release may impair image quality, the camera may be mounted directly above the microscope eyepiece without any mechanical connection at all, using, for example, a copying stand and a black cloth to obtain a light-tight connection between the camera and the eyepiece. In most cases, however, the camera will be attached directly to the microscope.

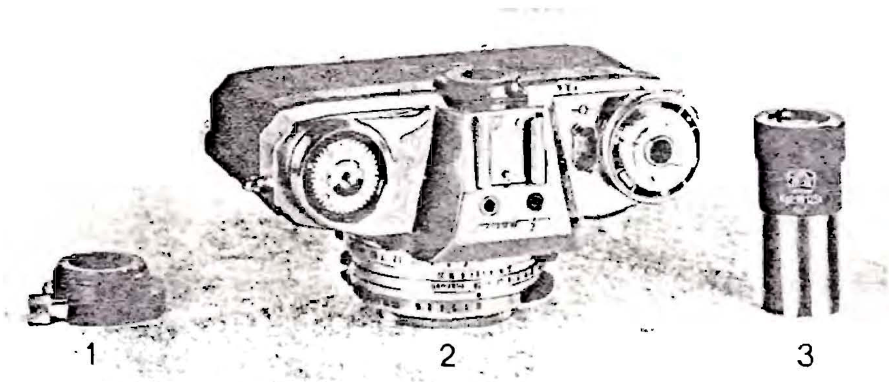
The situation is particularly simple in the case of the aforementioned ZEISS 12.5 x wide-angle eyepiece which fills the entire CONTAFLEX frame: the CONTAFLEX clamping ring (Fig. 5) is screwed into the standard camera lens and clamped on the eyepiece (Fig. 7).

Another possibility requires the use of two parts instead of one, but offers the advantage that the camera is mounted on a tube instead of the eyepiece. In this case, an adapter (25 mm dia. for ordinary microscopes, 33 mm dia. for stereomicroscopes) is attached to the tube and provided with an intermediate ring (Fig. 6). This equipment can be used in conjunction with any microscope eyepiece, including the wide-angle eyepiece (Fig. 8).

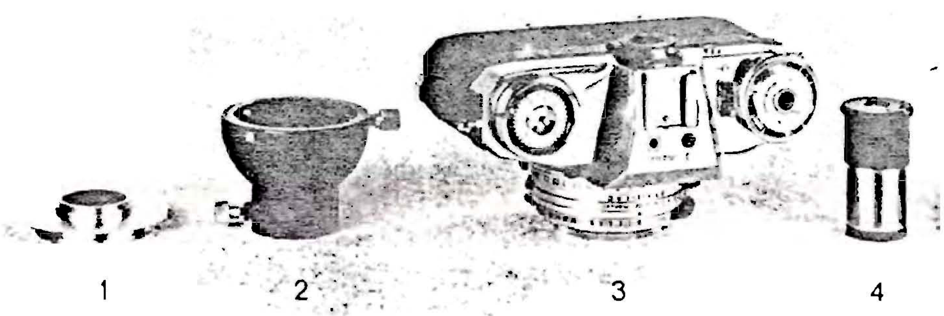
In both the aforementioned cases the camera filter thread is used to mount the camera. For CONTAFLEX models in which the front component of the lens is interchangeable it is preferable to use the vertical tube, since on the inclined body the weight of the camera might exceed the force of the spring in the lens bayonet, thus making a secure mounting of the camera doubtful.

If we assume that the rules of microscope operation including the procedure for Koehler illumination are known (see page 45 of the brochure "Microscopy from the very beginning" supplied with every ZEISS microscope), the next step is that of focusing, for which only the controls of the microscope are used. The camera must always remain focused at infinity. Mounted on the microscope, the CONTAFLEX viewfinder presents an image which at first sight may seem disappointing: the central split-image rangefinder appears almost completely black and the fine-grain focusing ring surrounding it is

5



6



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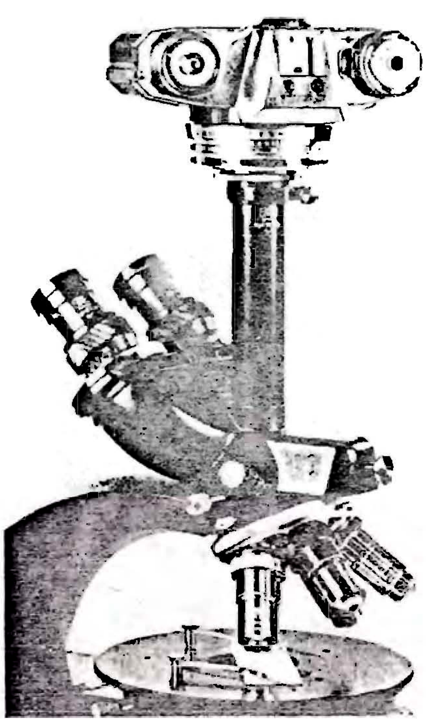

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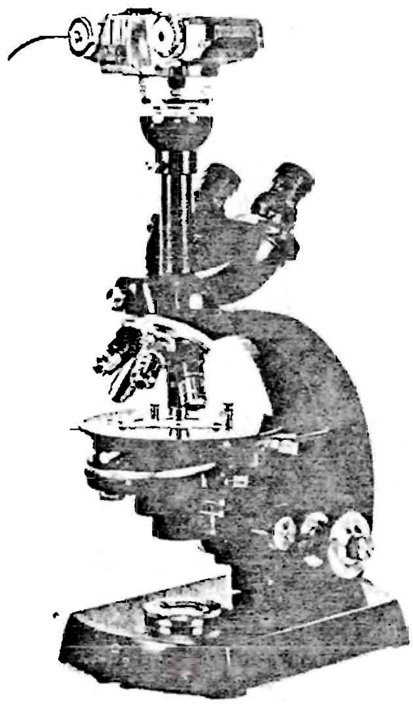

9

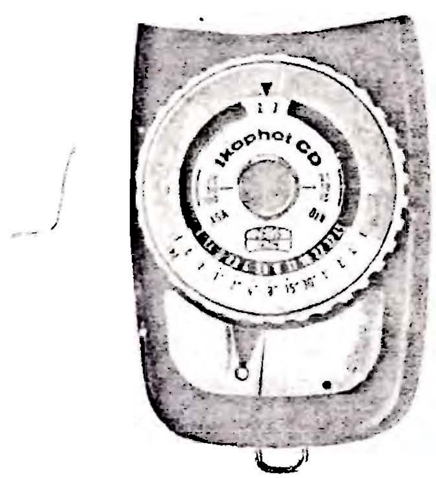

Fig. 5: The clamping ring (1. Cat. No. 46 49 13) is all that is required to mount the CONTAFLEX (2) on the wide-angle eyepiece (3, Cat. No. 46 41 42).

Fig. 6: With the aid of the intermediate ring for the photomicrographic attachment (1, ZEISS IKON Cat. No. 20 1620) and the adapter (2, Cat. No. 47 60 0[illegible]) the CONTAFLEX (3) can be used in conjunction with any eyepiece (4).

Fig. 7: CONTAFLEX mounted on microscope with the parts shown in Fig. 5.

Fig. 8: ZEISS WL stand, inclined binocular body with vertical tube and sliding prism, CONTAFLEX mounted with parts shown in Fig. 6

Fig. 9: "Ikophot CD" exposure meter

very dark, which is due to the fact that the camera lens is stopped down by the optical system of the microscope. In addition, the major part of the viewfinder field with the now clearly defined concentric rings of the Fresnel lens will be seen fully illuminated only if the eye is moved up very close to the viewfinder eyepiece.

In most cases, the aerial image between the above mentioned rings will be used for focusing so that all important object details and the rings are evenly sharp.

With very low powers there is a danger that a certain focusing error will be produced by the accommodation (= unintentional change in "focusing") of the eye. Focusing can then be checked by slightly moving the eye from one side to another in front of the viewfinder. If the distances between the object and one of the rings changes, the microscope controls should be operated until no further shifting occurs (parallax test). With specimens in which the detail to be focused can be recognized in the fine-grain focusing ring with sufficient brightness and clearness, that ring should be used for focusing.

The last step consists in determining the required exposure. This, however, is greatly facilitated by the new through-the-lens metering system of the CONTAFLEX-Super BC. Set the film speed as usual, close the slide of the viewfinder eyepiece (to cut out extraneous light) and turn the speed selector ring until the pointer in the window on the upper side of the camera coincides with the arrow (= f/5.6). A useful accessory is a variable transformer for the microscope illuminator, which makes it possible first to set the desired shutter speed and then to regulate the brightness of the microscopic image as required for f/5.6.

We here find ourselves in a situation where we cannot use the maximum lens aperture as originally suggested. But experience has shown that this is of no importance in conjunction with the ZEISS 12.5 x wide-angle eyepiece most widely used, if the rubber guard preventing scratching of eyeglass lenses is removed so that the camera can be brought very close to the eyepiece.

With other eyepieces the amount of vignetting to be expected can be estimated by the method described above.

If a CONTAFLEX without TTL measurement is employed, the required exposure may be determined with the aid of a hand-held CdS meter (Fig. 9). This must be held (without the incident-light cover) directly above the camera viewfinder If the meter is duly shaded to exclude extraneous light, the reading it gives for f/1.4 will be approximately the same as the one obtained in the Super BC model by through-the-lens metering at f/5.6. It is obvious that in all cameras without through-the-lens metering this exposure is allowed with the lens set at f/2.8, i. e. maximum aperture.

Photomicrographs should never be published without specifying the magnification, i. e. the image scale, preferably in the form of a scale in one corner of the picture, or at least in the caption. To determine this value we must know the image scale in the film plane of the CONTAFLEX. The following approximate rule applies: The image scale in the film plane of the photomicrographic camera is equivalent to the initial magnification of the microscope objective multiplied by the magnification of the eyepiece, multiplied by the focal length of the camera lens (in millimeters), and divided by 250 mm.

The pertinent formula

$$M = \underbrace{\text{objective magnification} \cdot \text{eyepiece magnification}}_{\text{visual magnification of microscope}} \cdot \underbrace{\frac{\text{camera focal length (mm)}}{250\ \text{mm}}}_{\text{camera factor}}$$

indicates that the visual magnification of the microscope must be multiplied by the so-called camera factor which in the case of the CONTAFLEX is $^1/_5$ (example: 40 x microscope objective, 12.5 x eyepiece; CONTAFLEX; the image scale is then 100 : 1).

The exact image scale can be determined by placing a stage micrometer on the specimen stage and imaging it on the camera focusing screen, the side length of which is 33 mm (example: 30 divisions of the stage micrometer divided into $^1/_{100}$ mm are counted over the 33 mm long CONTAFLEX viewfinder:

$$\frac{33\ \text{mm}}{^{30}/_{100}\ \text{mm}} = 110.$$

The exact image scale is thus 110 : 1). When the paper print is made, it is advisable to note down the enlargement factor on the back of the print. This may be determined, for example, in the following manner: slightly displace the film in the negative stage of the enlarger so that the perforation is projected onto the masking frame. Then measure the distance between two sprocket holes. The millimeter value divided by 2.76 (which is the true distance) is the enlargement factor which must be multiplied by the image scale on the film (see above) in order to arrive at the total magnification. Any change in scale during preparation of the printing plate must, of course, also be taken into account.

Finally a few additional remarks:

1. If in the BC model the "automatic" aperture of f/5.6 should lead to vignetting, this can be remedied by switching from A (automatic) to f/2.8 (manual) without changing the shutter speed previously set.

2. The integral exposure meter has a measuring range up to 1 sec. If longer exposures are required, readings can still be taken by the following procedure: Let us assume that the film used has a speed of 17 DIN (40 ASA). In this case set the film-speed index of the camera to 26 DIN (320 ASA) instead of 17 DIN (40 ASA) By turning the speed selector ring in the usual manner until the pointer coincides with the arrow (f/5.6), the exposure required is then eight times as long as the value set, because the meter was set 9 DIN (6 ASA) = 3 f-stops higher. – Incidentally, the shutter can be set to B (longer exposure than 1 sec) only if the camera is switched from "automatic" to "manual" (f/2.8)

It should be noted that setting of the CdS meter to maximum film speed may give rise to measuring errors due to light entering through the window in the camera front required to illuminate the scales in the camera; it is then advisable either to work in subdued light or to use a special cap available from ZEISS IKON.

Summarizing we may say that the use of a CONTAFLEX on the microscope has the advantage that relatively inexpensive equipment can be employed. On the other hand, however, certain inconveniences must be accepted, above all with respect to focusing, as a result of which workers requiring photomicrography for professional purposes will generally resort to a special photomicrographic camera

Friedrich Karl Möllring

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Zeiss Information No.65/pp.IOO-IO3

Z E I S S   M E M O I R S * * * Dr. Max C. Herzberger

I joined CARL ZEISS JENA in 1921-1922, as a work student concerned with two problems. The first was to make a Sach catalog (arranged under different titles so that you can find the basic content of each book); this brought me in contact with all the optical literature. Secondly ... an experience came about because of a tragic incident involving Dr.Erfle who was a member of the optical staff and also editor of the ZEISS publications especially the book 'Czapski-Eppenstein' which contained the available knowledge on optics up to 1924. Unfortunately while he was writing he hurt his finger with a pencil got blood-poisoning and died from it. Dr.Hans Boegehold, Chief of the microscope calculation department, took upon himself the task of finishing this nobel work, and he chose me as his assis tant. My work was on the literature appendix for which only some loose pages had been found. In this way I learned about the literature of optics all the way from PLATO to BOEGEHOLD. W.R.HAMILTON'S work especially brought my interest out, and I soon saw how wrong people were who thought that PLATO'S and HAMILTON'S interest were academic. (Later,I will provide a separate article on HAMILTON for ZH membership).

From 1925 to 1928 I was head of the calculation bureau for designing optical systems at ERNST LEITZ,WETZLAR, In 1928 I received a call from DR. STRAUBEL,scientific head of CARL ZEISS JENA, inviting me to become his assis tant and I rejoined ZEISS at that time. From 1928 to 1935 I had the invaluable collaboration of DR.HANS BOEGEHOLD with whom I published more than fifty papers. My book on the practicality of all of HAMILTON'S ideas was finished in 1931. In 1935 the Nazi's made an end to this Idyll.

From the beginning I attended all the meetings of the Deutsche Optical Gesellschaft, and after the war I returned to this group, which elected me an Honourary Member.

I arrived at ZEISS a little to late to meet ERNST ABBE , but not to late to meet all his successors. Prof. and Mrs.Straubel became warm friends of ours, and so did Dr. and Mrs. Gruber (Chief of the photogrammetry division), Dr. and Mrs. Langer (he had to solve the water problems connected with ZEISS manufacture); Dr. and Mrs. Auerbach, a relative of Dr.Straubel was professor of optics at Jena University. My closest friend was Hans Boegehold and we both had a wonderful time in working together. I also had a very nice personal relationship with Moritz von Rohr, the Historian of the ZEISS WORKS. I admired his accuracy and his minute knowledge. Boegehold was his pupil and I cannot conceal that the historical work of Boegehold in optics meant very much more to me than von Rohr's optics, since it was more personal, more humane, and not so cramped with details as von Rohr's. Thus it was always an honor to meet with von Rohr who was not superceded in scientific problems by anyone in the world, and who was always the perfect gentleman.

Hans Boegehold and I were togther practically daily and we worked on a theory of optics which was published in both our books. The cooperation was unique and we supplemented one another in every field. He was a connoisseur of optical history and a very prodigious solver of difficult problems, while my contribution was a complete new theory of optics according to the ideas of Hamilton. I brought to our work vector calculus and variation calculus, and together we attacked many questions which others has not thought of; we even managed to work together after the war separated us and I has found refuge in the United States. It was one of my saddest moments that upon returning to Europe after the War he was alive but died before I couldarrange a trip to Jena. Boegehold was, like Albert Einstein, a man without negative attitudes toward others. He was a Socialist, and for a while the Nazi's placed him in a concentration camp for this. Almost every day we would go together to the Chess Club in Jena and debate over the 64 squares.

Another good friend of mine was Dr.W.W.Merte (Chief of the large department of photographic calculations); who nearly every Sunday went with us on trips. Merte's department consisted of a staff of fifty employee's; while Dr.Robert Richter had to content himself with a staff of two. After a decade of work Dr.Merte brought out the BIOTAR LENS,which could, if necessary, concur with the Leica. While Dr.Richter brought out all the new types of wide-angle objectives.. Dr. Richter and I also frequently visited with each other. He and I had an unlikely characteristic in common,ie, when a thunderstorm was pending, we could both feel it many hours before it arrived, so we sometimes asked each other: ' Is there a storm brewing, or do we have a cold ?'

Dr.A.Kohler was the expert on microscopes,new and old, and he had a wonderful personality. Dr. August Sonnefeld,who since I935 when the computing office at JENA was divided,became head of the independent computation department for astrophysics which was also involved in optical computations for analysis and precision measuring instruments. His speciality was mirror optics and images, and worked for many years on ZEISS telescopes. Prof.Walter Bauersfeld was the director of engineering,and managing director of the ZEISS WORKS; he was a man of great visions. I remember working together with him for quite a while in the new (I923-I925) Planetarium., in which you could see the planets in a sphere around yourself, moving in their paths in an accelerated fashion.

Among my close friends were Dr. and Mrs.Langer who was the founder of the SAALETHALSPERRE; the method by which the energy of the Saale River which flows thru JENA in a South/North direction was harnessed for use by the ZEISS WORKS. Both Dr. and Mrs.Langer died tragically (which I will detail in a future article);however I particularily remember Mrs.Langer as the central figure of a pleasant story. One time we were discussing Nietsche's 'Thus Spake Zarathustra' and someone cited the portion that says that

..... inside evry man there is a child hidden who want's to come out and play. At that point Mrs.Langer ... one of the original women's libbers ..... protested. She didn't understand why that was said only of men ! ..... it could be just as true of women. This gave rise to loud laughter in the group.

These were some of the well-known scientists of ZEISS. I also had many connections with the computer scientists and the stenographers, as well as with a large group of young people. Together we made many trips along the beautiful mountains which surround JENA. Later on other German friends were added to the group and we played a large part in the Youth Movement, under the marvelous guidance of Mrs.Muller. We were lucky enough to see her even when she was over ninty years old, trying to get her a position to which she could adopt.

Of these and many more funny and human experiences I will speak in my next article.

Max Herzberger

ZEISS HISTORICA SEMAPHOR DOCUMENT C/J.VII.79/k.k./Stb
Four pages with FOTO - D / ALL RIGHTS RESERVED

" QUARTERMASTER ... forward this Instrument to Jena for repair. "

Author. William J. Ringler

++

"We have her,sir." - Aboard HMS Suffolk,the captain jerked around and stared straight at the communication speaker which had transmitted this emotionless four word message. "Confirm," The minutes dragged on in silence until the hollow voice sounded again, "confirmed - it's her," An open message was immediately sent to London's Admiralty War Room - "MAY 23,1941 - 6:40PM GMT - spotter plane has located German pocket battleship Bismarck and sister ship Prinz Eugen in Denmark Straight. HMS Norfolk ordered to attack directly Prince of Wales and Hood to close immediately. Suffolk joining." The long search for Germany's most successful pocket raider,Bismarck has just ended and now the battle lines were drawn. There could be no turning back for either side.

On the bridge of the Bismarck, Admiral Lutjens was handed a copy of the Suffolk's message which he read briefly and then folded and placed in his pocket. He had no choice - Bismarck must make a break for home.

A code message was sent to Prinz Eugen's captain, Helmuth Brinkmann, ordering him to meetthe attack by Norfolk head-on immediately. Brinkmann began steaming out of the fjord to meet the English threat while Bismarck made ready for the battle. Early on the morning of May 24th., Vice Admiral Holland, commander of the British North Fleet, was given the message aboard his flagship HMS Hood that Bismarck was heading directly into the Fleet. Holland ordered HMS Prince of Wales to prepare for action and took control of Hood on to the Admiral's Bridge. This would be the greatest sea battle of his career.

Target control information on Bismarck was fed into the rather primitive fire control systems on both Hood and Prince of Wales while look-outs were posted on every available elevation on both ships so that the firing could commence as soon as a course was determined.

"Smoke sir - bearing 63 degrees 16 minutes North." The target control computer was given the co-ordinates of HMS Hood's position and the first salvo was fired. The shells exploded far behind the charging German ship and, before Hood had a chance for a second attempt, a broadside was fired directly at her, exploding on the Admiral's Bridge and killing all of her senior officers. Holland had made a fatal mistake - his Identification Officer had mistaken Prinz Eugen for the slower, more unwieldly Bismarck and the target control information was wrong. HMS Hood never had the opportunity to correct the mistake , because just then Bismarck fired a salvo that straddled the pride of the English Navy and the next burst of fire broke her back. HMS Hood sank just six minutes after the battle had begun.

Meanwhile,Prinz Eugen continued her rush directly for Prince of Wales and began firing when the range had closed to just under five miles. Her accuracy was deadly - 3 shells exploded on the deck and flying splinters decimated the ship's ranks. Captain Leach,R.N., although severly wounded himself took the ship out of the fray and broke off the engagement by firing six shells at Prinz Eugen while on the run.

++

Just then, 4 shells from Bismarck hit the ship and she was on the brink of being lost when Lutjens broke off the fight and turned for home. Hitler's fear of losing one of the big ship's in a fire fight and Lutjen's unflagging devotion to the Fuhrer saved HMS Prince of Wales and her remaining crew for another time and another place. Bismarck was heading home.

At the Admiralty, anger and shock greeted the news that Hood was gone and Prince of Wales severely damaged and orders were given to find the Bismarck and sink her without regard to the costs in manpower involved. A mighty task force was sent out to intercept the Bismarck, which had been slowed in her run for home by a shell hit from Norfolk, causing her to lose precious fuel oil and requiring a makeshift steering gear. Prinz Eugen was cut loose from her protector's role and made for port at a run, but the end was in sight for the mighty Bismarck. She was found and engaged on May 27th, and sunk with the loss of most of her crew.

Prinz Eugen,meanwhile, continued on her way home and arrived at Brest harber on June Ist, where she was re-fitted for an extended raiding spree and the minimal damage she had suffered during the break-out could be repaired. One of the items which was removed from the ship during this time was one of the TWO target directing night glasses which were used on the fire control bridge as an adjunct to the TDI computer. A shell fragment from HMS Prince of Wales had hit the glasses, breaking the right side of the inclinometer and necessitating their return to the manufacturer, CARL ZEISS,JENA, for repair. A manilla repair tag attached to the glasses, stamped with the Brest harbor quartermaster's stamp and the serial number of the glasses, then sent to CARL ZEISS,JENA where the repair's were made and the glasses completely re-furbished before being returned to the Brest stores. On the very bottom of the repair tag is the fully legible pencil comment "Return to Prinz Eugen" and the date "August, I94I." (See also inclosed Foto's B & C) with data.

++

ZEISS HISTORICA SEMAPHOR DOCUMENT B/J.VII.79/k.k./Stb
Two pages /Two Foto's B & C / ALL RIGHTS RESERVED

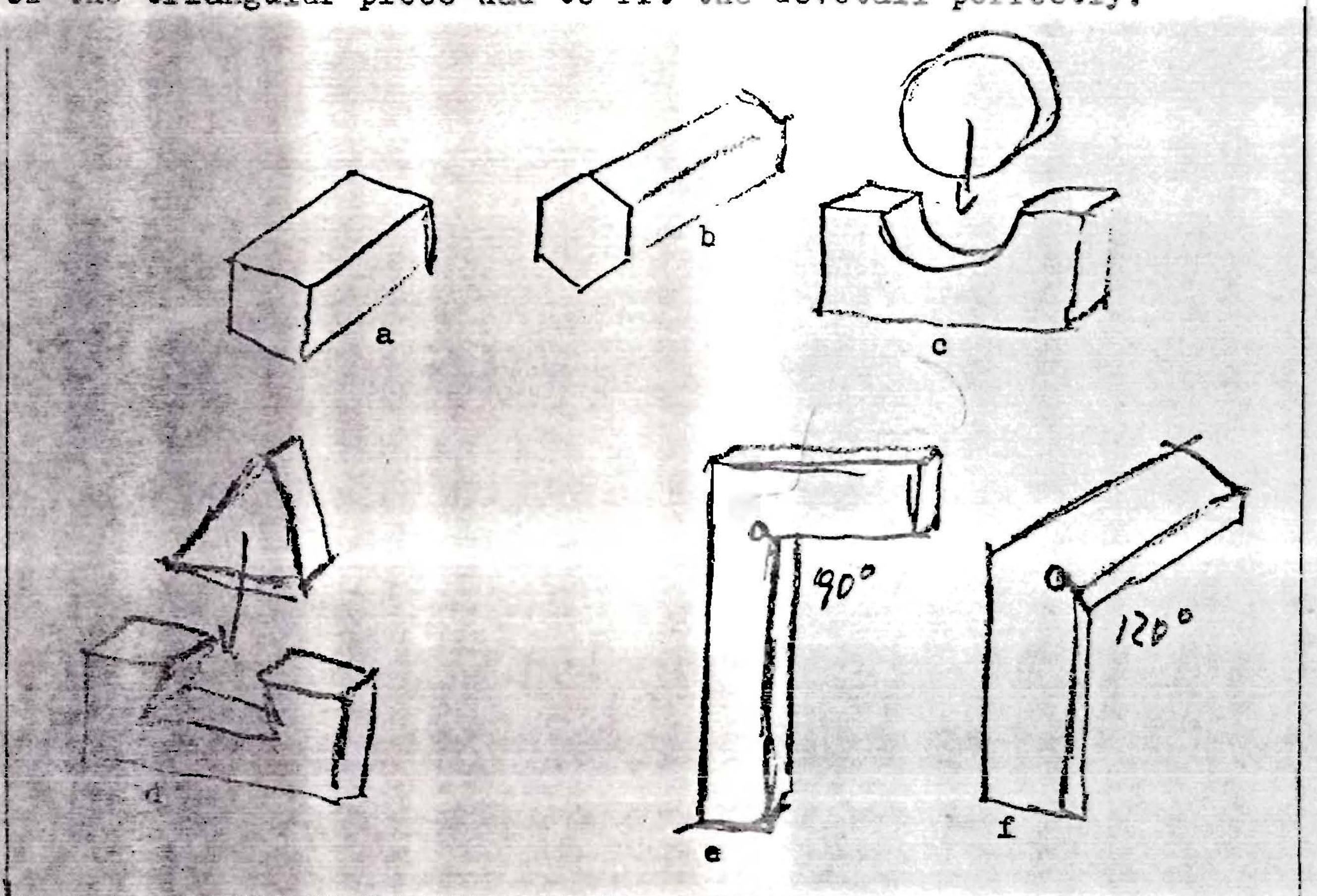
' THE LEHRLINGS '

Author * HUBERT NERWIN * Illustrator

++

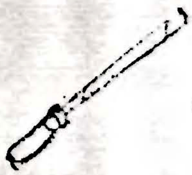
..... they stood there for hours ..... for days ... slowly ... patiently ... filing, and filing ... and filing ... pieces of steel ... one stroke to much and the metal is removed irreversibly. Who were these people ? These lehrlings of ZEISS . Dresden,Jena and Stuttgart ? They were quite simply the apprentices of the ZEISS WORKS who went on to produce the exquisite Instruments we treasure so highly.

...... the lehrlings (lowest of the low) were given dimensioned blueprints of the geometric shapes illustrated below together with handwraught pieces of steel, approximately the shape of the finished product ..... then led to a vise and handed a german mill (file) and told to file to perfection. The dovetail shape shown in illustration (d) was particularily difficult since all three sides of the triangular piece had to fit the dovetail perfectly.



The apprentice forman then checked the trueness of the surfaces and parallelism with calipers, micrometers and other ZEISS gauges, and awarded a I,2,3 or 4 grade. A failing grade of (4) in one example could be corrected by doing it over again. More failing marks required a repetition of one year.

The lehrling apprentiship program began at age I4 and combined both academic schooling and shop work, after three to four years, and the passing of examinations and the production of a GESELLENSTÜCK (see Foto A) you became a GESELLE (Journeyman) and finally after an additional three to four years, examinations and further shop testing, the individual could make MASTER STATUS (MEISTERPRUEFUNG).



... legendary Zeiss German mill (file).

Hubert Nerwin

Editors Note ... Hubert Nerwin was a member of management at ...
ZEISS IKON DRESDEN - 1932-1945
ZEISS IKON STUTTGART 1945-1947

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JENOPTIK JENA G.m.b.H.

Postal Address of Sender: Jenoptik Jena [illegible] Jena

Dated
Our Ref.:

Mr. Harry B. Soletsky
Tower Rd. Extension
Brockfield Ctr., CT 06805
U. S. A.

Jena, April 19, 1972
SCV 1/Dä/Sb - Bo/EP

Your letter dated March 17, 1972
Lens "S" 1 : 1.5 f = 5.8 cm

Dear Sir,

With reference to your enquiry we wish to inform you as follows:

Lenses "S" 1:1.5 f 5=cm in a mount fitting the Leica and with thread M 39x1 and coupled exposure meter were manufactured by us before the War. A lens with f = 5.8 cm is, however, not known to us. Maybe said lens was made in a small number to special order. Respective records would, however, have been destroyed during the War.

We regret, therefore, to be unable to give you any information on the lens.

Yours faithfully,

JENOPTIK JENA G.m.b.H.

Fröhlich Gessinger

' To the eternal question ... did Carl Zeiss, Jena ever manufacture their photographic objectives in Leica mount .... the answer. '

ZEISS HISTORICA /Letter G / J.VII.79 / k.k./Stb/with Foto's H & I.

Telegrams: Jenoptik Jena
Telephone: Jena 830
Teleprinter: Jena 058 8622

All communications to be addressed to the firm and not to individuals.

9.60/47-4

10-MF-G 8-770-V/10/12

' ZEISS IKON CAMERA CATALOG NUMBER SYSTEM DENOTES FILM SIZE '

(c.I926-I955)

(IKONTA No.520/2)			(IKOFLEX No.850/I6)		(CONTAELEX TLR No.860/24)		
	-I-	6 x I3 cm	-I0-			-I9-	
IKONTA -	-2-	6 x 9 cm	-II-			-20-	
	-3-	6I/2 x 9 cm	-I2-			-2I-	
	-4-		-I3-			-22-	
	-5-		-I4-			-23-	
	-6-		-I5-		CONTAFLEX	-24-	24 x 36 mm
	-7-	9 x I2 cm	-I6-	IKOFLEX 6x6cm		-25-	
	-8-		-I7-			-26-	
	-9-	I0 x I5 cm	-I8-			-27-	24 x 24 mm

Care to add your camera to these columns ?

++

CARL ZEISS IN JENA

OPTISCHE WERKSTAETTE.

mit der gesetzlichen Bekräftigung versehen

Jena den 15ten Mai 1875.

Carl Zeiss,

Dr. Ernst Abbe

LETTERHEAD and EXTRACT from the original contract between Carl Zeiss and Dr.Ernst Abbe of May I5,I875.

ZEISS HISTORICA PUBLICATION J.VII.79 /k.k./Stb /Bulletin E

FOTO DATA

LEFT --- Gesellen Stück (apprentice) Microscope.

Right --- standard microscope

MFG., --- CARL ZEISS,Jena,Germany

ZEISS HISTORICA /J.VII.79/k.k.Stb

Document A /FOTO - A

Experimental dome for the world's first projection type Planatarium on the roof of CARL ZEISS,JENA (I923) Diameter I6m. Delighted thousands of visitors in (I924); was finally set-up in the German Museum,Munich;and inaugurated on May 7,I925;by Dr.Walter Bauersfeld, Inventor of Projector.
ZEISS HISTORICA / J.VII.79/k.k.Stb
FOTO - D /Document C

First Projection Type Planetarium Projector (I923) CARL ZEISS,JENA shown in German Museum,Munich (I925)
ZEISS HISTORICA /J.VII.79/k.k.Stb
FOTO -Dd /Document C

TANK AIMING TELESCOPE (Zeilfernrohr)
ZEISS IKON - DRESDEN (c.I935)
Early models contained mirrors, which were later replaced by prisms As wheel was turned,reticle moved up and down in sight.
ZEISS HISTORICA /J.VII.79/k.k.Stb
FOTO'S -E/F/G

SONNAR LENS I:I.5 f=5cm T coated
MFG., CARL ZEISS,Jena,Germany,made in Leica M 39 x I screw mount by ZEISS in late I930's. (24x36mm format)
ZEISS HISTORICA - J.VII.79/k.k.Stb
FOTO'S - H & I accompaning letter.

MONUMENT TO ERNST ABBE
in Jena,Germany.
Dedicated - July 30,I9II
Architect - VAN DE VELDE
Abbe was the scientific associate to CARL ZEISS and together with OTTO SCHOTT formed the CARL ZEISS, OPTICAL FIRM,which at first (I846) manufactured microscopes.
ZEISS HISTORICA - J.VII.79/k.k.Stb
ReprintH-ERNST ABBE: In Memorium
FOTO - J

SCISSORS & PASTE

FOTO DATA

ERNST ABBE Bust and relief
Artist Max Klinger
Abbe was the scientific associate to CARL ZEISS, and together with OTTO SCHOTT founded the firm of CARL ZEISS,Jena,Germany (1846) which at first manufactured microscopes. The three sides of the relief are entitled ...'Microscopy' 'Science and Engineering' and 'Astronomy'.
ZEISS HISTORICA-J.VII.79/k.k.Stb
Reprint H/ERNST ABBE:In Memorium
FOTO K

ERNST ABBE Bust
Artist Max Klinger
Abbe was the scientific associate to CARL ZEISS, and together with OTTO SCHOTT founded the firm of CARL ZEISS,Jena,Germany (1846) The firm at first manufactured microscopes.
ZEISS HISTORICA -J.VII.79/k.k./Stb
Reprint H/ERNST ABBE:In Memorium
FOTO - L

INSTRUMENT,OPTICAL,TELESCOPE / Double-tube triple revolving eyepieces.
MFG., - CARL ZEISS,JENA,GERMANY (1930's)
TYPE -military version of ASEMBI model.
DESCRIPTION -right triple revolving eyepieces equipped with target control gradients. Left turrent flanked by a large Marine eagle over M (emblem of the German Kriegsmarine), with abbreviation 'ARTL' (artillery). Military Nr.112.Graduated inclinometer-bubble

FOTO'S -B & C

Leading Optical Particulars:

Magnifications	×12	×20	×40
Light-transmitting capacity	45	16	4
Exit pupil	6.7	4	2 mm.
Field of view in angular measure	3.5°	2.1°	1.0°
Linear field at 1000 yds.	61	36	18 yds.
Diameter of objective	80 mm. (3⅛ in.)		
Focal length of objective	500 mm. (20 in.)		
Specific plastic effect of Asembi Telescope	1.8		

Provenance - William J.Ringler
ZEISS HISTORICA J.VII.79/Document B
Two pages,
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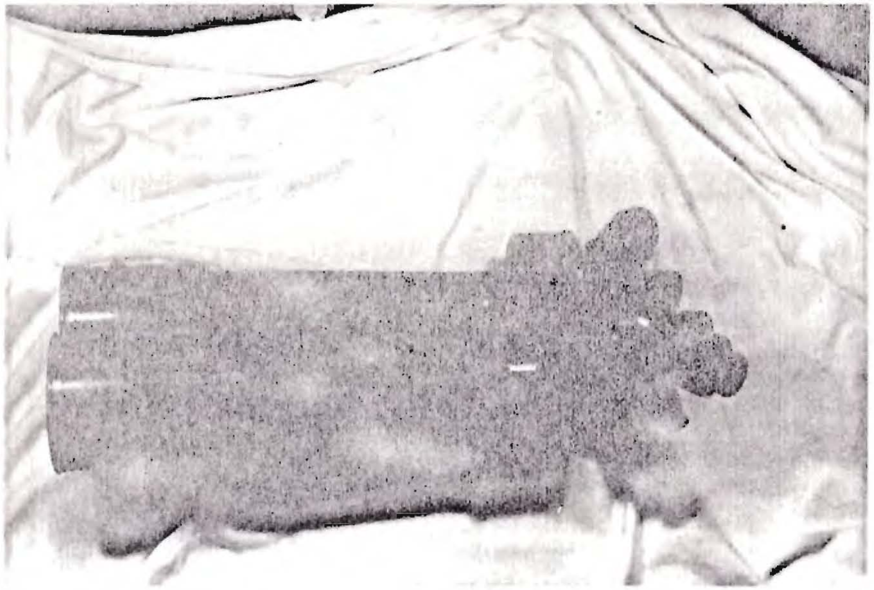
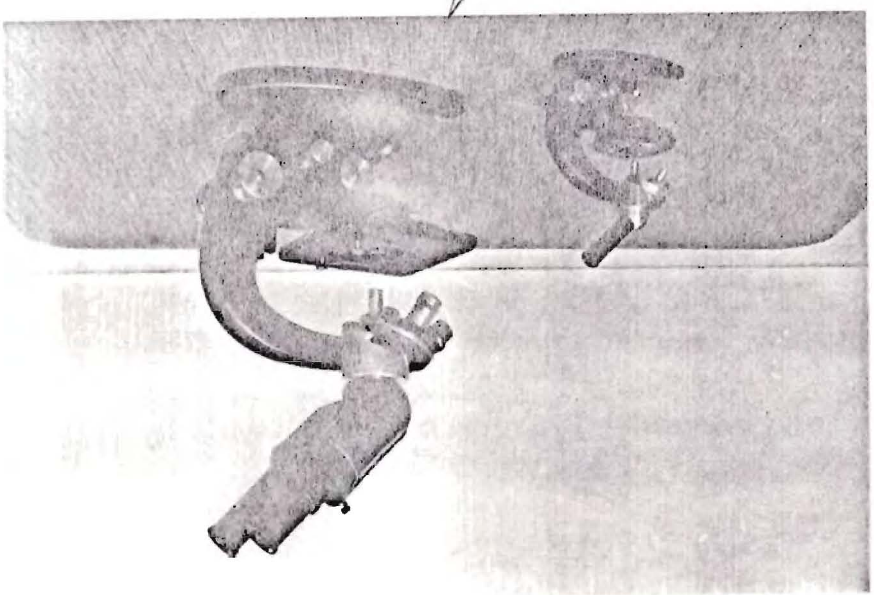
SCISSORS + PASTE

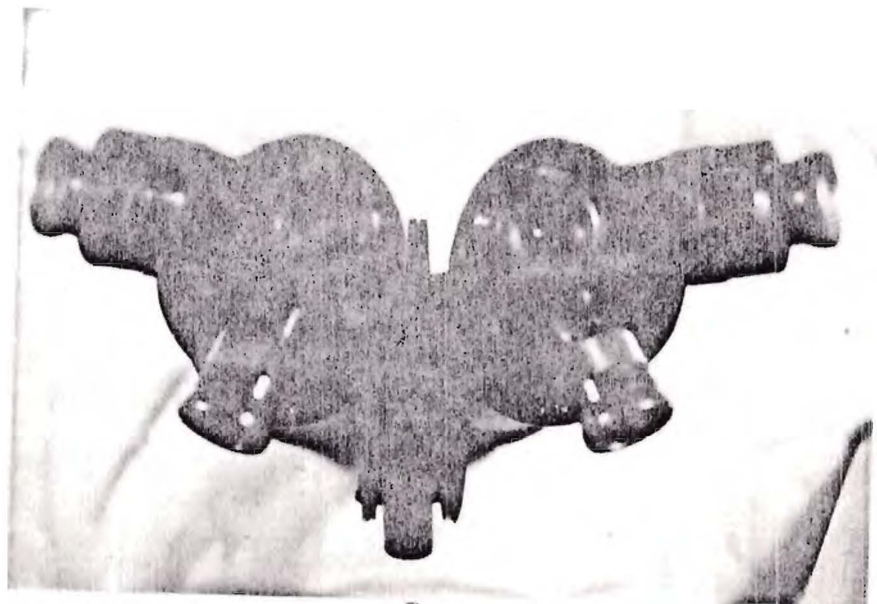


B

D

A





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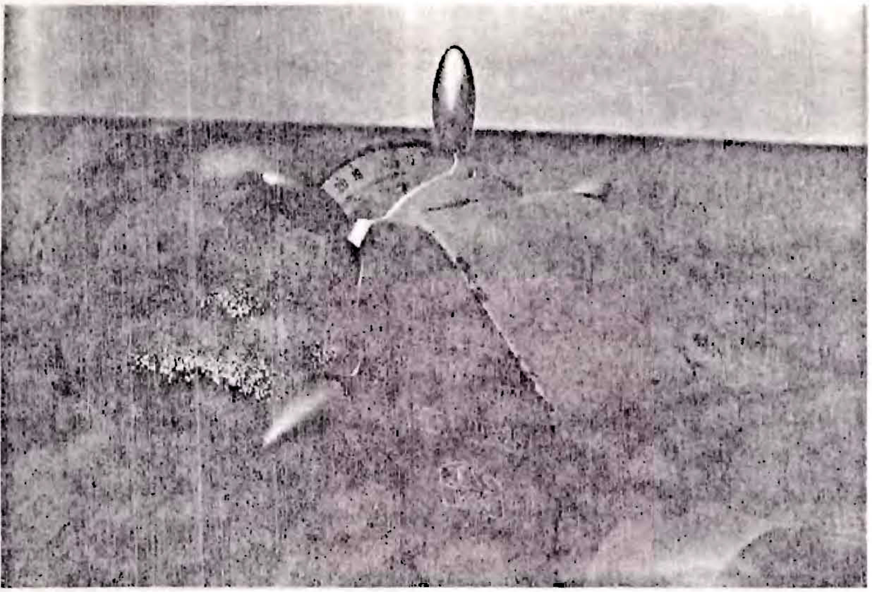
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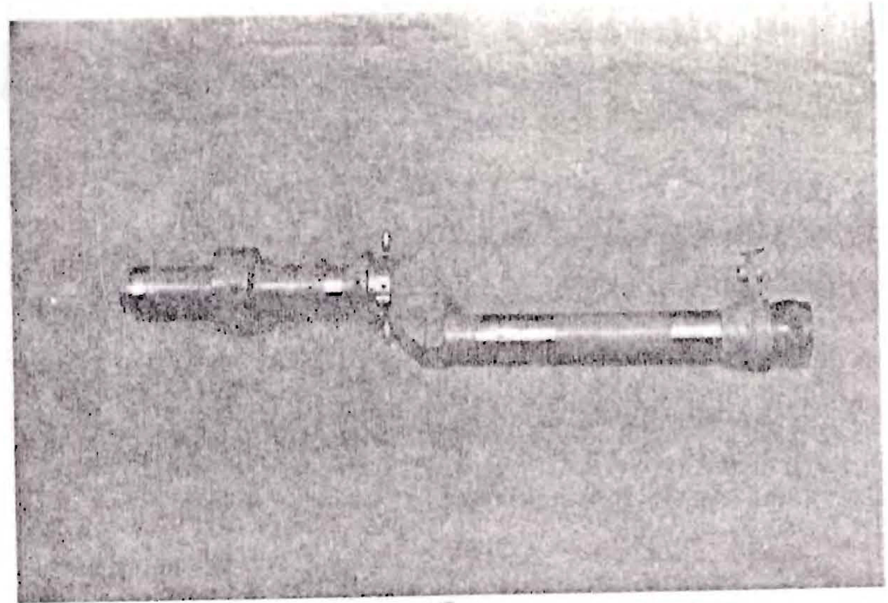
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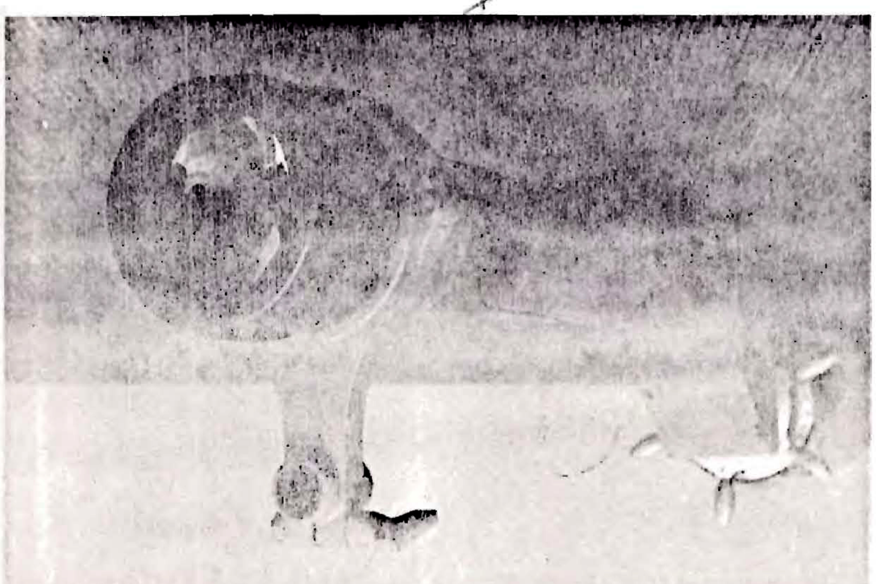

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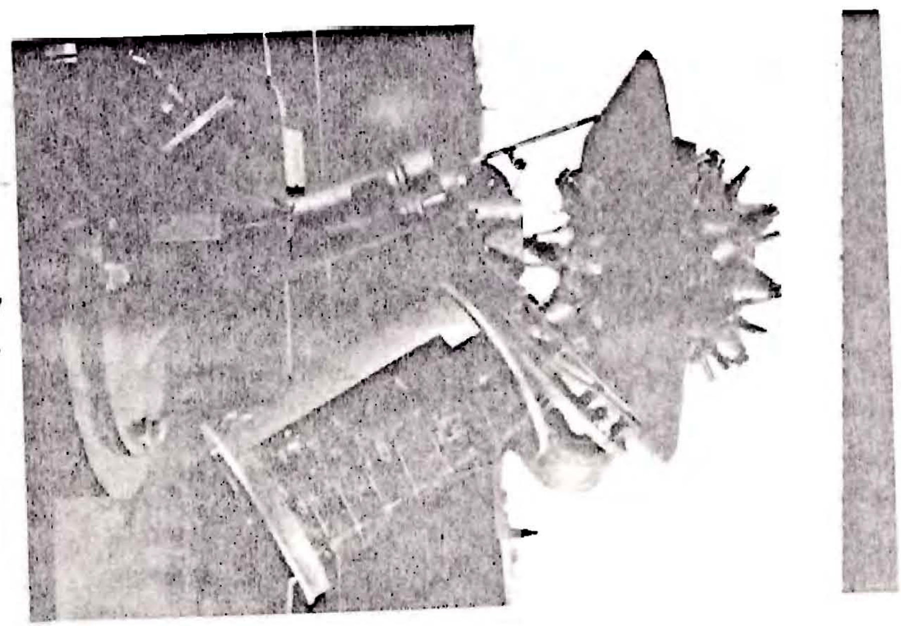

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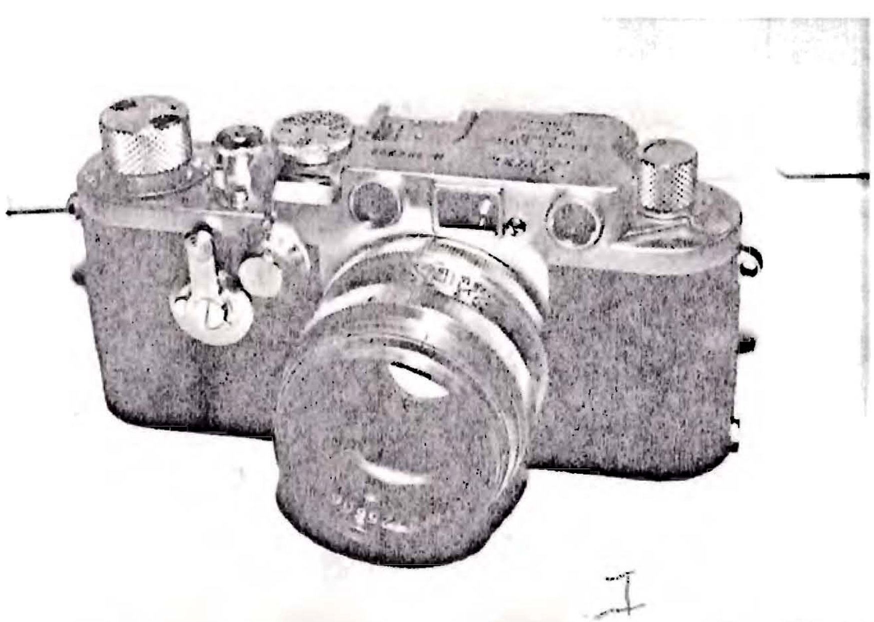

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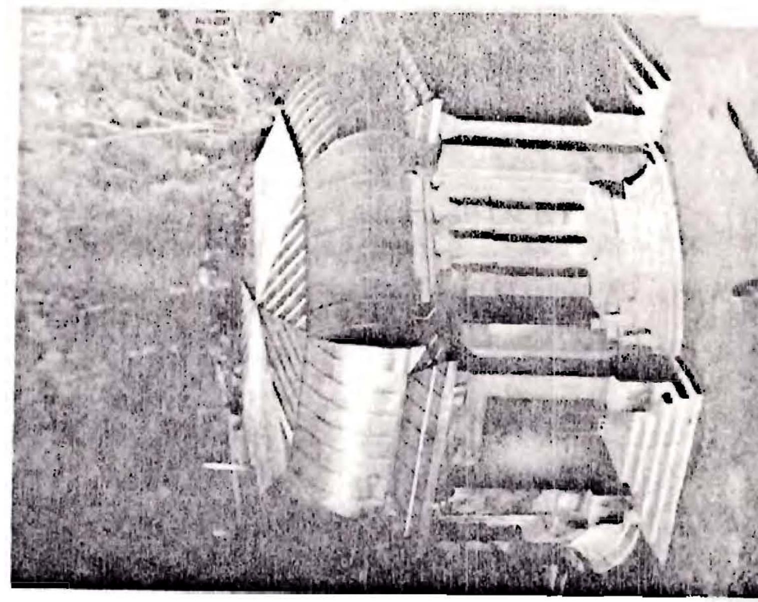

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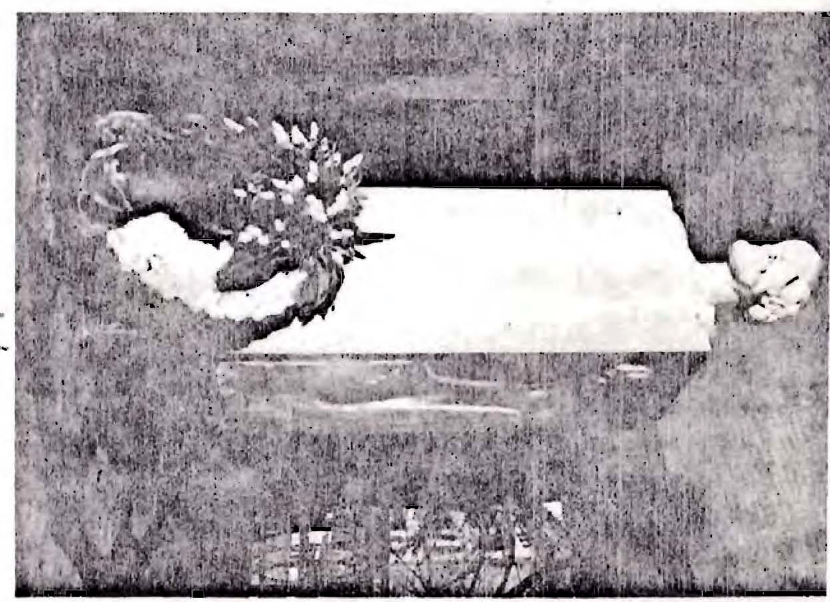

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