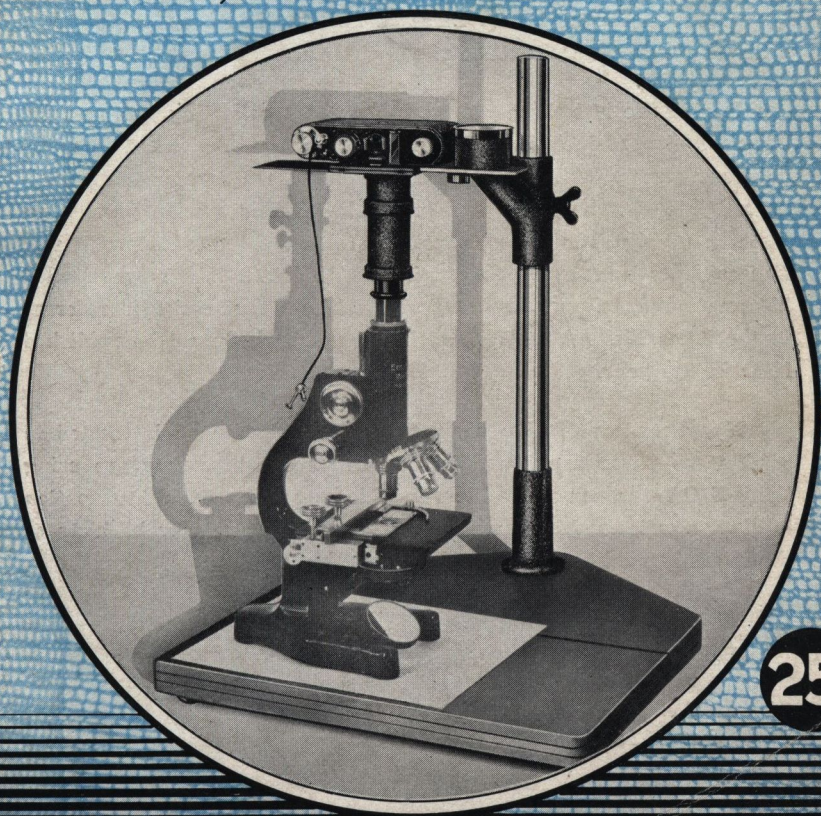


LEICA IN SCIENCE

MACRO AND MICRO PHOTOGRAPHY

By WILLARD D. MORGAN



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E. LEITZ INC., NEW YORK

INTRODUCTION

DURING the last few years the LEICA Camera has been applied so successfully in so many different scientific fields that a booklet giving more specific information has become necessary. Therefore this booklet, **The Leica in Science**, has been published in order to give a general outline of the many applications of the LEICA.

During the last three years we have been collecting photographs, letters, and specific notes from actual LEICA users located in many different states. All this information has been compiled and condensed into this booklet. Readers will find this section quite complete in giving definite information. With the limited space it was impossible to treat every subject in minute detail. For more detailed information on a number of special subjects the reader is referred to the **Leica Manual**, by Willard D. Morgan, which will be published later in the year.

Many readers of this booklet will undoubtedly be interested in sending us photographs and information about how they are using the LEICA for some specific scientific purpose. Such information is always welcomed, and wherever possible used in new booklets or the monthly publication, **Leica Photography**.

E. LEITZ, Inc.,

New York, N. Y.

September, 1934.

WHY THE LEICA IN SCIENCE

When the LEICA Camera was first placed on the market over nine years ago the equipment available for the scientific worker was limited to the usual bulky view camera and some awkward accessories. However, since that time the Leica Camera has completely revolutionized the photographic field by establishing itself as a unit camera **which can be adapted to any type of photographic work.** During the last few years tremendous strides have been made with the LEICA and the new accessories.

The LEICA can be used for general picture making or applied to any specific work in the fields of biology, medicine, dermatology, dentistry, X-ray, psychology, natural sciences, geology, petrology, metallurgy, dendrology, microscopy, and many others. We have been collecting information from actual LEICA users in every profession during the last two years. From the mass of material received we have selected some of the outstanding examples for publication in this booklet. Along with the interesting work presented by actual LEICA users we have added considerable information about LEICA equipment for the professional worker, and in addition given latest information about using the various accessories.

After reading through this booklet one will immediately realize that the LEICA has a very definite place in the work of the scientist. The reason for this is to be found in the fact that the LEICA is so economical to use, compact in size, convenient to operate, and so accurately adjusted for the finest photographic uses.

MANY LEICA ACCESSORIES

Although there are over 300 LEICA accessories available, the LEICA user need not become alarmed and feel that it is necessary to invest a small fortune in additional equipment. At first only the LEICA and one 50mm lens may be selected together with the copy attachment, developing tank and the enlarger. Such an outfit will certainly give the widest range for most photographic requirements. By using the LEICA equipped with one of the 50mm lenses only, it is possible to photograph the actions of animals under observation, close-ups, portraits of people, geological formations, progress photos on all types of construction jobs, record photographs of various experiments and many other subjects. Additional lenses may be used for speed, telephoto, portrait, aerial, stereoscopic, and many other types of photography. The main thing to keep in mind is that the LEICA Camera can be adapted to practically any photographic use.

INFINITY TO PHOTOMICROGRAPHS

It is an amazing thing to realize that the LEICA Camera is capable of making landscape photographs off to infinity just as accurately as it can make photographs through the microscope and obtain photographs which may have a 2000x magnification. LEICA pictures may be made at every stage between these two extremes. You can pick out individual subjects for close-up views, use the copying attachments for very close macro photography, and finally use the microscope. The series of five illustrations shown on Pages 37 and 38 illustrate this fact very favorably. Additional photos could have been made to complete the whole cycle if space permitted. Such photos would have shown close-up pictures of the pollen grains, and micro sections of the plant cells.



Fig. 1 LEICA Model F with built-in range finder, coupling for automatic lens focusing, and shutter speeds between 1 second and 1/500 second. SUMMAR f:2.5mm lens on camera

Today the Model F LEICA represents the very latest and most progressive step ever taken in miniature camera developments. The new Model F is ideally designed for the amateur as well as for the professional worker. Here are a few of the important features of the Model F LEICA.

1. Universal control of one full second, including shutter speeds ranging between 1 and 1/500th of a second.
2. An extremely accurate built-in range finder with magnified image permits absolute accurate automatic focusing.
3. The focal plane shutter does not drag across the opening when using the slower speeds. Instead one unit of the shutter snaps open and is followed by the second unit at the exact time setting. Such positive shutter action insures perfectly timed negatives.

4. All shutter speeds can be instantly set without confusion or unnecessary changing of dials.
5. A threaded lens mount permits the quick interchanging of lenses. There is no danger of a lens falling out of its mount after it is attached to the camera body.
6. In addition to these main features there are many others which are more fully described in our new literature. The LEICA Camera is adapted for using 35mm motion picture film. An average of 36 exposures can be made with each loading. There are many different emulsions available on motion picture film. Consequently it is possible to secure a film for any specialized photographic use from the slowest positive films to the fastest superspeed films. Such a range of emulsions permits the LEICA Camera to be used in every photographic field. Motion picture film can be purchased in bulk and cut up in 5 ft. lengths for the LEICA Camera. Each foot of film will make 8 exposures.

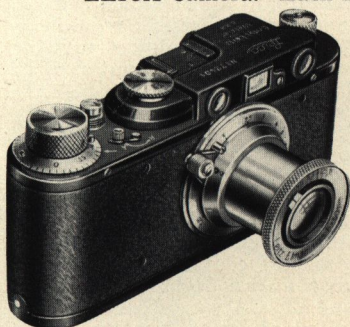


Fig. 2. LEICA Model D

Each negative will **only cost from ½ cent to 1 cent**. Think of it, an entire film negative library can easily be made for only a few dollars. For example, thousands of x-ray negatives could be copied and preserved on LEICA films. See Page 42 for additional information about photographing x-ray negatives.

In addition to the Model F LEICA we can supply the Model E without the built-in range finder and the Model D with the built-in range finder but without the slower shutter speeds between 1/20 and 1 second.

Now let us refer you to actual LEICA users and show you how they are using their cameras in unusual ways. The following pages should be read very carefully in order to obtain a complete understanding of the way the LEICA can fulfill such a universal use in the entire photographic field.

See Page 62 for descriptions and prices on the LEICA Cameras and lenses.

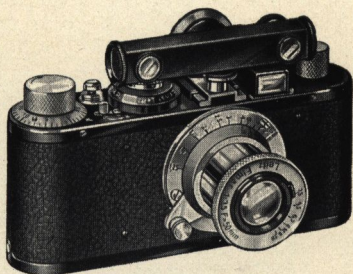


Fig. 3. LEICA Model E

LEICA FOR PSYCHOLOGICAL RESEARCH

The following description of the way Howard Champney, Dept. of Psychology, Antioch College, uses his LEICA Camera is of stimulating interest. Mr. Champney was able to make dozens of valuable negatives showing the various responses and reactions in children. It was essential to take these photographs in rapid succession with a minimum delay in winding film and reloading. Mr. Champney stated that this feature alone was fully as valuable as the excellence of the camera and lens itself. We will let Mr. Champney tell his own story about making LEICA negatives for his special research work in child psychology.

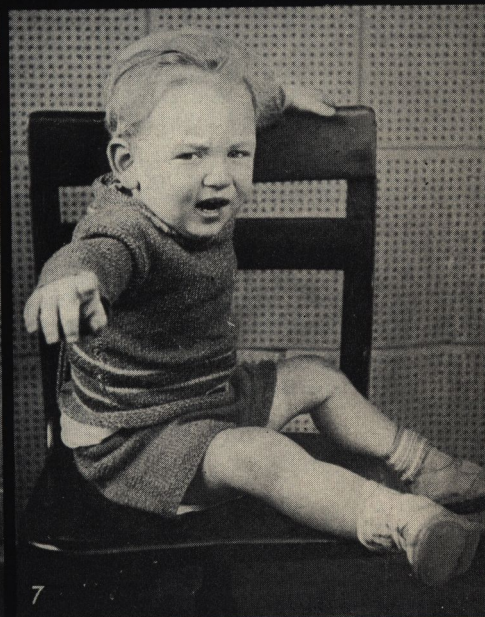
"The procedure in these experiments was this; the child is presented with a series of emotional stimuli all of which are carefully controlled and recorded, and a photographic record is made of the resulting facial expressions. The object was to study the relation between types of stimulating situations and the resulting types (if any) of facial expression. A camera was required which would catch instantly the typical expression when it appeared, which could be set for the next exposure with a minimum of manipulation, which would take a long series without reloading, and which would produce a sharp picture for study. Low cost per exposure was also an important factor. The standard LEICA, f:3.5 ELMAR, focal plane shutter, met the requirements with gratifying perfection. The work was done indoors and of course flashlights were out of the question as was also an arc light or other distracting illumination. But with the LEICA we got well exposed negatives at f:3.5, 1/40 sec. and about 1000 watts of artificial light in addition to what daylight came through the window. And we came as close as 4 feet without any trouble with shallow focus. We succeeded in getting about a hundred very interesting pictures. Our success may be attributed in no small measure to the fact the LEICA Camera solved our technical difficulties to such an extent that we were able to devote most of our attention to the psychological problems involved."

See photos on opposite page

	Emotion	Stop	Time	Distance	Light
Fig. 4	Fear (false-face).....	f:3.5	1/40	5 ft.	1000 w. plus some daylight
Fig. 5	Amusement	3.5	1/40	4 ft.	1000 w. plus some daylight
Fig. 6	Disgust (bad taste).....	3.5	1/40	4 ft.	1000 w. plus some daylight
Fig. 7	Anger (deprived of toy).....	4.5	1/40	4 ft.	1200 w. plus some daylight



6



7

Four LEICA photographs illustrating the use of the LEICA Camera for psychological research purposes

AGRICULTURAL USES OF THE LEICA CAMERA

LEICA Cameras are coming into continual use in practically every agricultural department; in the government, in the individual colleges of agriculture as well as in state departments. As the LEICA Camera is so light and compact for use on field inspection trips it is being selected as the ideal camera for this type of work. Hundreds and even thousands of LEICA negatives can be made on such trips. Even students will find that the LEICA Camera is invaluable for illustrating all their reports and investigations. Here again the LEICA negatives can be assembled for projection purposes when special lectures are given. It is possible to show actual planting and harvesting operations, spraying, pruning, pictures of test plots, experiment station workers demonstrating in the field, grafting and budding operations, and countless other uses.

Mr. M. J. Dorsey, Chief of Pomology, College of Agriculture at the University of Illinois gives the following interesting information about how he is using the LEICA Camera in his own work. The accompanying illustrations will be of additional value for all who are interested in this type of photography. Mr. Dorsey writes as follows;

"Taking it all told, I can see very little reason why one needs to pack around a big camera when the LEICA offers so many possibilities in such a small camera.

As I get around among scientists at meetings like the Association meeting just ended at New Orleans I see a good sprinkling here and there of LEICAS, and I was especially interested in looking over the newer equipments in your exhibit.

I am sending you some of my LEICA photographs which I have taken for special record purposes. Each photograph contains a special descriptive caption which will give complete details. A study of the photographs will undoubtedly be sufficient to show how the LEICA Camera can be used in a special phase of agricultural work."

M. J. Dorsey, Chief of Pomology.

The LEICA Camera equipped with one of the regular 50mm lenses is sufficient for making most of the agricultural type of pictures. The LEICA Stereo Attachment and also one of the longer focal length lenses may also be used to good advantage for some views.

Fig. 9. A three-year-old peach tree injured by cold weather during the winter of 1929-30. A cut has been made into the browned wood to show the thickness of the season's growth

LEICA Photos by M. J. Dorsey using 50mm ELMAR Lens



Fig. 8. A "close-up" of a Delicious apple tree showing the crowding of the limbs when the "head" of the tree has not been correctly trained or directed.

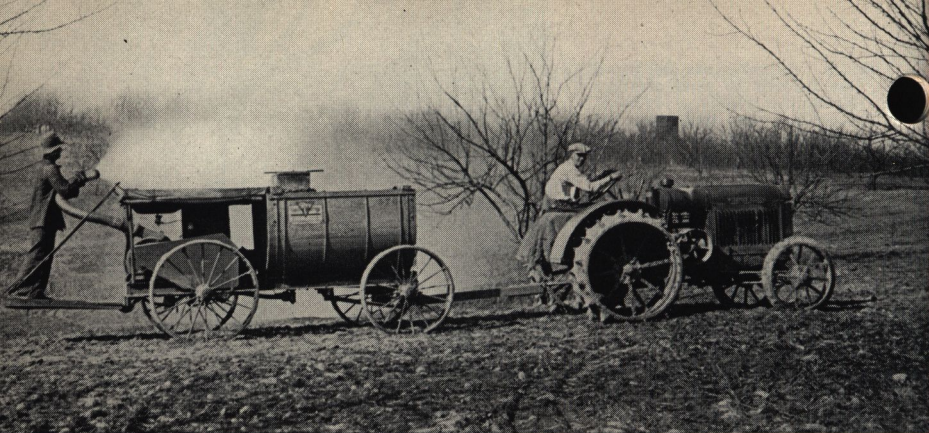


Fig. 10. ELMAR 50mm f:3.5 lens...M. J. Dorsey. An Illinois orchard at spraying time. An example to show how the LEICA can actually be used on field inspection trips. Such photographs show people and machinery in action. The LEICA really becomes the substitute for the note book.

THE INDUSTRIAL LEICA

When it comes to the industrial field there are endless possibilities for the use of the LEICA Camera. This camera can be used for photographing actual manufacturing operations because of the fast lenses and films which are available. Again it is possible to use a LEICA for many types of photomicrography. Still another valuable use for the LEICA is in the making of positive film slides for projection purposes. Such films are of tremendous value in educational work among employees as well as for use by salesmen in demonstrating new products. It is also possible to arrange many statistical reports on a film slide strip for projection at directors' meetings or for any other purpose where a number of people must concentrate on the same subject at the same time without distraction.

Quite a number of firms are using the LEICA to make illustrations for their catalogs and also for advertising purposes. Many times it is possible to reduce the photographic expense considerably by using the LEICA Camera instead of more elaborate outfits.

Fig. 11. Whorl with silk on knitting machine. LEICA photo taken with ELMAR 50mm f:3.5 lens, using Front Lens No. 2

Fig. 12. Machine part of a knitting machine. LEICA photo taken with ELMAR 50mm f:3.5 lens, using Front Lens No. 1

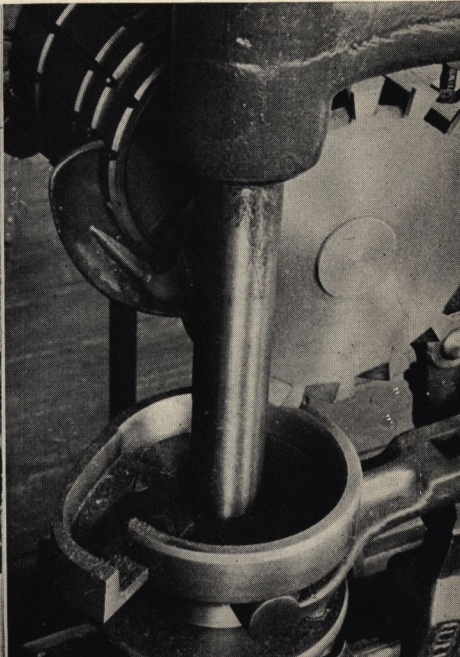
NOTES ON USING THE LEICA IN INDUSTRY

1. Select the lens best adapted for interior or exterior photography. If pictures are to be taken under poor light conditions, the f:2 50mm SUMMAR lens would be ideal for this purpose.
2. One of the fast panchromatic films should be used where speed is an essential factor. However, whenever possible, we recommend the use of the slower or orthochromatic emulsions, such as the Perutz Fine Grain film and also the Dupont Micropan $\frac{1}{4}$ speed film.
3. It is quite convenient to use two or three Photoflood lamps when photographing inside factories.
4. A tripod and also the Sliding Focusing Copy Attachment can be used to good advantage when photographing in the factory or out in the field.

Fig. 11



Fig. 12



Leica Industrial Facts

In order to present a more concrete illustration showing how the LEICA Camera can be used for industrial purposes, we are reproducing photographs and also a letter from W. F. Stoody, President of the Stoody Company who manufacture welding and grinding equipment at Whittier, California. Mr. Stoody writes as follows:

"As you probably remember when I purchased my LEICA several years ago, my sole interest in photography was as a hobby.

"I think it would be of interest to you to know that since that time I have found that we can use photography in our business to a great advantage. So much so, in fact, that we have furnished LEICA Cameras to all our salesmen.

"Our principal business is the manufacture of welding rods and tungsten carbides for hard surfacing oil well tools, road maintenance and quarrying tools, agricultural implements, and whenever abrasion occurs in any industry.

"Our salesmen who call upon welding shops and industries using welding, are able to get photographs of actual application to new tools or parts. These photographs are published in our house organ, 'Fusion Facts,' and our catalogs and books of instructions; thus spreading throughout the entire welding industry, the latest new applications of our materials.

"In addition to this, we do considerable direct mail advertising which consists of an individually typed letter and photographs of the articles or their application that we are marketing.

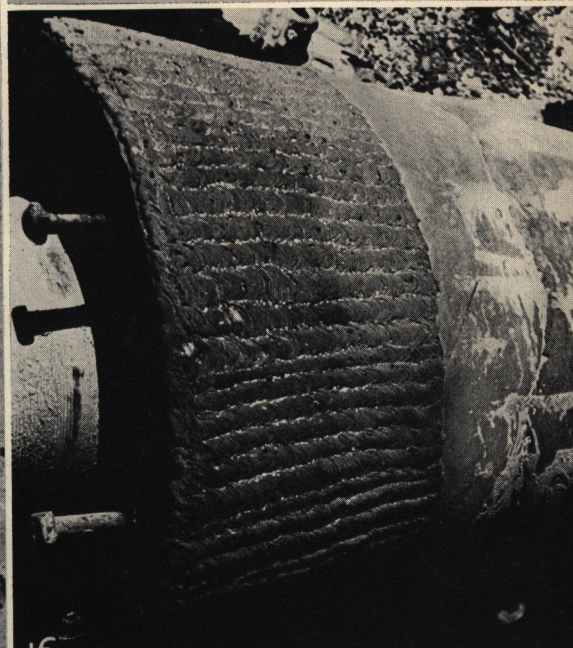
"We have our own studio and these pictures are taken under controlled light conditions with a proper background. The part that will interest you is the fact that all of this work is done with the LEICA.

"We have a 5 x 7 in. view camera and a 4 x 5 in. Speed Camera. At first, we took our pictures with one of the larger cameras and under the same lighting conditions, took a snap with the LEICA. After developing and printing, we always came to the conclusion that the LEICA negative gave better results than the larger negatives.

"We have our own darkroom and do all of our own printing by projection, and one operator is able to print, fix, wash and dry 800 5 x 7 in. prints in 8 hours.

"In addition to the above, we make all of our own photographs for our cuts for cover pages and illustrations using LEICA negatives and double printing. In this way, we illustrate our product in the foreground and print in the background, suggested uses or applications.

LEICA photographs made by the Stoddy Manufacturing Company, showing the use of their Barium products for various industrial purposes. These and similar photographs were used for catalog illustrations



"Under separate cover, I am sending you one of our booklets 'Gold In Your Own Back Yard.' The cover of this booklet is all LEICA work and double printed. I have also marked the pages inside having cuts made from LEICA negatives.

"In addition to this, I am sending you our catalogs and some photographs taken with the LEICA that we use in direct mail advertising, and one of our direct mail letters.

"There is, of course, no retouching on any of this work.

"Trusting the above information may be of use to you, I am"

Very truly yours, W. F. Stoody.

A ROAD BUILDING MANUFACTURER USES THE LEICA

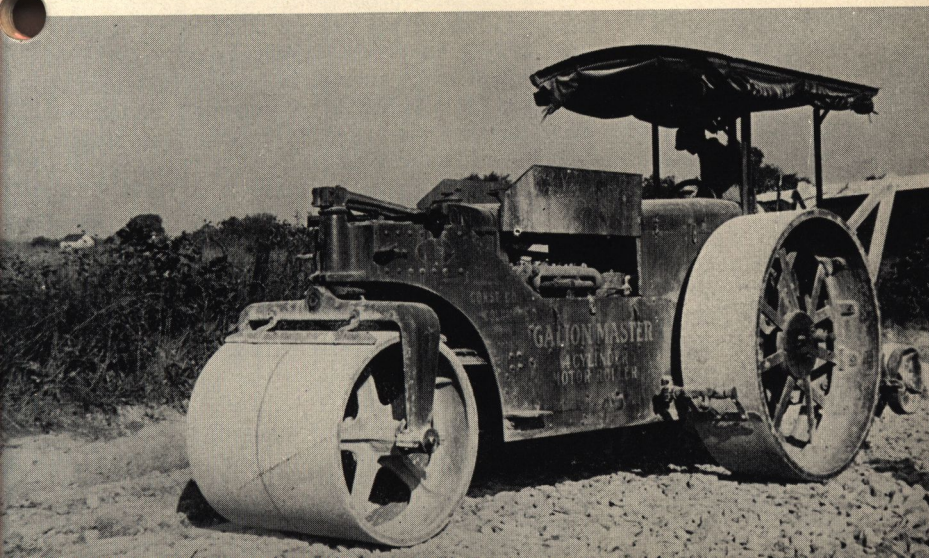
Mr. D. Townsend has sent us many interesting LEICA photographs showing how he is using the LEICA Camera for securing pictures of road building machinery for the Galion Iron Works Manufacturing Company, Galion, Ohio. Here are some interesting extracts from his letters:

Fig. 13. LEICA photo by D. Townsend...showing Galion Patrol with double drive and dual rear tires mixing new surface material for a "retread" road surface. Lincoln Highway. Another example to show how products in actual use can be photographed for record purposes.



"Just a couple examples of how versatile and convenient the LEICA has been in some of my work. Recently my employer sent me clear across the state to get some pictures of one of our machines in action on a new job. I found on arrival that the road was closed and I had to hike the last couple miles which were very rough going. I had an 8 x 10 view outfit in the car but elected to take only the LEICA when I hiked. This confidence in the LEICA was gained on my first two rolls of film. On arriving at the place where the machine was working, I found that the contractor had brought in two other models of our machines and that all three were doing interesting new work. I took twenty-eight pictures of the three machines. Now in the first place the 8 x 10 view outfit would not have been very convenient to drag over that closed road and in the second place our view camera case only holds eight film holders and to have taken twenty-eight pictures I would have had to take along a changing bag and extra boxes of film and would have been inconvenienced by the delay of re-loading the holders. The views were practically all action shots and the view camera would have had a very shallow depth of focus with its long focus lens and the large stop, it would have been necessary to use it with a high enough shutter speed to stop motion.

Fig. 17. Galion 10 ton Master roller, rolling first course of stone on a new road. LEICA photo by D. Townsend



"All of these views were action shots and were not posed in any way. These machines operate at a speed that requires at least $1/100$ sec. to stop motion, especially when taking side views. Frequently the light conditions are unfavorable, because of dull or rainy days or even the best view will be in heavy shade. During the fall months I have been thankful for the speed of the HEKTOR lens and the color sensitiveness of modern Pan films. Several times during the last few months I had to take pictures about 4:30 P. M. when the light was very decidedly yellow. Pan film and the HEKTOR lens recorded the needed views in splendid shape.

"Our engineering department is constantly observing our equipment in operation and planning changes in design to increase efficiency, convenience and ease of operation. Contractors and other users of our machines are constantly finding new uses for this equipment and for that matter new abuses too. By keeping in constant touch with what users are doing with our machines, our engineering department is able to make the necessary changes to insure that the machines will not fail in this modern high pressure service of use and abuse that the owners of today expect of the equipment they buy. Pictures play a large part in this contact between our engineering department and the users of our machines. Quite naturally these pictures to be of real value must be action shots and cannot be posed in any way."

Leica for Sales Work

A large manufacturing company which does not wish to have its name mentioned at the present time is preparing to use a LEICA Camera very extensively in its sales promotional work. This firm will secure LEICA photographs from the various district managers all over the country. All LEICA negatives are then sent in to the main office where they are edited and prepared in final form for use in sales meetings. Then 8 x 10 in. LEICA enlargements and also positive LEICA film slides present the latest developments in their sales organization work. By using the LEICA Camera hundreds of dollars in photographer's expenses are saved, because it is possible to produce results which are very satisfactory when compared to the commercial type of photograph. This firm has found that they require a more personal and informal type of photography which is difficult to obtain from the commercial photographer. The LEICA Camera can produce quick snapshots under unusual conditions. In this way people are photographed inside of stores or wherever the occasion may require photographs to be made for sales purposes. The LEICA really becomes a candid camera applied to commercial purposes. Here is an angle which should be of immense value to many manufacturers who are interested in building up a more effective sales organization.

ARCHITECTURAL AND ENGINEERING PHOTOGRAPHY WITH THE LEICA

Photography is just as essential to the entire building industry as the blue prints used during the actual construction process. Preliminary land surveys are easily recorded with the camera. Terrain surveys for special engineering projects such as bridges, dams, highways, and buildings can easily be photographed with the LEICA. Photographs from every conceivable angle are quickly made. As the LEICA holds sufficient film to expose up to 36 pictures at one loading, it is possible to secure an interesting sequence.

After construction has started it is possible to make many progress photographs with the LEICA for legal and office records. Many times serious disputes occur over certain construction jobs which can only be settled by showing the actual photographs made during the progress of the work. One of the most ambitious examples of this use of the LEICA was made during the construction of the Empire State Building in New York. One of the engineers who owned a LEICA made thousands of negatives of the steel installations from the ground floors to the final top tower construction. In the case of any

Examples of architectural and construction photographs which can be taken with the LEICA. Photos by Willard D. Morgan

Fig. 18

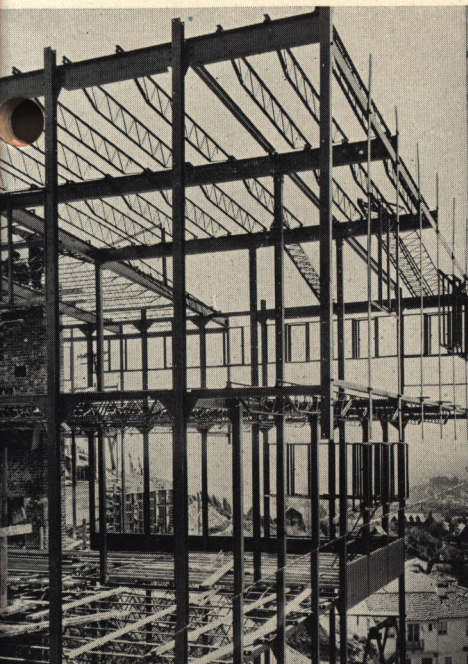
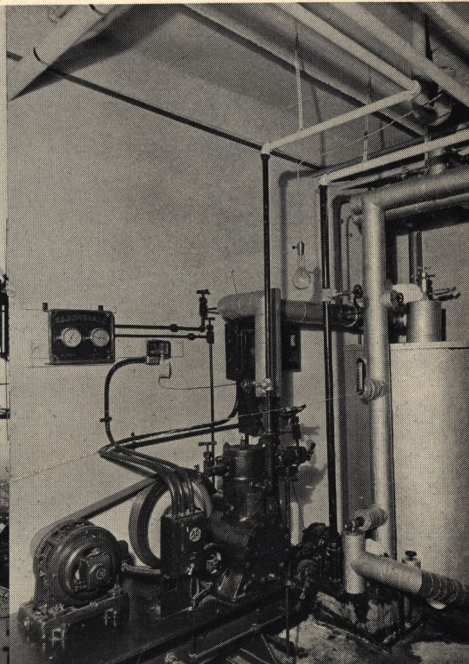


Fig. 19



dispute or for use as reference material these pictures are invaluable. The actual expense involved was extremely nominal.

Architects and draftsmen are applying the LEICA in their daily work by securing photographs for reference material as well as for recording the various building stages of their own projects. Many times it is impossible to call in a commercial photographer in time to get the exact photographs required. However, if the architect or engineer carries a LEICA with him it is possible to snap photographs at any moment and in practically any conceivable position, and light. Here again the expense item is reduced to a minimum. With the wide angle lens, the regular 50mm ELMAR, and the 135mm ELMAR lens, the architect or engineer has a wide choice for any particular photographic work with the LEICA.

There is actually very little LEICA equipment required for making the majority of architectural and engineering pictures. In addition to the LEICA Camera and one or two lenses, a good fine grain film should be selected, such as the Du Pont Micro Panchromatic or the Perutz fine grain Orthochromatic films.

Fig. 20. Construction methods are quickly photographed for record purposes. Here is a valuable use for the LEICA when photographing successive stages of any process. Such pictures can readily be used for instruction purposes or for use in illustrating articles. Photos by Willard D. Morgan. ELMAR 50mm f:3.5 lens, DuPont Regular Pan film, 1/60 sec. at f:9.



LEICA MACRO PHOTOGRAPHY

There are many cases where the photographer is called upon to make routine record photographs of specimens under various conditions, such as, dorsal, anterior, and posterior views with different contrast filters under different magnifications or possibly during movement. Other photographs are to be made of manuscripts, botanical specimens, small machine parts, dental subjects, insects, and numerous other objects which are to be found in every profession. In order to photograph such a wide range of subjects it is paramount that the finest photographic equipment should be used. Such equipment can be found in the combination of the LEICA Camera and the Focusing Copying outfit. With this universal copying attachment it is possible to photograph small objects the size of a pin head as well as large manuscripts and even newspapers when necessary. By using the various extension tubes which are placed between the lens and the Focusing Copy Attachment No. 57,600, it is possible to secure various magnifications. The special magnification table for use with this equipment may be referred to on Page 21.

The Sliding Focusing Copy Attachment FULDY No. 57,600 may be considered as the universal accessory for all types of copy work. However, there are the following additional accessories which may be used for various reasons. These attachments are usually limited to certain areas. Consequently, it is not possible to copy subjects of any size as is the case with the Sliding Focusing Copy Attachment No. 57,600 and also the Focusing Copy Attachment Model 2, No. 57,610.

Additional Copying Accessories

1. Sliding Focusing Copy Attachment Model No. 1 (No. 57,600).
2. Focusing Copy Attachment Model No. 2 (No. 57,610).
3. Front Lenses No. 1 (No. 57,730), No. 2 (No. 57,740) and No. 3 (No. 57,750) for use with the ELMAR 50mm f:3.5 lens. Front Lenses No. 1 (No. 57,760), No. 2 (No. 57,770) and No. 3 (No. 57,780) for use with the HEKTOR 50mm f:2.5 lens.
4. Collapsible reproduction stand No. 57,680 for holding the LEICA Camera in position for copying with the different Front Lenses.
5. The BELUN (No. 57,810) fixed focus 1:1 copying attachment for use with the 50mm f:3.5 ELMAR lens. See Fig. 40, Page 36. The BEINS (No. 57,820) Copying Attachment is similar to the BELUN accessory with the exception that the BEINS Attachment is for use with the 35mm wide angle lens.
6. The BEMAR Auxiliary Copying Attachment (No. 57,830) can be used to cover any objects between $2\frac{1}{8}$ th x $7\frac{7}{16}$ ths inches to $4\frac{1}{4}$ x $2\frac{7}{8}$ ths inches. The BEVOR Auxiliary

Copying Attachment can be used with the No. 2 (No. 57,740) and No. 3 (No. 57,750) Front Lenses covering the minimum and maximum areas of $5 \times 3\frac{3}{8}$ ths inches x $8\frac{7}{16}$ th inches. BEMAR and BEVOR illustrations on Page 36.

Descriptions of these copying attachments will be given in order to show the various special uses for each accessory. The selection of any one of these accessories usually depends upon the photographic work which is required. For example, if the LEICA user is to make many natural size 1:1 photographs it would be quite easy to do this with the BELUN (No. 57,810) Fixed Focus Copying Attachment. On the other hand it may be necessary to make many copies of different sized manuscripts where speed and operation is of extreme importance. For such work we would recommend the Sliding Focusing Copy Attachment Model No. 1 (No. 57,600). A more complete description of this Model No. 1 Copying Attachment will be given as it is considered by us to be the universal copying outfit.

THE UNIVERSAL FOCUSING COPY ATTACHMENT

The FULDY Attachment (No. 57,600) may be used with any LEICA Camera with the exception of the Model A and Model B. In order to use the Model A LEICA it is necessary to convert this camera to either the Model C, D, E or F. This change can easily be made at our New York Office. The Model B LEICA Camera which was equipped with Compur shutter has been discontinued because the later Model F LEICA Camera has all shutter speeds up to one second.

The FULDY Attachment may be purchased separately or together with the 3cm (No. 57,650), 6cm (No. 57,660), and 9cm (No. 57,670) extension tubes, Sliding Arm (No. 57,620), and if necessary the base board and upright pillar used for supporting the LEICA enlarger head. It is also possible to use the FULDY Attachment on the ordinary tilting top tripod head.

A special magnifier (No. 57,630) can be secured for use with the FULDY Copying Attachment. There is a mounting clip already provided on the attachment for securing this 3 x magnifier.

The accompanying illustration gives complete information about the various parts of the FULDY Copying Attachment. The LEICA Camera can be quickly secured to this focusing copy attachment as illustrated. After the camera is attached it is easy to reload the LEICA without removing from the sliding plate of the attachment. The FULDY Attachment illustrated is for use with the Model F LEICA as well as for the Model C, D and E LEICA Cameras. It is possible to convert the earlier FULDY Copy Attachments for use with the new Model F LEICA.

DESCRIPTION OF THE VARIOUS FULDY COPY ATTACHMENT PARTS

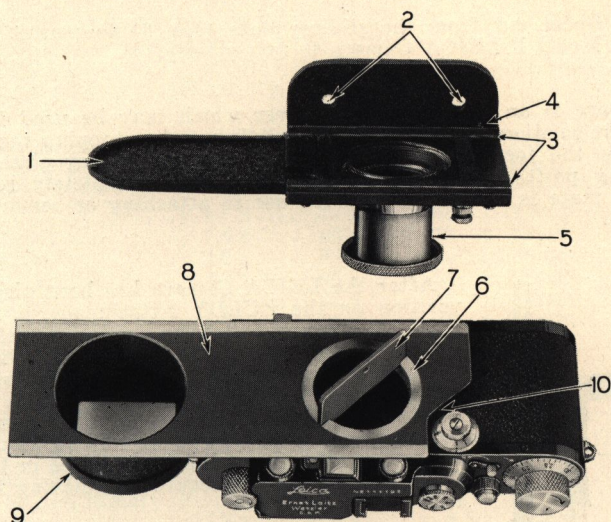


Fig. 21. Sliding Focusing Copy Attachment

1. Light shield to prevent stray light from entering camera opening while focusing.
2. Threaded opening for securing the attachment to a tripod, extension arm of the reproduction stand, or the sliding arm for use with the upright pillar of the LEICA Enlarger.
3. Dove-tail groove into which the sliding plate (No. 8) moves while focusing and making exposures.
4. Stop for use when changing from focusing to photographing position.
5. LEICA lens screwed into position.
6. Clamping ring for holding the LEICA Camera securely to the sliding base plate.
7. Key for turning clamping ring (No. 6).
8. Sliding base plate for holding the LEICA Camera, focusing ground glass, and also the magnifier.

9. Focusing ground glass in exact plane with the film in the camera. There is also a place to clamp in the magnifier when necessary.
10. Space cut from the sliding plate (No. 8) to permit the Model F LEICA Camera to fit properly.

There is an adjustable stop lever which may be used in three different positions for releasing the sliding plate, stopping the sliding plate at the focusing position, and locking the sliding plate at the focusing position. When this stop is pulled completely back the sliding plate is easily removed for use in attaching or removing the camera.

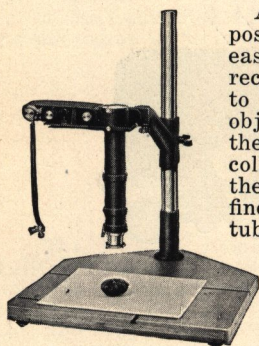


Fig. 22. Sliding Focusing Copy Attachment set-up

After the LEICA Camera has been placed into position on the FULDY Attachment, it is quite easy to operate. A wire extension release is recommended for making all exposures in order to prevent any jarring of the apparatus. The object is first focused through the LEICA lens on the ground glass. In doing this it is possible to collapse the 50mm lens in its own mount. After the entire attachment has been raised or lowered, finer focusing can be secured by moving the lens tube in or out.

After perfect focus has been obtained on the ground glass, the camera is easily slid into position for making the exposure.

Without using the extension tubes an area of approximately 14 x 21 inches can be photographed when using the 50mm lens. While the Camera is on the copy attachment it is possible to place a rubber ring around the lens barrel and push the lens into position until sharp focus is secured. In such a position the lens barrel extends beyond the base plate so that it is impossible to slide the camera into position. To overcome this position the lens barrel is withdrawn, the LEICA Camera slid into position and then the lens is pushed back into proper focus for making the exposure. Such a set-up is required in a few exceptional cases for copying large objects.

The following table shows the various magnifications which are possible with the sliding focusing copy attachment. This table gives the exposure factors which must be accounted for when making photographs of higher magnifications. In other words when using the copy attachment without an extension tube the exposure may be one second. If the 60mm extension tube is used for copying, it is necessary

to increase the exposure time to approximately 4 seconds as shown in the table. This table also gives the magnification, area covered and working distance between the lens and the subject.

EXPOSURE FACTORS, MAGNIFICATION, COVERAGE, AND WORKING DISTANCE FOR LEICA CAMERA, SLIDING FOCUSING COPY ATTACHMENT (NO. 57,600) AND 50MM LENS SET AT INFINITY.

Intermediate extension tubes	Exposure factor	Magnification of image	Field covered	Working distance
None	1 x....	.22 x....	163 x 114mm....	271mm
12mm tube.....	1.4 x....	.46 x....	78 x 52mm....	154mm
30mm tube.....	2.2 x....	.82 x....	44 x 30mm....	108mm
12 and 30mm tubes....	2.8 x....	1.06 x....	34 x 23mm....	94mm
60mm tube.....	3.9 x....	1.42 x....	25 x 17mm....	82mm
60 and 12mm tubes....	4.7 x....	1.66 x....	21 x 14mm....	77mm
90mm tube.....	6.1 x....	2.02 x....	18 x 12mm....	71mm
90 and 12mm tubes....	7.1 x....	2.26 x....	16 x 11mm....	68mm
90 and 30mm tubes....	8.8 x....	2.62 x....	13.7 x 9mm....	66mm
90, 30 and 12mm tubes.	10.0 x....	2.86 x....	12.5 x 8.4mm....	63mm
90 and 60mm tubes....	12.0 x....	3.22 x....	11.2 x 7.5mm....	61mm
90, 60 and 12mm tubes.	13.0 x....	3.46 x....	10.4 x 7mm....	60mm
90, 60 and 30mm tubes.	15.6 x....	3.82 x....	9.4 x 6.3mm....	59mm
90, 60, 30 and 12mm tubes	17.2 x....	4.06 x....	8.9 x 6mm....	58mm

Specific LEICA Uses

Practically every profession has some use for photographs. The LEICA Camera is the only camera which has been able to adapt itself to so many different photographic requirements. With this thought in mind we have reproduced the actual statements from various scientific workers in this booklet. By carefully reading these descriptions and letters by actual LEICA users, we are certain that the reader will become not only better informed about using the LEICA but also become an enthusiastic worker with this camera. The following letter from Oscar W. Richards, Osborn Zoological Laboratory at Yale University, presents first-hand information about definite LEICA uses.

"I have used it most with the attachment for making pictures of growing organisms through the microscope. These pictures I project and measure with a planimeter.

"I have used the camera to take pictures of three dimensional models and used the pictures for publication. I use the camera to photograph organisms for publication and to

make records of habitats in the field and to illustrate the change in the size of organisms as they grow.

"The camera is well adopted for making records of experimental set-ups of apparatus and I use it as a matter of routine for my own apparatus and have used it when visiting others to make records of especially interesting devices.

"The camera may be used for making pictures in the field and in museums which can later be used either as enlargements or as lantern slides for class teaching.

"When I was at Clark we started a catalog of shells using a picture made with a LEICA Camera on each card and the students added to the card information regarding the specimen, its origin, classification, etc.

"For filing my negatives I cut them into strips of four and place three strips in each envelope of a five by seven inch negative album, which thus accommodates 1200 pictures."

Oscar W. Richards

Today the LEICA Camera and the Focusing Copy Attachment may be found in practically every profession. For example, the

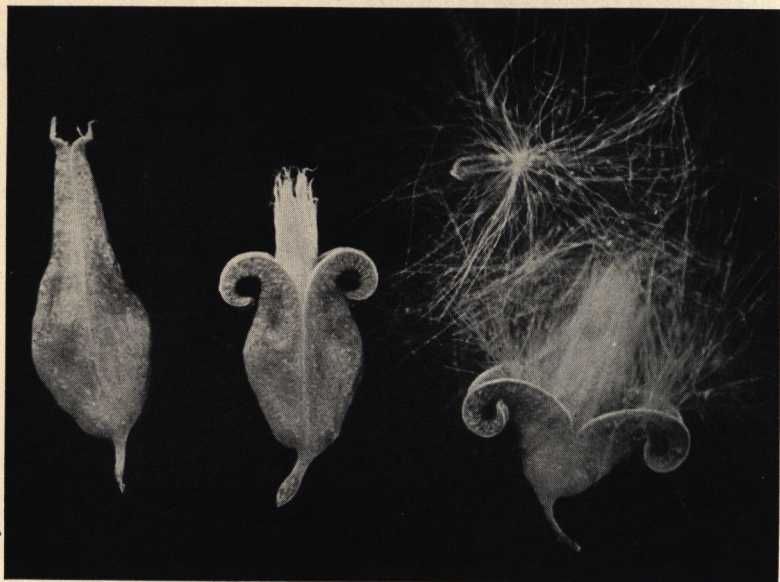


Fig. 23. Three successive stages in the opening of a willow capsule (fruit). Note the individual seed above the capsule on the right. LEICA photo by Wm. M. Harlow.

LEICA Copying Outfit is in use at the Yale University Library, the Huntington Library, various hospitals, manufacturing plants, etc. Individuals using this equipment include Professor Barnes of Temple University who uses the LEICA in copying rare documents, letters and manuscripts which he later projects on a screen for lecture purposes or for individual study. Doctor Forrey R. Getz uses his LEICA equipment in his regular dental practice. Other users of this equipment will be mentioned later.

Naturalists are extensive users of the LEICA Copying Attachment. On Page 28 James M. Leonard describes how he uses the LEICA Camera for his own hobby of photographing insects. The uses for this copy outfit are practically unlimited. The directions given in this booklet and also the concrete examples of the work produced will certainly stimulate new ideas in many who wish to work with the LEICA Camera in their own professions.

The accompanying description and interesting illustrations will give an excellent idea about how the LEICA Camera and the copying attachment is being used by William M. Harlow, Asst. Prof. of Wood Technology, and his associates at the New York State College of Forestry. Right now Mr. Harlow and E. S. Harrar are cooperating on a new book which will be completely illustrated with LEICA photographs similar to the ones shown in this booklet. These LEICA photographs are furnished through the courtesy of the authors and also the McGraw-Hill Publishing Company. Mr. Harlow, Assistant Professor of Wood Technology, writes as follows:

"I am enclosing some enlargements from negatives both made with this camera and also with the new LEICA outfit purchased by this department. These photographs I cannot call anything less than remarkable and even that term is too meager. In the past I have tried to make such pictures with standard equipment but never before with any camera have I secured the marvelous depth of focus displayed by these photographs. It should be remembered that with the pictures of the flowers, in particular, the depth of focus often is as great or greater than the width of the object itself—and this at such a short distance!

"As I have indicated in previous correspondence, I am writing, together with Mr. E. S. Harrar, formerly of the University of Washington, the first text of its kind on Dendrology (tree identification) and this will contain several hundred photographs illustrating everything from bark to tree flowers.

"Since trying out the LEICA equipment, we have decided to use LEICA entirely from now on for all our photography. From the standpoint of quality, cost and portability, we do not believe that any equipment known to us will serve us as well."

Sincerely, W. M. Harlow,

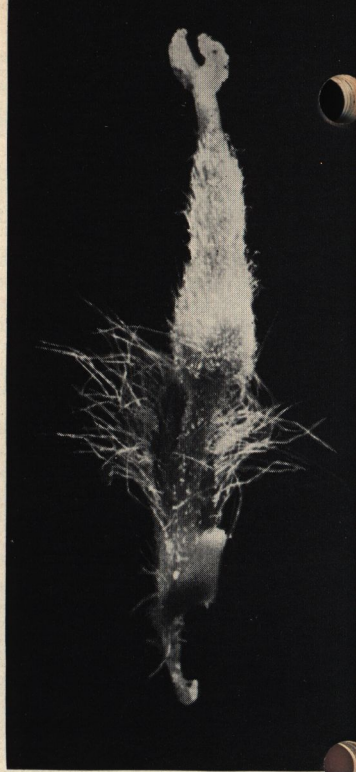
Asst. Professor of Wood Technology.

Fig. 24. Cluster of staminate (male) cones (flowers) of Pine

Fig. 25. A single flower of American Elm. LEICA photo using Sliding Focusing Copy Attachment, 35mm lens and two 3cm extension tubes. Light from one window and 60-watt Mazda bulb. Diaphragm stop f:18, exposure 30 seconds

Fig. 26. A single pistillate flower of Willow showing nectar gland at the base. Same set-up as Fig. 25, but using two 9cm extension tubes and the 50 mm lens.

All LEICA photos made by Wm. M. Harlow. Permission to use these photographs given by McGraw-Hill Book Company.



← Fig. 24

↓ Fig. 25

↑ Fig. 26



LEICA FOR DENTAL PHOTOGRAPHY

Quite a number of dentists are finding that the LEICA Camera can be ideally adapted to their own profession. For example, the orthodontist may use the LEICA Camera for making close-up photographs of the mouth of his patient. Front and side views may be made each time the patient visits his office. At the end of six months or a year it is possible to have a complete series of photographs showing the gradual regulating of the mouth as it is straightened. These pictures will furnish invaluable records which may be of immense value for educational work as well as for the regular use in the office files. Occasionally these photographs may come into use in case of a law suit or when it is necessary to show evidence of work done in order to collect a bill. In any case the dentist as well as all other professional workers should keep continual photographic records of their work. The LEICA affords a quick economical way in which to make these record pictures. The average light in the usual professional office is sufficient for making close-up snapshots with the LEICA. It will rarely be necessary to use artificial light if a fast film is used.

Other dentists use the LEICA for photographing special dental cases, casts, and also artificial bridges which may be made. A good example of this type of dental photography may be found in the LEICA work being done by Dr. Forrey R. Getz of New York City. We are reproducing a few dental photographs made by Dr. Getz along with a letter which he has recently sent to us describing how he uses this camera in his work.

"The little LEICA Camera which I purchased quite some-time ago has been greatly admired by others and the source of much pleasure and satisfaction to me.

"Compactness and outside beauty of the LEICA challenges one's attention at once, but it is the combination of time saving and economical mechanical features and its adaptability to various uses that makes the strongest appeal to the enthusiast for ownership.

"I have found it most satisfactory in my professional work, for making records of cases, of plaster models, of bridge-work, as well as for all types of copying, and for screen projection in educational work. The ELMAR f:3.5 50mm lens cuts its lines sharply, has great depth of focus, and the negatives, where desired, enlarge with great detail. Strips of positive film and three window glass slides project beautifully in a home screen and afford a better means of study than a movie.

"Things that I select for either professional use or the pursuit of a hobby must be well made and efficient, as well as good to look at, and in those respects this little marvel meets all requirements in its field.

"I never made a trip anywhere by motor or train without taking my LEICA and bringing back excellent records of scenes and places encountered. In two instances, once in the mountains of Switzerland and once in the Rockies of Colorado, it served as an irrefutable witness to exact positions and conditions of cars in automobile accidents. I would feel handicapped without my LEICA and want to express my appreciation to its inventors and makers, E. Leitz, Inc., for this optically and mechanically perfect little camera."

Very sincerely, Forrey R. Getz.

Students who wish to illustrate special reports will find the LEICA indispensable for copying quotations out of reference books as well as diagrams, photographs and other material which will serve to clarify their theses.

For all this type of copy work we recommend the sliding focusing copying attachment. When photographing certain definite areas it is possible to use the LEICA Camera and one of the front lenses or the BEMAR Copying Attachment No. 57,830 (see Page 36). With the focusing attachment it is possible to make quicker changes when it is necessary to photograph various sized objects.

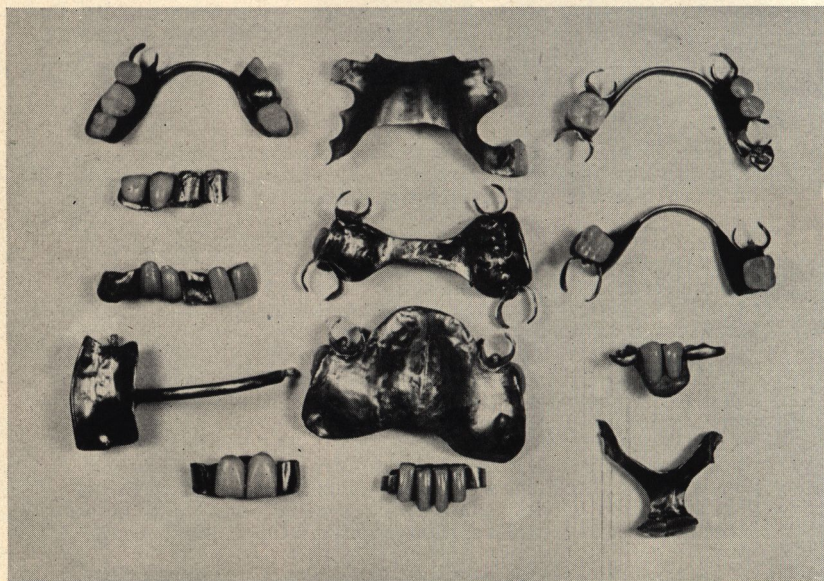


Fig. 27. LEICA photo by Dr. Forrey R. Getz, showing bridges and partial dentures removed from patients. Not good dentistry but a lot of inexpensive photographic record secured within the LEICA size negative.



Fig. 28. Gold Foil Filling Instruments. Enlarged from LEICA negative to show its adaptability for either simple enlargement or screen projection, for lecture or classroom work. Dr. F. R. Getz photo

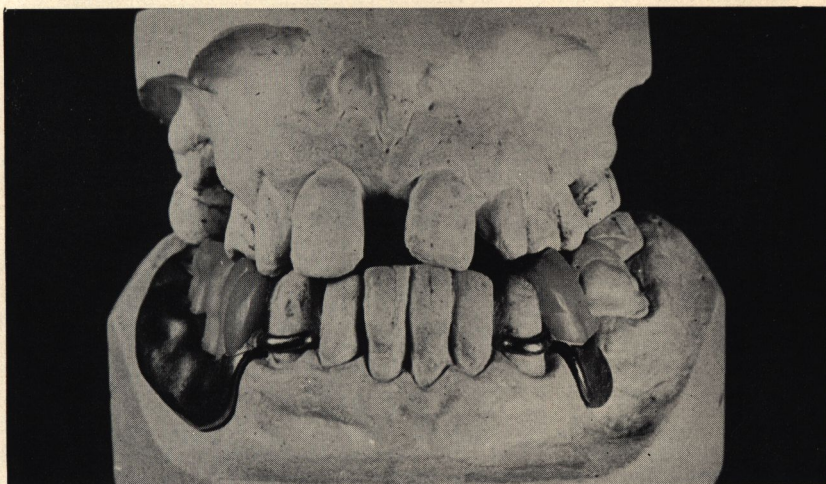


Fig. 29. Photographic Record of Unusual Dental Case. Note extreme depth of focus secured. Distance from front to rear is $2\frac{1}{2}$ inches. Dr. F. R. Getz photo

LEICA FOR THE NATURALIST

Everyone who is at all interested in natural history will find immediate use for the LEICA in his work. The botanist may use the LEICA for photographing flowers, trees, or even for copying herb-
arium sheets. The zoologist will photograph animals in their natural environment or he may continue his photographing under the microscope. Even the teaching of natural history can be made easier as well as more effective by an intelligent use of the LEICA Camera. For example, Mr. Ellis C. Persing, School of Education, Western Reserve University, Cleveland, Ohio, has been using the LEICA Camera for several years in his own educational work. Quite a number of his magazine articles and book illustrations have been made with his LEICA Camera.

Leica for Insect Photography

An interesting example to show how the LEICA Camera may be used for photographing insects may be found in the work of James M. Leonard of New York City. Mr. Leonard works for the A. T. & T. Company in New York but his absorbing hobby is to be found in photographing insects with his LEICA Camera and Sliding Focusing Copy Attachment. By using the various combination extension tubes on this copy attachment, Mr. Leonard is able to obtain remarkable results. His photographs have received national recognition. The accompanying letter and illustrations will give a complete story about Mr. Leonard's LEICA work.

"It is a pleasure to tell you how helpful I find the LEICA Camera in the pursuit of my hobby of insect photography. I am photographing mounted insects by artificial light and live ones in their natural surroundings in the field and am getting excellent results under all conditions.

"Through the use of the lens, extension tubes, and subsequent enlarging I am obtaining pictures of insects or parts of them up to one hundred or more times their natural size. With the extension tubes and the focusing device the camera has proved itself so versatile, so easy to use both in the field and in the laboratory, and so productive of outstanding results that I would not be without it.

"As an engineer I admire its ingenious design and its mechanical and optical perfection, as an amateur photographer, I find it an unending source of pleasure."

Sincerely yours, J. M. Leonard.

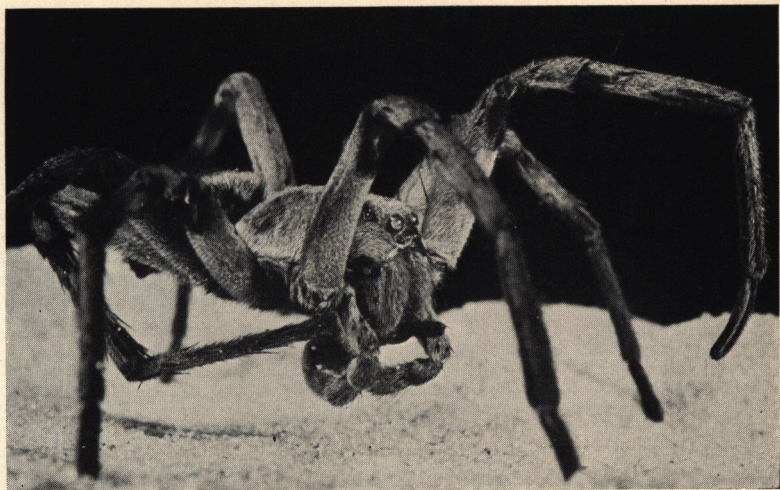


Fig. 30. Photograph of a wolf spider made with the Sliding Focusing Copy Attachment and extension tubes. LEICA photo by J. M. Leonard

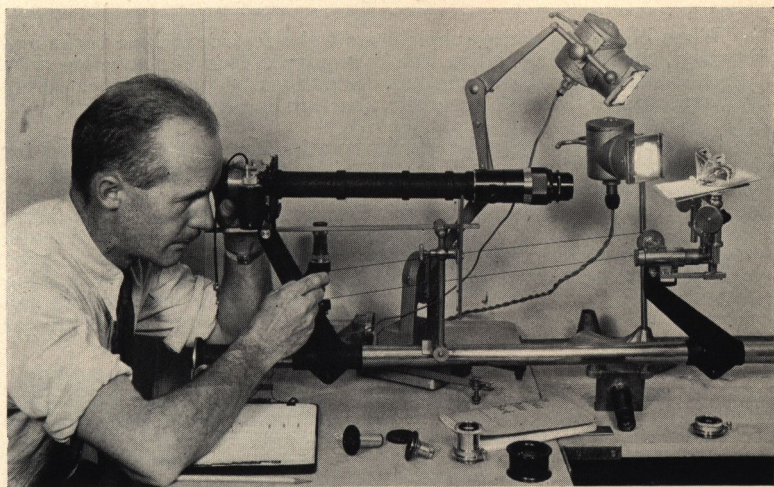


Fig. 31. This unusual photographic apparatus was set up by J. M. Leonard for photographing insects. Note how the LEICA is used with the Focusing Copy Attachment. Photograph by Willard D. Morgan

FILMS, FILTERS, AND EXPOSURES

As every set-up for copying is so different, it is almost impossible to give absolutely accurate data without knowing the exact conditions. For those unfamiliar with this type of copy work, we recommend that they make a full LEICA roll of test exposures under various lighting conditions, magnifications, filters, and also on different films. In this way it is very easy to obtain exact information which is invaluable for all future work. When a darkroom is convenient it is also possible to place a short 4 inch strip of film into the LEICA Camera without using any magazine or take-up spool. One exposure can be made on this test strip and then developed before starting the regular copy work.

Whenever possible we advise the use of orthochromatic film when copying with the LEICA Camera. With the exception of the DuPont Micropan (No. 56,090 micro panchromatic film) the orthochromatic films have a finer grain than the ordinary panchromatic films. Of course when it is necessary to photograph moving objects and a film of extreme speed is required, we recommend the fast panchromatic films, such as, the DuPont Superior (No. 56,080) which has a tremendous speed and also produces excellent quality negatives. The Perutz Neo-Persenso and the Perutz Special Fine Grain films are excellent for use in copying. These films are especially recommended for copying x-rays in order to produce fine detail and also reproduce the fine graduations of the x-ray negative.

When black and white subjects are to be copied, such as books and drawings, the regular positive film is required. This film together with a good contrast developer produces negatives of fine quality. Avoid over-exposure in order to preserve fine line details in negatives.

One of the most popular panchromatic films now being used for obtaining good color correction and also for obtaining a fine grain negative is the DuPont Micropan film (No. 56,090). This film has a speed similar to the ordinary orthochromatic films. When using the DuPont Micropan film it is possible to copy blue prints through a red filter and make the resulting picture come out with a good black and white contrast. This film is also recommended for making photomicrographs. It can also be used for copying manuscripts and especially when copying colored or yellow manuscripts which require filters.

Color filters may be secured for any type of correction when photographing. Our complete catalog gives full information about the various filters. Usually the yellow filters and possibly the green and red filters would be the best selection for ordinary macro and micro photography. Our Booklet No. 1192 is another source for information about filters. This booklet gives complete information about developing and printing of LEICA pictures. A copy is included with every new LEICA Camera sold.

Exposures and Meters

When it comes to determining exposures for the LEICA Camera, we recommend the use of either the LEICASCOP (No. 51,520) or the LECIAMETER (No. 51,500). These exposure meters give accurate exposure ratings when using the various films or filters in the LEICA. The LEICASCOP uses the extinction principle by gradually fading out a number while looking through the meter. At the point where the number cannot be read, the meter is removed from the eye and the exposure is read on the dial.

The LECIAMETER is essentially a photo-electric cell which operates a very sensitive and accurate meter indicator. It does not depend on the human eye whatsoever except to be read. The meter gives a direct reading for any film used depending on the Scheiner rating of the particular emulsion. The Scheiner speed rating of the most popular films is given on the meter. This meter is recommended for all types of photography and its use will guarantee perfectly exposed negatives.

CONVERSION: H & D to SCHEINER

H & D	72	310	650	1300	2700	5500
Scheiner	11	17	20	23	26	30

Fig. 32. LECIAMETER No. 51,500

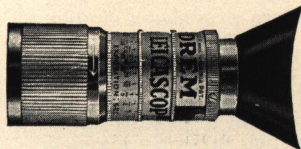
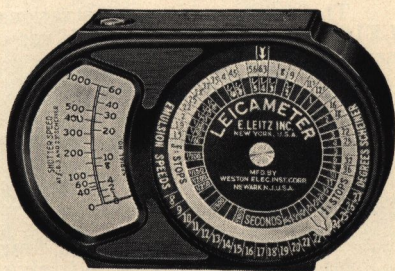


Fig. 33. LEICASCOP Exposure Meter No. 51,520 operated by the extinction method of eliminating light while looking into the meter

LEICA FOR COPYING BOOKS AND MANUSCRIPTS

One of the most important uses of the LEICA Camera is in the field of copying manuscripts. Today the LEICA Camera may be found in many libraries, universities and among research students. When we realize that a certain rare book can only be seen by comparatively few readers, it is of immediate interest to know how many readers may have access to such a rare volume without the hazard of having the book worn out by continual use. The only answer is by copying the entire book on LEICA film. For example, a book containing 200 pages would require 25 ft. of 35mm positive motion picture film. This film can be purchased directly from the manufacturer at 2 cents per foot. Think of it, at a total film cost of only 50 cents an entire book may be copied. This negative film can then be duplicated hundreds of times if necessary and used in the regular LEICA projectors (see Page 44).

Students who wish to illustrate special reports will find the LEICA indispensable for copying quotations out of reference books as well as diagrams, photographs and other material which will serve to clarify their theses.

For all this type of copy work we recommend the sliding focusing copy attachment. When photographing certain definite areas it is possible to use the LEICA Camera and one of the front lenses or the BEMAR Copying Attachment (see Page 36). With the focusing attachment it is possible to make quicker changes when it is necessary to photograph various size objects.

The accompanying illustrations will serve to illustrate how the LEICA Camera, together with one of the copying attachments can be used.

Reproducing Books and Documents

A letter from James A. Barnes tells how he is using the LEICA Camera in his historical research work. He writes as follows:

"I have just completed a four months' research trip in the Middle West. I relied entirely upon your LEICA Camera for copying, and found it exceedingly satisfactory. Manuscripts, documents, pamphlets, books, and newspapers are copied with equal ease. The easily transported camera provides a simple, accurate, and inexpensive method of gathering material. I often copied two hundred letters a day.

"In the LEICA you have supplied for the historical researcher an instrument which removes much of the drudgery and all of the inaccuracies of copying which formerly plagued him."

Yours very truly, James A. Barnes.

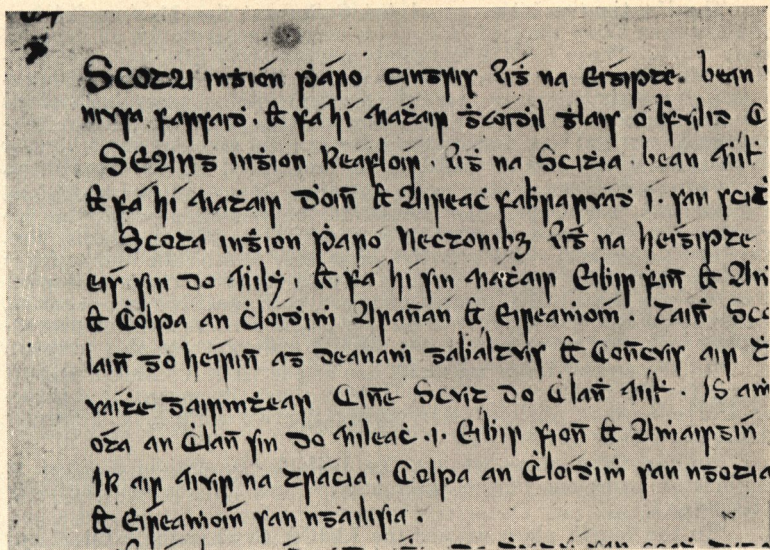


Fig. 34

Fig. 34. Reproduction of early manuscript made at the Huntington Library, San Marino, California.

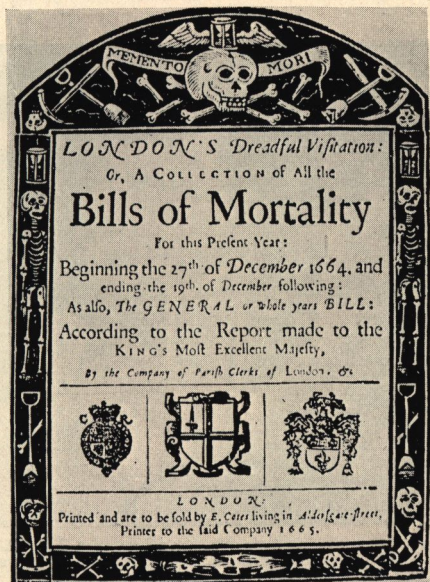


Fig. 35. Title page of the London Bills of Mortality for 1665. A LEICA reproduction made by F. G. Ludwig at the Yale University Library

Fig. 35

The Huntington Library and Art Gallery at San Marino, California has been using the LEICA camera very extensively for all types of copy work. These LEICA negatives are carefully filed and used continuously for projection purposes as well as for making paper enlargements for distribution to research workers and to many institutions all over the world. Dr. L. Bendikson has charge of the LEICA photographic work at the Huntington Library. He gives us the following description about how the LEICA is being used in his department.

"In the first place for the reproduction of voluminous books and manuscripts, for which the photostatic reproduction would be too costly. In such cases we make a negative on 35mm cinema film. Our institution keeps this negative or master film on file and supplies the applicant with a positive film for projection. To print the positive, we use the LEICA printer and test, both, positive and negative, with the LEICA projector. If certain pages are required in photographic form we make use of the LEICA enlarger for this purpose.

"In the second place we make use of the LEICA Camera and its filters for the making of colored lantern slides, by means of a three-color dye-mordant process. For registration we use a Leitz binocular microscope (low power, wide field).

"In the third place we use the LEICA Camera on a stand in conjunction with one of the Leitz microscopes for photomicrography (Ultrapak).

"In the fourth place we use the LEICA Camera for most of our outside work, as recording memorable events that take place on the grounds of our Institution."

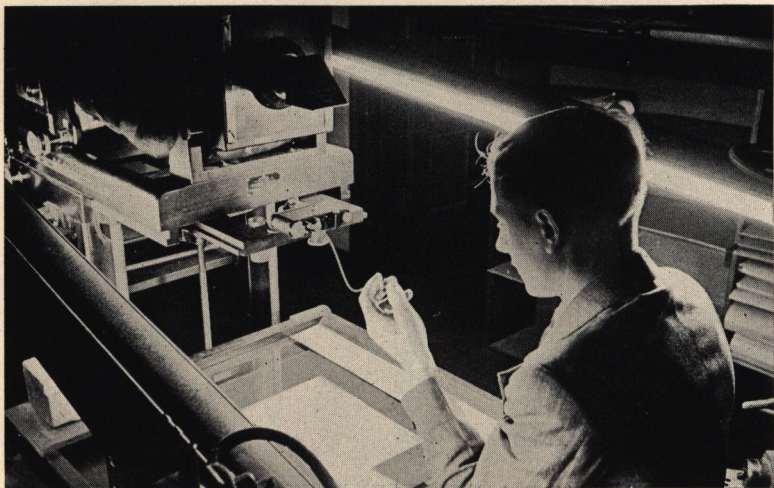


Fig. 36. Photograph showing how the LEICA Camera is mounted on the regular photostat machine at the Huntington Library, San Marino, California. Photo by Gilbert Morgan

Leica Combination Reading, Projecting and Enlarging Equipment

With the continued use of the LEICA Camera for copying manuscripts and similar subjects, there has been a demand for a convenient reading outfit for use with the negatives and also LEICA positive film strips. Consequently the combination reading, projecting, and enlarging apparatus was designed. The accompanying illustrations will show how to set up this outfit. The convenience of this equipment will be quickly appreciated when one realizes how convenient it is to read directly from the LEICA negatives without the necessity of making paper enlargements. Then the ground glass projection box can be removed when it is necessary to throw the LEICA negative or positive directly onto a projection screen. Again if it is necessary to make enlargements directly onto sensitized paper the equipment can be quickly adjusted for this particular use.

The film-holding part of the reading equipment can be rotated for use with vertical or horizontal LEICA negatives.

Libraries, research workers as well as others will quickly find this combination equipment No. 60,100 to be one of the best time saving as well as convenient pieces of equipment they can secure with the LEICA Camera.

Complete directions about using this reading equipment are furnished upon request.

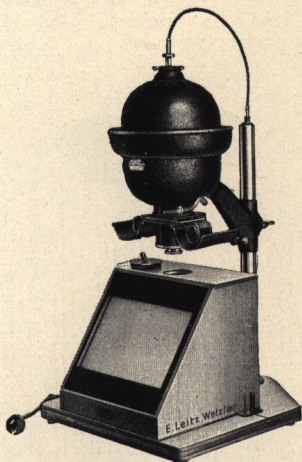


Fig. 37. Reading Equipment set-up with the ground glass reflecting box

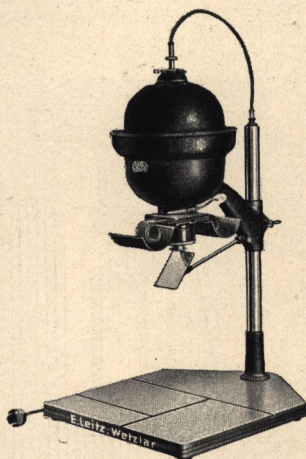


Fig. 38. Reading Equipment set-up with the reflecting mirror for projection onto a screen

AUXILIARY REPRODUCTION ATTACHMENTS

For certain types of close-up photography the LEICA user will find that our BEMAR and BEVOR Copying Attachments will be of special value. These attachments are equipped with a universal ring to which four extension legs are attached. In actual use the BEMAR and BEVOR Attachments are quickly set up by adjusting the extension legs and also inserting an intermediate extension tube between the LEICA Camera body and the lens. The illustration No. 41 on this page shows the BEMAR Attachment set up for use. The BEVOR Attachment is used without an extension tube. However, the No. 2 or No. 3 Front Lens is used in combination with the BEVOR set-up. The illustrations will give a fairly complete idea about the appearance of these attachments. A complete direction Booklet No. 7207-A is available and will be sent to anyone upon request.

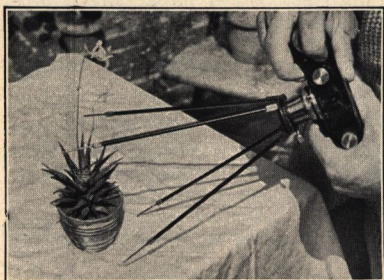


Fig. 39. BEVOR Setting Device No. 35283 for use with the Supplementary Front Lenses

Complete information is also given in our Booklet No. 7207-A regarding the BELUN 1:1 Fixed Focus Copy Attachment. With this attachment it is possible to make LEICA negatives in rapid succession of any object which comes within the standard LEICA size area of approximately $1 \times 1\frac{1}{2}$ inches. For example, seeds, sand, small insects, stamps, sections of drawings, etc., may be quickly copied with this BELUN LEICA attachment.

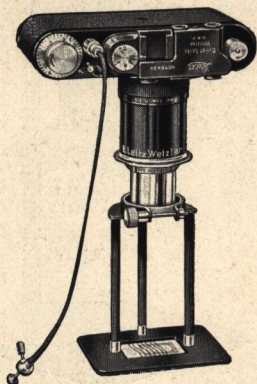


Fig. 40. BELUN Fixed Focus 1:1 Attachment No. 57,810

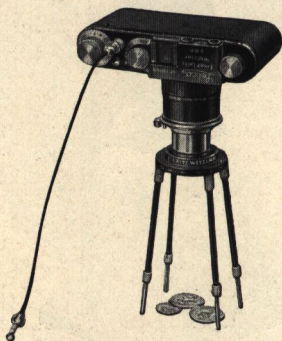


Fig. 41. BEMAR Copying Attachment No. 57,830 for use with the 50mm ELMAR lens

A series of five different photographs of *Digitalis purpurea*. Photographs showing the versatility of the LEICA Camera with the 50mm ELMAR lens. Note successive close-ups made of the same plant.

Fig. 42 shows malformation of the blossom. Front Lens No. 1 used with ELMAR lens



Fig. 44

Fig. 42



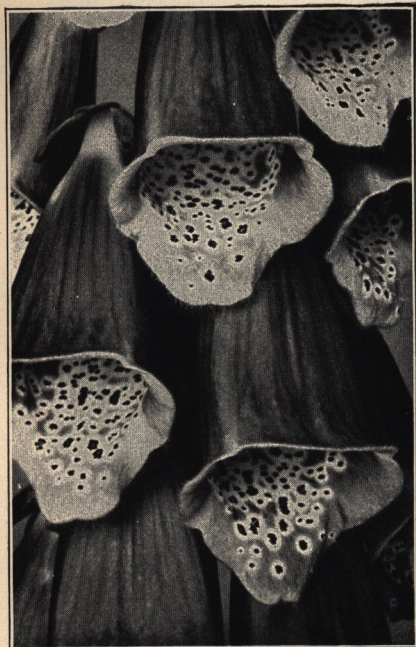


Fig. 45. Blossoms on *Digitalis purpurea*.
Elmar 50mm lens used with BEMAR
1:3 Attachment

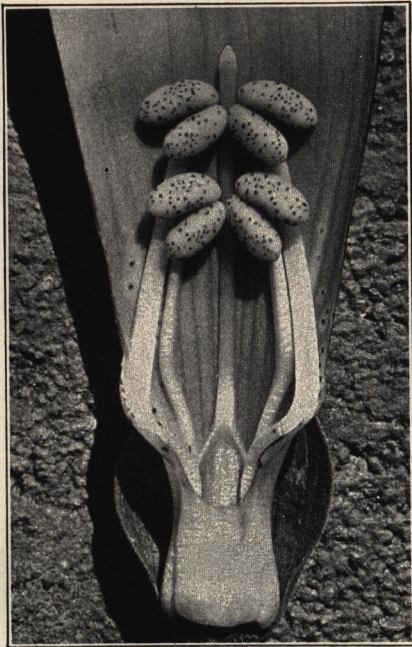


Fig. 46. *Digitalis purpurea*, pistil and
anthers of an open flower. ELMAR
50mm lens used with BELUN 1:1 At-
tachment

MEDICAL WORK WITH THE LEICA

Doctors will find continual use for the LEICA Camera in their private practice or in connection with their clinic, hospital and laboratory work. For example, at one of the New York hospitals some patients are photographed from the time they enter the hospital until they shake hands with the superintendent and leave. At the conclusion of this series of photographs a film slide strip is compiled to show the progress and correction of the abnormality. With such a film strip it is possible for the doctors as well as the hospital to show the various corrected processes in each individual case.

The following paragraphs have been taken from a recent letter received from Dr. L. B. Arey, Chairman Northwestern University Medical School.

"The photographing of specimens in the fresh condition, especially those that lose color in preservatives, is accom-

plished easily with the LEICA. Here again ease of manipulation combined with the advantages of panchromatism are valuable features. In the same category of record photography come the step-by-step recording of the condition and progress of animals in long time experiments, the similar records of human patients, the steps in experimental procedure and set-ups of apparatus. One is able to go to hospital and clinic and obtain good records of unusual conditions of patients; due to the speed of the ELMAR lens there is little trouble with proper exposure. By using the cable release and holding the LEICA firmly against forehead and cheek, it is easy to take short time exposures $1/5$ second or less. The new Model F LEICA is ideal for this work.

"Another use among student classes has been in taking individual photographs for attaching to the records in the files. These are useful in learning names in large classes and make an invaluable permanent record by which a name and face can be easily reassociated. For this purpose the tele-photo lens set at 6 feet is best; the students are told to stand on a marked spot while the photographer takes a position as determined by trial with the range finder. Pictures then may be taken as fast as the students can file by."

L. B. Arey.



Fig. 47. LEICA photograph of operation to remove an ulcer of the stomach. Taken by Dr. John Foulke Gallagher at Pennsylvania Hospital, Philadelphia. Model E LEICA used with ELMAR $f:3.5$ 50mm lens, $1/30$ second exposure, DuPont Superior Pan film. Enlargement made on Agfa Brovira velvet paper

LEICA photographs can easily be made of patients during various stages of treatment. All these pictures may be taken in the same way so that the proportion to size is alike. Then enlargements can easily be made from the LEICA negative to show the healing processes of any desired area. In this way the doctor or student can see details within the picture which are not so readily available in the usual print. The following letter received from Dr. F. J. Viner, Supt. of Infirmary, College of Dentistry, Creighton University, gives some interesting information about how the LEICA is being used for special purposes.

"I have been using the LEICA in quite a number of ways, photomicrographs for histology and embryology, special anatomy illustrations for the students at the medical school, in pharmacology showing the effect of different drugs on animals. In dentistry showing the different steps in crown and bridge construction and the same in full denture construction, photographs of dissections of fish for comparative anatomy. This work has been carried out with the projection apparatus and enlargements in teaching the various subjects. I cannot recommend it too highly for this kind of work.

"During the past year the Nicholas Sinn Hospital purchased a complete outfit so as to have a complete history of all their operative cases and I trained their technician in the use of the apparatus, some very beautiful photographs were obtained of frozen sections, a thing that the doctors were rather skeptical about and didn't think could be done on account of the thickness of the section."

F. J. Viner

The following note from Dr. Joseph A. Fahey tells what he thinks about the LEICA Camera and its use at the Millard Fillmore Hospital, Buffalo, New York.

"The LEICA Camera is the 'big shot' here in our Clinical Photographic Department, in fact we built the department around the LEICA, and even at that we can't catch up with its possibilities. Its adaptability seems endless. It has performed excellent service in the Dissection room, Lecture rooms, and Operating rooms, and enlargements from its negatives are just what you said they would be—'crisp clear and sharp.'"

Joseph A. Fahey, M.D.

LEICA FOR PHOTOGRAPHING THE HUMAN EYE

Quite a number of oculists are finding excellent use of the LEICA Camera for their work in photographing the human eye. For this type of work the Sliding Focusing Copy Attachment No. 57,600 comes into excellent use. With this attachment it is possible to photograph the human eye (natural size) or if necessary it is possible to photograph an area large enough to include both eyes on the same negative. With different adjustments, practically any size area may be covered. Space does not permit us to go into minute detail about the entire equipment and process for this type of LEICA photography. A complete chapter on eye photography will be included in The "LEICA Manual" by Willard D. Morgan scheduled for publication later in the year. However, the following points will be sufficient to give a general survey of this field.

1. Select a fast fine grain panchromatic film.
2. Use the Sliding Focusing Copy Attachment No. 57,600.
3. Use a side lighting in order to prevent any undue strain on the eye.
4. It is even possible to have dark shutters over the light bulbs which can be opened only during the time of the short fractional second exposures.
5. For some eyes which cannot stand even a small concentration of light, it is possible to use the Photoflash bulbs for making quick exposures.
6. The patient should have a rigid support for the head or chin in order to prevent motion during the focusing or exposure.

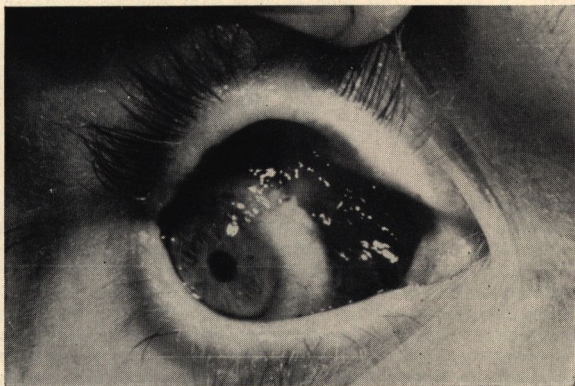


Fig. 48. A remarkable LEICA photograph made by Dr. R. Castroviejo showing pathology of the eye

7. Use a wire release on the LEICA Camera for releasing the shutter. This should be done for any other type of photography when the LEICA Camera is used with any of the copying attachments.

The accompanying illustration made by Dr. Raymond Castroviejo shows how he is using the LEICA Camera at the Ophthalmetry Department at the Medical Center in New York. Dr. Castroviejo has been making hundreds of eye photographs. Many of these photographs are being used in his reports and magazine articles which are appearing in the optical journals. All his photographic illustrations were made with his LEICA equipment.

LEICA IN THE X-RAY DEPARTMENT

X-ray negatives can be copied onto LEICA film for projection purposes as well as for making contact paper prints for indexing or for use in making enlargements for special study requirements. As most x-ray films are too large for direct projection the LEICA size negative affords an excellent economical method of showing various cases by projecting in the regular LEICA double frame size projector.

Many hospitals destroy their radiographic films after a few years as a fire precaution. In this manner many valuable records of interesting cases are lost for future reference. The LEICA offers a most economical way of preserving these records by copying them on motion picture film. A roll of 200 feet of this film can be made in negative form for a cost of less than ten dollars. This amount of motion picture film will contain 1600 copies of x-ray films in their reduced form and can be placed in a tin can that will easily fit into the coat pocket. When any particular film is desired for study in the future it may be either projected on a screen from the LEICA film or it may be photographically enlarged in print form for study or reproduction in scientific publications.

Our special illuminating boxes are available in different sizes. By using these boxes it is possible to copy x-ray negatives, various gross specimens, reduce large sized photographic negatives onto the LEICA film, as well as copy any other type of transparencies. For example, it is possible to secure the best white background around a subject by copying over the illuminating box. In addition to the light coming around the specimens it is also possible to have top lights to give the proper illumination. The quality of the background can be varied by the intensity of the lights. Also it is possible to secure a black background by using a red plate through which the light may pass. When copying with orthochromatic film the red will turn black.

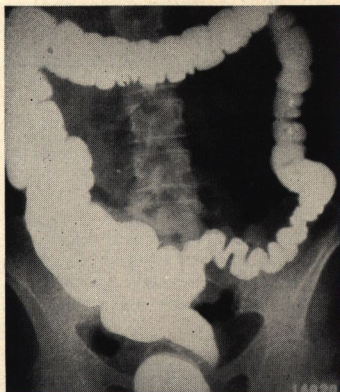


Fig. 49. Photograph of an x-ray film made with the LEICA

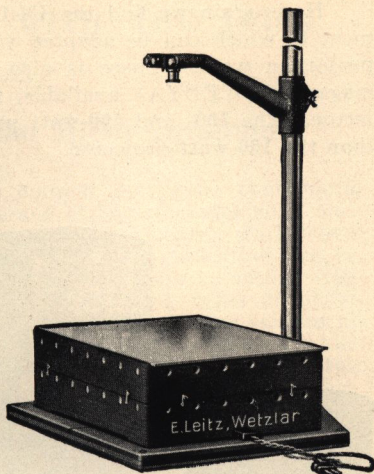


Fig. 50. LEICA x-ray Copying Attachment

PROJECTING LEICA PICTURES

LEICA negatives can be easily printed onto positive film strips as well as onto the 2 x 2 inch LEICA glass plate for projection. Still another method of preparing LEICA negatives for projection is by enlarging them in the VALOY Enlarger directly onto the standard 3 1/4 x 4 inch glass plates. However, it will be found that there is practically no difference between the quality of the 2 x 2 inch LEICA slide and the 3 1/4 x 4 inch standard slide. The LEICA slide has the additional advantage of being smaller and much lighter. In fact it is much less liable to breakage. The LEICA film slides have the tremendous advantage of being made at a very low cost. Study and lecture film and glass slides can be easily prepared in your own laboratory or darkroom.

The UDIMO Projector is one of the most universal types of projection equipment available in the miniature camera field. This projector will accommodate single frame, LEICA double frame, 3 x 4cm (half-vest pocket size), and 4 x 4cm negatives or positives for projection. Film slides as well as glass slides are readily interchangeable. An automatic film slide turning device prevents any possibility of scratching. The LEICA interchangeable lenses can be used as well as special projection lenses with the appropriate condensers. This projector is available with 100-, 300- and 500-watt projection bulbs. When necessary, the entire film or glass slide mount can be turned for projecting vertical or horizontal pictures.

Here again we find the UDIMO Projector a single unit attachment to which can be adapted various attachments for all types of projection work. There is also an automatic glass slide changing magazine (WEDYA) available, for use with the UDIMO 100 projector. The 300- and 500-watt projectors have larger lamp-housings than the 100-watt projector.

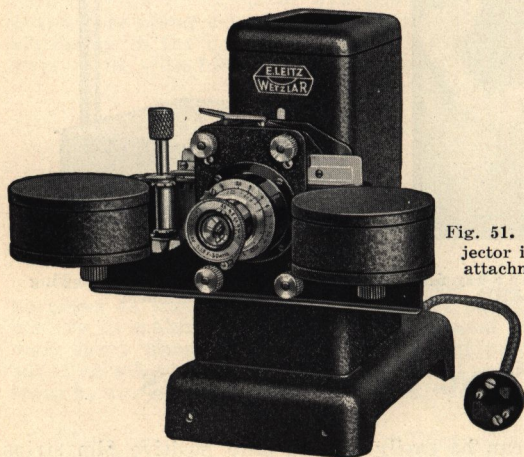


Fig. 51. UDIMO 100 Projector including film slide attachment



Fig. 52. UDIMO 300 Projector shown without film or glass slide attachment

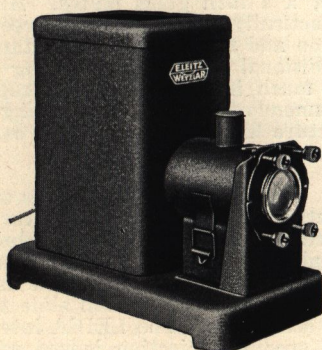


Fig. 53. UDIMO 500 Projector shown without film or glass slide attachment

PHOTOMICROGRAPHY WITH THE LEICA

LEICA Versus Professional Micro Equipment

Many microscopists are of the opinion that good photomicrographic work requires very expensive and elaborate equipment. Naturally it is true that for very finest results in research work where crispness, good definition, and extremely high magnification are required, it is essential to have an elaborate and expensive outfit. Generally it is not fully realized that there are many types of photomicrographic work which can be done with much simpler equipment. In addition to this there are certain cases in photomicrography which make a smaller equipment, such as the LEICA offers, absolutely imperative.

In many types of photomicrography a very crisp definition and extremely high magnification is not necessary. It is often desirable to photograph living objects under the microscope and in these cases extremely short exposures are necessary because the object moves so quickly within the field of view. Such work is encountered by biologists, bacteriologists, chemists and many other users of microscopes. It is evident that short exposures are possible only if great light concentration prevails in the plane of the negative. Right here the LEICA Camera can offer an excellent advantage because of the small negative area which will give the best opportunity for light concentration.

The LEICA negative is comparatively small. In fact it has only 1/25th the area of a 5 x 7 inch plate. Naturally if the light intensity is concentrated on this small area it is 25 times higher.

When using the LEICA for photomicrography the regular objective of the camera can be removed, while the body of the camera which holds the film can be adapted to the Micro Ibsso Attachment (No. 58,310), or the Sliding Focusing Copy Attachment (No. 57,600). The camera objective is replaced by the objective and eyepiece of the microscope, making these two optical units responsible for the excellent quality of the results obtained. However, the LEICA lens is not removed from the camera when using the micro adapter (No. 58,300).

Summarizing the advantages of the LEICA Camera for general photomicrographic work we can state the following:

1. The LEICA is practically indispensable where moving objects are to be photographed through the microscope. This will find practical application in the photography of plancton life (small animals in the water of ponds, etc.).
2. Other applications include the photographing of living bacteria, amoeba, and other single and multiple cell organisms.

3. Photomicrography of the blood circulation through the capillaries.
4. For recording any special operation under the microscope, such as micro dissecting and micro manipulating.
5. The fact that the LEICA Camera will hold about 36 exposures at one loading is a distinct advantage in photomicrography. As we mention later it is quite difficult to judge the correct exposure without previous experience. However, with a generous film capacity available, one can snap various photos of the same object and change the time of exposures for each picture. Upon developing the film one will always find plenty of negatives which give excellent printable results.

List of Equipment Available for Leica Photomicrography

1. Micro Adapter Ring (No. 58,300) for holding the LEICA directly over the microscope eyepiece with the LEICA lens set at infinity. (See Pages 46 and 47 for additional information and directions.)
2. Sliding Focusing Copy Attachment (No. 57,600). See Pages 18 to 20 and 48 for additional information and directions.)
3. Micro Iiso Attachment (No. 58,310) for use with the LEICA Camera. (See Pages 49 to 51 for additional information.)

Leica Photomicrography With the Micro Adapter

When low and medium magnification is desired, the Micro Adapter Ring can be used for attaching the LEICA Camera directly to the tube of a microscope. The focusing and method of using the LEICA with this adapter ring is extremely simple. When setting up the equipment, proceed as follows:

1. Place special clamping ring (No. 33375) around the extension tube of the microscope in order to prevent its collapsing when the camera is set into position. A rubber ring which is furnished with the Iiso Attachment can also be used for this same purpose.
2. After placing the specimen under the microscope the observer should look through the eyepiece and bring the desired section into sharp focus to the eye. The point where the specimen is in sharp focus to the eye is usually considered to be at infinity, or in other words, the rays coming from one point of the specimen leave the microscope eyepiece as a parallel bundle of rays. Consequently, if we replace the human eye with an artificial eye, such

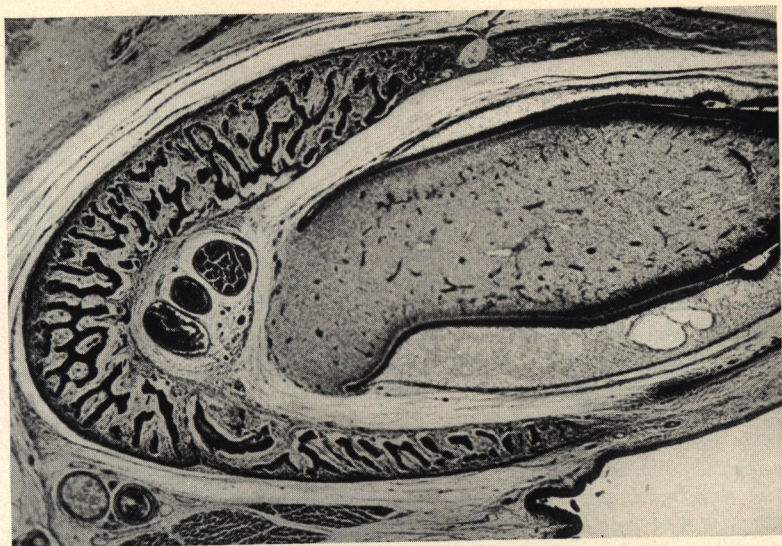


Fig. 54. LEICA photomicrograph of tooth development

as the lens of the LEICA, it is essential to have the camera lens set at infinity in order to record the image in exact focus. Note that an observer who wears glasses in order to correct an optical defect of his eye must wear his glasses while focusing the microscope.

3. After correct focus has been secured with the microscope, place the LEICA Camera lens at infinity and clamp into position by tightening the micro adapter set screw around the LEICA lens mount.
4. Attach the wire release to the LEICA shutter for use when making the exposures.
5. It is advisable to select an eyepiece of comparatively high magnification, such as the 12 x ocular in order to cover the complete LEICA area. The distance from the eyepiece to the film plane of the camera is so short that even when using the 8 x or 10 x eyepieces, only a part of the negative frame will be covered.
6. If a side viewing eyepiece is available on the microscope, the LEICA Camera can be left in position for making successive exposures of different specimens. Otherwise, it will be necessary to remove the camera and focus directly each time.

Photomicrography With the Sliding Focusing Copy Attachment

Excellent photomicrographs can be made with the Sliding Focusing Copy Attachment in connection with extension arm, base board and vertical upright of the VALOY Enlarger. Only the LEICA Cameras with interchangeable lenses can be used with this attachment. In this case the microscope with the regular objective eyepiece is placed below the 6cm extension tube of the focusing copy attachment. Note that the LEICA lens is not used. Instead the extension tube overlaps the microscope eyepiece. A piece of black light-proof cloth should be wrapped around the lower end of the 6cm extension tube in order to create a light-proof connection between the copying attachment and microscope. In addition to the 6cm extension tube it is possible to use a 3cm or the 9cm tube. These extension tubes may be compared to the bellows of the usual photomicrographic camera. The longer the intermediate tube, the higher the magnification will be on the ground glass of the focusing attachment. Naturally there is a certain limit beyond which it is not advisable to increase this projection distance. However, satisfactory results can be obtained even if the three tubes are used together.

The method of using the focusing copy attachment for photomicrography is extremely simple. Proceed as follows:

1. Place the specimen in position, adjust the illumination, select the color filter required and set the camera and the Focusing Copy Attachment in position over the eyepiece of the microscope.
2. Attach the wire release to the LEICA Camera.
3. Focus the specimen sharply on the ground glass of the copy attachment. The viewing magnifier (No. 57,630) should be used to obtain critical focus.
4. After accurate focus has been secured, simply slide the camera into position directly over the microscope and make the exposure.
5. When the focal plane shutter of the LEICA Camera is released, there is no danger of a lateral vibration because the camera is rigidly held in the focusing attachment which is not directly connected with the microscope. This fact is of great importance when working at higher magnifications.
6. Complete information about setting up and using the Focusing Copy Attachment will be found on Pages 18 to 20.

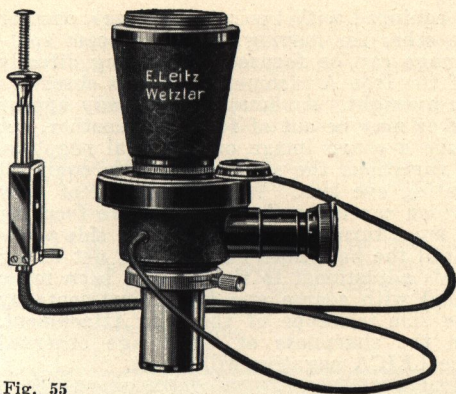


Fig. 55

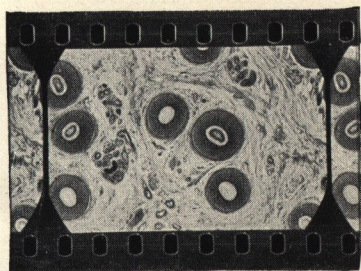


Fig. 56

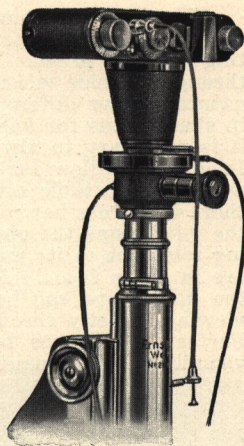


Fig. 57

Fig. 55. Micro Ibso Attachment No. 58,310 for use with LEICA Camera and microscope

Fig. 56. Actual size photograph made with Micro Ibso Attachment

Fig. 57. Micro Ibso Attachment with LEICA attached shown in Actual use on the microscope

The Leica Micro Ibso Attachment

The Micro Ibso Attachment can be used with the Model C, D, E or F LEICA. In other words the Ibso Attachment is to be used with the interchangeable lens models. The lens is removed from the LEICA Camera and in its place the Ibso Attachment shown in the accompanying illustration is attached. The regular eyepiece of the microscope is removed because there is already a 10x eyepiece attached in the Ibso Attachment.

The image to be seen through the microscope is circular, while the size of the LEICA negative is rectangular. It is possible to select a lower power eyepiece which will show the entire circular field on the LEICA negative. Such an eyepiece would not give any great advantage because the outer part of the field, due to unavoidable curvature of the field seen through the microscope, will always be slightly out of focus and practical experiments have shown that the 10x eyepiece is the most satisfactory.

The Ibso Attachment is equipped with two wire releases, one for the Compur shutter and the other for moving aside the beam splitting viewing prism. The image can be focused by viewing directly through the side telescope of the Ibso Attachment. Various observers naturally have differences in eyesight. An image which may appear in sharp focus for one observer may be out of focus for another, yet it is necessary to always have a sharp image on the final negative. In order to allow for these variations the side telescope is equipped with an adjustable compensating eye lens. Within the field of view there is a cross net ruling which can be easily seen. Before focusing the microscope the observer must turn the eye lens of the side viewing telescope in its mount until the hair lines of the cross net ruling are in sharp focus. After this adjustment to the eye has been made the microscope can be focused with coarse and fine adjustments by viewing directly through the side telescope of the Ibso Attachment. Perfect coincidence between the sharpness of the image observed visually and the image on the LEICA negative will result.

It is essential to know that for photomicrography only the Compur shutter of the Ibso attachment should be used. The curtains of the focal plane shutter in the LEICA would create a lateral momentum which may show its effect as vibrations on the final negative. In making photomicrographs with the Ibso Attachment it is necessary to proceed as follows:

1. After removing LEICA lens, replace with Ibso Attachment.
2. Place special clamping ring (No. 33375) around the extension tube of the microscope in order to prevent its collapsing when the camera is set into position. A rubber ring which is furnished with the Ibso Attachment can also be used for this same purpose.
3. Remove microscope eyepiece and place the LEICA with Ibso Attachment in position as shown in the accompanying illustration.
4. Attach the wire release with set screw to the release knob of the LEICA Camera. Set the LEICA shutter for time exposures.
5. Make the proper adjustments for accommodating the side viewing eye lens to the eye of the observer.
6. Focus directly on the image with the microscope by viewing through the side telescope.
7. Press the wire release button on the LEICA Camera down and clamp into position with the set screw. The shutter will now remain open.
8. If desired the beam splitting prism can be pushed aside in order to reduce the exposure time by approximately 50%.
9. It is possible to use the automatic release attachment No. 58,320 for operating the Compur shutter and also the beam splitting prism at the same time.

10. When image is in correct focus release the Compur shutter of the Ibso Attachment which has been previously set at the estimated exposure time.
11. Close the focal plane shutter by releasing the set screw on the wire release and wind to the next film.
12. Open the focal plane shutter in the LEICA Camera as previously described and repeat the same procedure in the next picture.
13. If the ocular attached to the Ibso Attachment is to be replaced, it is quite easy to unscrew the aluminum ring at the base of the Compur shutter. This ocular is of a standard type and can be replaced by another one of different magnification.

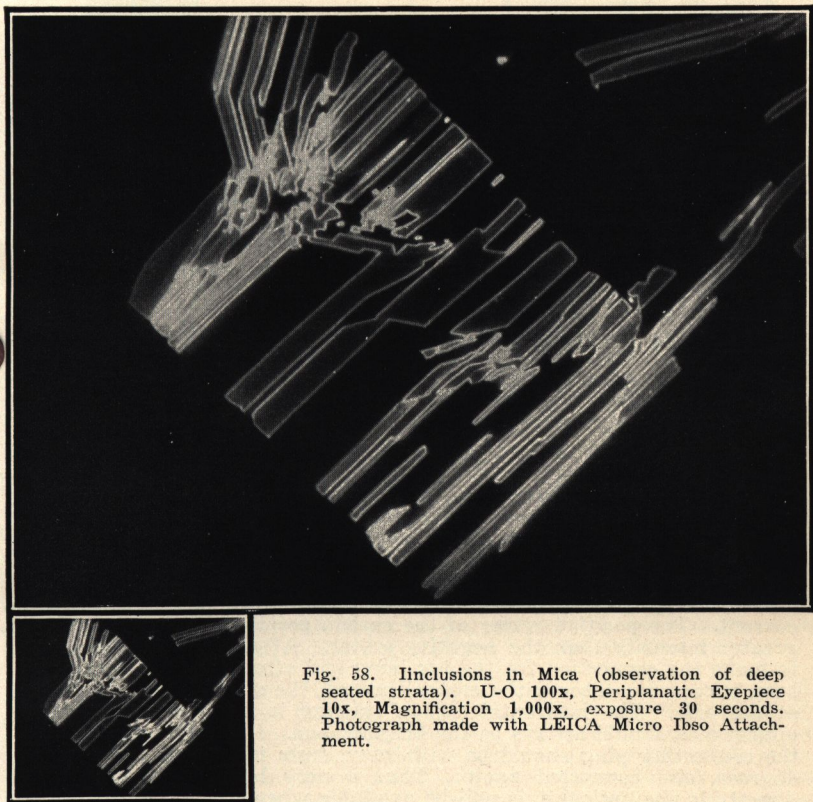


Fig. 58. Inclusions in Mica (observation of deep seated strata). U-O 100x, Periplanatic Eyepiece 10x, Magnification 1,000x, exposure 30 seconds. Photograph made with LEICA Micro Ibso Attachment.

Light Sources for Photomicrography

Ordinary Desk Lamps—For general work or for amateur photomicrography and ordinary desk lamp with an inside frosted 60-watt bulb can be used. This lamp should be placed approximately eight inches away from the mirror of the microscope base. If the field of view through the microscope is not evenly illuminated a ground glass may be inserted below the condenser. This type of lamp will be satisfactory for photographing permanent objects which permit a longer exposure. This type of light is not powerful enough to enable the user to take instantaneous photographs at higher magnifications. The light cannot be used at all for darkfield work or with the Leitz Ultropak illuminator.

Low Voltage Lamp—The Leitz low voltage lamp (Monla) listed in Pamphlet No. 7063 may be considered as the most ideal source of light for photomicrography with the LEICA Camera. This lamp has a concentrated filament of very high intensity and a condenser system to make the light parallel for photography in transmitted light or slightly convergent when using a vertical illuminator. The lamp operates on a circuit of only 6 volts but requires a current of 5 amperes to give a total wattage of 30. If we would make a similar lamp for 110-volts we would again require a current of 5 amperes giving a total wattage of 550. Yet this 550-watt lamp would not yield more light for photomicrography than the 30-watt bulb because the differences between the two would simply be that one filament is approximately 18 times longer than that of the other and therefore covering an area 18 times as great. Since we only deal with very small surfaces in microscopy, the short concentrated filament of the low voltage lamp is fully sufficient and the excessively long filament of a 550-watt lamp would be mostly wasted. This condition explains why efficient microscope lamps always require low voltage and consequently a special rheostat or transformer.

Arc Lights—Arc lamps are still more powerful than low voltage lamps and wherever maximum intensity is required the arc lamp is to be preferred. These arc lights are also used with a rheostat. Arc lamps are equipped with focusing condenser systems, clock-work feeding mechanism for the carbons, or the usual hand adjustments can be made. If possible an arc lamp should always be used with direct current. The positive crater at the carbon points will always emit a greater intensity than the negative crater. After inserting the plug to make the connection for the arc lamp and after the lamp itself has been turned on, observe the crater through the smoked glass window at the side. The horizontal carbon running in the direction of the optical axis should always be the brighter one. If this is not the case the connecting plug should be withdrawn from its socket, turned 180 degrees, and connected again. Thus a very brilliant light source directly in the optical axis will be available when using the arc lamp.

If alternating current is used, both craters are equally bright, but the total intensity of the illumination will not be as great as that of the positive carbon with direct current. By increasing the amperage this deficiency can be counteracted to a certain extent. When using an arc lamp with the alternating current, the rheostat should permit at least 8 amperes to pass through.

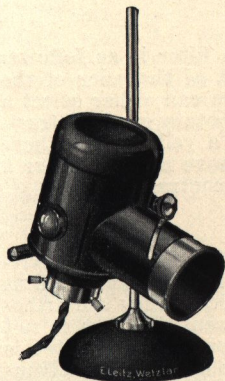


Fig. 59. Leitz low voltage Lamp Monla

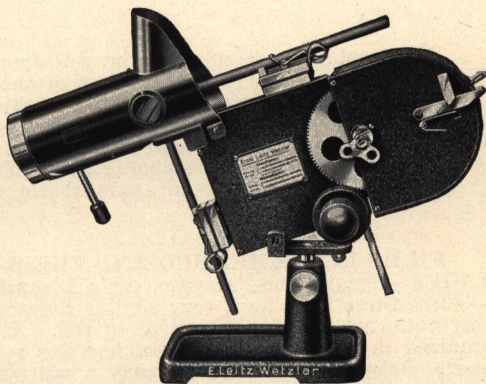


Fig. 60. Leitz Arc Lamp

The Use of Correction Filters for Photomicrography

Naturally in this booklet we cannot go into complete detail about the use of the principal light filters. It is usually only important to know that light filters can be used successfully to increase the contrast of photographs made through the microscope. A booklet issued by the Eastman Kodak Company, entitled "Photomicrography" gives explicit information about the range of transmission for the various filters. However, the most satisfactory procedure in selecting the correct light filter will be to observe the specimen through the microscope when holding the various filters in the path of light rays and to then determine when the rendition of contrast is most satisfactory.

In general it may be stated that a green filter is most advantageous. Usually the majority of the stains which are being used for the preparation of microscopic specimens are more or less reddish or range from blue to violet. In the spectrum of the light the green color is somewhat in-between and somewhat closer to the blue than to the red end of the spectrum. The green filter will absorb most of

the red light and slightly less of the blue light so that a good differentiation between the two colors can be obtained when using a green filter. In connection with this question it must also be mentioned that the objectives have their best correction for green light. Consequently the quality of the image will be improved. For the sake of obtaining the very best definition theoretically possible with the microscope, a blue or violet filter will be more advantageous. However, other reasons eliminate the use of such filter for general purposes.

The most general rule for the selection of a filter is as follows: The filter should always absorb most of the light of the color of the object. If for instance we have a green object we can either select a blue filter or a red filter. In both cases we will obtain good contrast. If we have a yellow object and if we would take a yellow filter there would be no contrast in the photograph. If we have a dark red or a greenish blue filter we would again obtain good contrast.

FILMS RECOMMENDED AND THEIR PARTICULAR ADVANTAGES—Perutz Neo-Persenso, Agfa Plenachrome and Gevaert Films—These three films have very similar characteristics. They are orthochromatic and are not sensitive to red. A red sensitive film is not required in photomicrography unless for some reason a red filter is used. Only in very few cases may a red filter be of sufficient advantage because it has the one distinct disadvantage that it is most unfavorable for securing really sharp definition. For general purposes the three orthochromatic films mentioned will be satisfactory. They have the additional advantage of permitting development by red light, yield an extremely fine grain and good contrast which is quite important in photomicrography, especially if the negative is to be enlarged.

Complete information about films and their development may be found in our Developing Booklet No. 1192 (price 25c).

The Panchromatic Films

Wherever the greatest speed and light sensitiveness is required, the faster panchromatic films, such as DuPont Superior, Eastman Supersensitive and Agfa Superpan may be used. When photographing living objects or any other specimens which require instantaneous exposure and especially when specimens are illuminated directly by either Darkfield or Ultropak, it is necessary to use a film of the highest speed possible. The DuPont Superior panchromatic film when developed in Paraphenylene-Diamine or some other extremely fine grain developer, possibly yields finer grain than any other of the films and therefore it may be preferred. Its speed is also excellent, although it is not quite as red sensitive as the other two films which makes it really more of an advantage than a disadvantage because of the better balance for color correction.

Dupont micropan film—This film has a speed similar to the ordinary orthochromatic film of approximately 17 degrees Scheiner. Therefore it may require a somewhat longer exposure. Its panchromatism as mentioned before is of no special advantage for most of the photomicrographic work. However, this film has a very fine grain and yields a strong contrast which makes it of special value for photomicrography with the LEICA Camera.

To obtain pictures of the contrast usually desired in portrait and pictorial work this film should be developed for about one-third of the time that would be used with regular panchromatic negative, or a softer, slower acting developer used. For most users the control of the time factor is simpler than using a special formula, so stagnant development from 3 to 4 minutes at 68°F. in the following formula, is suggested.

Sulphite	75 grams	Hydroquinone	3 grams
Rhodol	2.5 grams	Borax	5 grams
Water to	1 liter		

For less contrast, the developer may be diluted or the time reduced. For greater contrast, increased development time is required.



Fig. 61. LEICA photomicrograph showing nerve cell of spinal cord



Fig. 62. LEICA photomicrograph showing section of human testicle

PHOTOGRAPHY OF OPAQUE OBJECTS WITH THE ULTROPAK MICROSCOPE

The Leitz Ultropak Illuminator sends the light onto the specimen through a condenser which surrounds the objective and renders this light highly oblique. This illuminator if used for visual observation is equipped with a small bulb for 8 volts and 0.6 ampere, together with a very powerful condenser system. The light is satisfactory for visual observation but must be greatly increased for most purposes of photomicrography. Therefore, we supply for the Ultropak a special lens system mounted to a metal funnel which will concentrate the light coming from an arc lamp or the low voltage lamp and produce a much more powerful illumination of the specimen. Many objects cannot be too strongly illuminated for any unnecessarily long period because there is danger in destroying the specimen by excessive heat. In order to avoid this a special illuminating changing device is provided. This item consists of a small T shaped tube. At one end it is connected to the Ultropak, at the other end the funnel with a special illumination lens is attached. At the third end the light system for visual observation can be adapted.

In the course of rays there is a mirror inclined 45 degrees toward the optical axis. This mirror is on a swing-out arm. It is so arranged that when making visual observations it reflects light from the small bulb onto the specimen. By means of a wire release it can be swung out of the course of rays to permit the light from a powerful source to reach the specimen.

Complete information about the Leitz Ultropak may be secured from the special literature available. When using the Ultropak Illuminator, it is advisable to select a microscope stand with an object stage which is adjustable in height. If the strong light and the illumination lens are once aligned in respect to each other, it is advisable not to move the tube up and down but do the coarse focusing with the stage. Further details of the procedure for taking photographs does not differ from that of any other type of photomicrography.

Darkfield Photography

Here again the reader is referred to the special Leitz literature which is available on the subject of darkfield microscopy. In this literature the alignment of the darkfield condenser itself is carefully explained. The most popular darkfield condensers are primarily intended for high power objectives. Special darkfield condensers are available for objectives of lower magnification and long working distance. The procedure of focusing and taking the photograph is similar to any other photomicrographic work. For darkfield photography it is advisable to use the most powerful light sources, such as the arc lamp. A filter will hardly be necessary for darkfield work.

Fig. 63. Line drawing showing the set-up of the Leitz Ultrapak Attachment which can be used so successfully for LEICA photomicrography

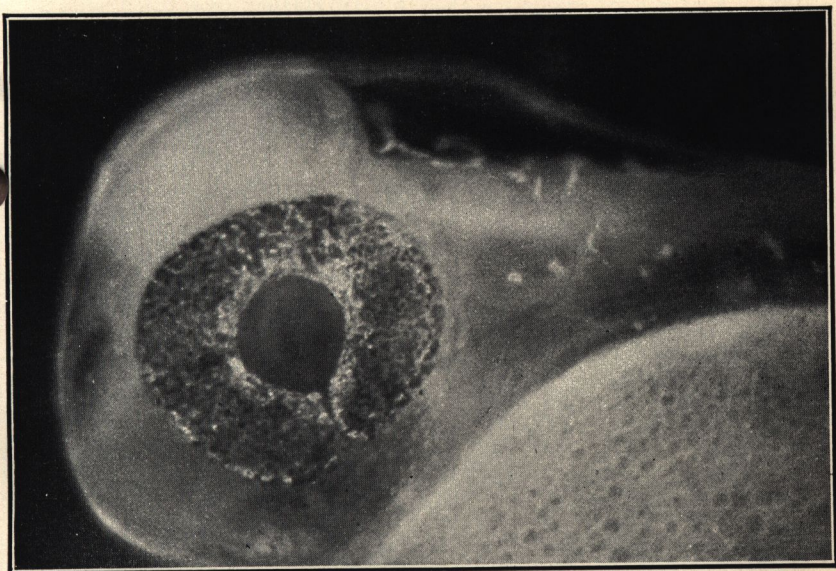
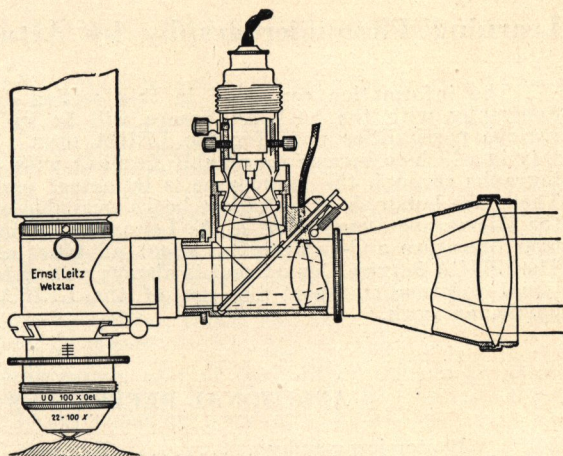


Fig 64. Head of newly hatched *Gobius niger* with yolk-sac adjoining. U-O 11 x. Periplanatic eyepiece 8 x, Magnification 88 x. Photograph from life by Prof. Becher of Giessen in the Zoological Station, Naples

Learning Photomicrography by Actual Experience

The information contained in this section devoted to photomicrography with the LEICA Camera will be sufficient to show the various possibilities open for the LEICA user. Naturally the best way in which to become thoroughly familiar with the making of photographs through the microscope is by actual use of the equipment. There are hundreds of reference books available on the subject; also the Microscope Department of E. Leitz, Inc., is in a position to furnish literature and information about all types of micro equipment. The LEICA Service Department is always willing to furnish any additional information about the use of the LEICA Camera for any particular work.

ADDITIONAL REFERENCES

Photomicrography Eastman Kodak Co.
Wratten Light Filters Eastman Kodak Co.
The Microscope by S. H. Gage



Fig. 65. Photograph taken by E. M. Spieker to show the use of the LEICA for Geological survey work. Fault in tertiary beds, Central Utah. The fault crosses the outcrop diagonally upward from the base of the rod to the left

LEICA FOR GEOLOGICAL WORK

One of the most interesting applications of the LEICA Camera has been in the geological field. This type of work covers the use of the LEICA for photomicrography as well as for use on expeditions when it is necessary to make hundreds or even thousands of negatives for later study and record purposes. On the Byrd Antarctic Expedition, Lawrence M. Gould used his LEICA constantly for recording all the geological photographs which he made. Still another enthusiastic user of the LEICA Camera is Prof. Ellis C. Persing, School of Education, Western Reserve University, Cleveland, Ohio. Mr. Persing has used his LEICA Camera on exploration trips through the Western States where he has secured interesting negatives for illustrating his magazine articles, books, and also for use in his own classroom for teaching purposes.

Still another enthusiastic user of the LEICA Camera is Albert Johannsen, Prof. of Petrology at the University of Chicago. Prof. Johannsen has this to say about his work with the LEICA.

"Recently I have been using the LEICA Camera for taking photomicrographs of rock-sections, and many of the illustrations in my 'Descriptive Petrography of the Igneous Rocks' are enlargements of LEICA negatives. I find that I can not only take the photomicrographs much more quickly with a LEICA Camera than with a larger instrument, but that the resulting photographs are uniformly better, being invariably in sharp focus.

"I have also used the camera for copying printed matter and find the small negatives much more satisfactory, for my purpose, than photostat copies."

Very truly yours, Albert Johannsen.

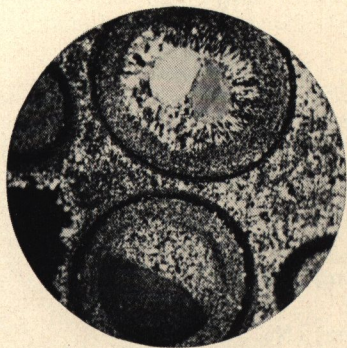


Fig. 66. LEICA photomicrograph showing Oolitic texture in siliceous colite. Center County, Pa.

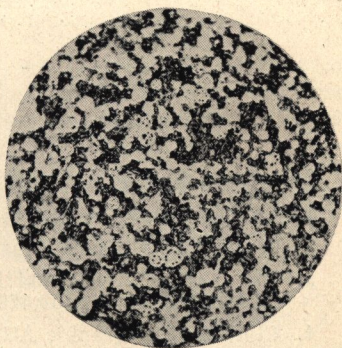


Fig. 67. Clathrate texture in leucitite (28x) Capo di Bove, near Rome

Photos by Dr. Albert Johannsen

LEICA FOR CLINICAL PHOTOGRAPHY

During surgical operations it is often desirable to obtain a continuous series of close-up photographs without the interruption of the surgeon and his workers. For this purpose a special clinical photographic equipment (No. 58,500) has been designed for use with the LEICA Camera.

In addition to using this equipment for surgical photography it is possible to photograph all types of close-up subjects which may require a similar apparatus. For example, photographs could be made by the dentist or possibly there would be a special demand for making many close-up photographs during some manufacturing or inspection process where it is necessary to have a photographic equipment which is easily portable. A tripod is not necessary to use with the clinical attachment. The entire equipment including the illuminating lamps can be supported by means of a strap which fits around the body of the photographer.

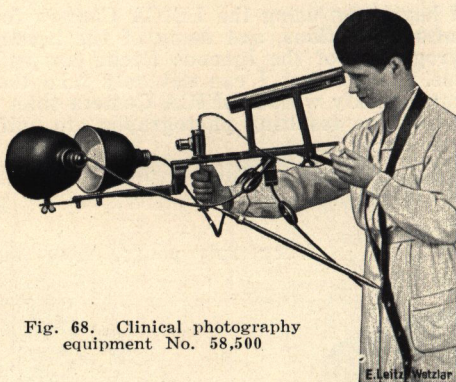


Fig. 68. Clinical photography equipment No. 58,500

This Leica clinical equipment consists of the following parts:

1. LEICA Camera with wire release.
2. 50mm f:3.5 ELMAR Lens.
3. No. 1 (No. 57,730) and No. 2 (57,740) Front Lenses for ELMAR Lens (No. 50,320).
4. Clinical Photographic Attachment (No. 58,500).

The HEKTOR f:2.5 50mm lens is not recommended for use with this attachment because it is necessary to use this lens at the f:6.3 or f:9 diaphragm stops when using the Front Lenses.

The accompanying illustration (No. 68) will give an excellent idea about the appearance of this special clinical equipment when in actual use. The illumination is secured from two 500-watt lamps with aluminum reflectors attached to the front end of the fork. These lamps can be turned in any direction in order to secure the most favorable lighting effect. It is also possible to use Photoflood bulbs if desired.

In order to secure sharp focus and also for the convenience of sighting the object for direct alignment with the field to be included in the photograph, there is a special telescopic finder. This finder is fixed to the frame and is set at an angle so that its optical axis meets the axis of the LEICA lens exactly at the point where sharp definition is secured on the subject to be photographed.

The LEICA Camera can be moved back and forth in the frame in order to secure exact focus upon different sized areas to be photographed. In this way the point seen through the focusing finder remains fixed. As the camera is moved back and forth this same point is always in sharp focus. The only difference is that the areas covered vary between $5\frac{1}{2} \times 8\frac{1}{2}$ inches to $11\frac{1}{2} \times 17\frac{3}{4}$ inches, depending upon the position of the camera and the particular front lens used. After the camera has been set for covering the desired area it is quite easy to make the photographs in continual succession.

The telescopic finder does not cover the various fields. However, this finder serves the purpose of sharply defining the center of the photographic field. In this way the telescopic finder is pointed at the most important point to be photographed. The additional area covered can be easily estimated.

This clinical equipment is designed for photographing at distances ranging from 16 to $28\frac{3}{4}$ inches. These distances are measured from the back of the camera to the subject photographed. Front Lenses No. 1 and No. 2 are required.

Booklet No. 7298 gives complete directions for assembling and operating this clinical photographing equipment. This booklet also includes depth of focus table, and also a table showing the areas covered at various distances, including the portion of reduction for each distance.

In addition to using the LEICA for surgical operations, it is naturally possible to use this same equipment for all general purposes of photography. For example, patients can be photographed before, during, and after treatment in order to keep valuable clinical records for later reference.

LEICA PRICE LIST

CAMERAS

Cat. No. and Code Word		Price
50,000 LYDRO	LEICA AUTOFOCAL CAMERA MODEL F , complete with focal plane shutter with speeds from 1 to 1/500th second, built-in focusing range finder, special 1½ X magnifying eye-piece for range finder, eyelets for special strap, supplied with camera, 10 inch cable release, and one film magazine, without lens or case	\$94.50
50,015 LYSUM	LEICA AUTOFOCAL CAMERA MODEL F , same as No. 50,000 but with SUMMAR 50mm focus f:2 lens.....	204.00
50,020 LYMAR	LEICA AUTOFOCAL CAMERA MODEL F , same as No. 50,000 but with ELMAR 50mm focus f:3.5 lens.....	144.00
50,030 LYNOL	LEICA AUTOFOCAL CAMERA MODEL D , with focal plane shutter with speeds from 1/20 to 1/500th second, built-in range finder, coupling for automatic focusing, 10 in. wire cable release, one film magazine, without lens or case	73.50
50,040 LYKUP	LEICA AUTOFOCAL CAMERA MODEL D , same as No. 50,030, but with ELMAR 50mm focus f:3.5 lens.....	123.00
50,050 LYSTA	LEICA CAMERA MODEL E (Standard), complete with focal plane shutter with speeds from 1/20th to 1/500th second, special horizontal detachable range finder, ELMAR 50mm focus, f:3.5 lens, and one film magazine, without case	88.50
50,070 LOOMY	LEICA AUTOFOCAL CAMERA MODEL FF , accommodating large film capacity (250 exposures). Magazines hold 33 feet of standard 35mm cinema film. This camera is particularly well adapted for aerial, copy and other types of photography where a greater film capacity is a convenience. Aside from the larger film capacity, this model is identical to the model F LEICA (50,000). Complete, with focal plane shutter with speeds from 1 to 1/500th second, built-in focusing range finder, special 1½ X magnifying eye-piece for range finder, 10 inch cable release, and two special 33 ft. capacity film magazines (a magazine is used at both ends of this camera, making rewinding unnecessary), without lens or case .	178.50
50,080 LOOYE	LEICA AUTOFOCAL CAMERA MODEL FF , same as No. 50,070, but with ELMAR 50mm focus, f:3.5 lens...	228.00
50,110 OLIGO	NOTE: LEICA Cameras are not supplied without lenses. SINGLE EXPOSURE LEICA CAMERA , for testing and similar purposes of a special nature where only one exposure is required. The camera consists of a round metal body into which the standard LEICA lens is screwed. Special metal film holders are used which accommodate standard 35mm motion picture film in strips 1½ inch long. A special IBSOR shutter is supplied with the camera, which can be used on all LEICA lenses, and by means of which the exposures are made. A ground glass focusing screen is used for focusing the lens. It slides in and out of the rear of the camera, interchangeably with the film holder. This camera is in effect a miniature view camera. A view finder may be attached to the camera body if desired, provision having been made for such accommodation. The camera complete consisting of camera body, ground glass focusing screen, one metal film holder, and IBSOR shutter which can be used on all LEICA lenses, but without lens	\$34.50

LEICA LENSES

Cat. No. and Code Word		Price
50,300 EKURZ- KUP	LEITZ Anastigmat ELMAR , 35mm focus, f:3.5, (wide angle lens) in focusing mount.....	\$49.50
50,310 EKURZ- CHROM	LEITZ Anastigmat ELMAR , 35mm focus, f:3.5, (wide angle lens) in focusing mount, but with chrome finish	51.75
50,320 ELMAR- KUP	LEITZ Anastigmat ELMAR , 50mm focus, f:3.5, (stand-ard lens) in focusing mount.....	49.50
50,330 ELMAR- CHROM	LEITZ Anastigmat ELMAR , 50mm focus, f:3.5, (stand-ard lens) in focusing mount, but with chrome finish	51.75
50,340 HEKTOR- KUP	LEITZ Anastigmat HEKTOR , 50mm focus, f:2.5, (speed lens) in focusing mount.....	67.50
50,350 HEKTOR- CHROM	LEITZ Anastigmat HEKTOR , 50mm focus, f:2.5, (speed lens) in focusing mount, but with chrome finish	69.75
50,360 SUMUS- CHROM	LEITZ Anastigmat SUMMAR , 50mm focus, f:2, (speed lens) in collapsible mount (in chrome finish only)....	109.50
50,370 HEKON- KUP	LEITZ Anastigmat HEKTOR , 73mm focus, f:1.9, (ultra speed lens) in focusing mount, including special sun-shade	157.50
50,380 HEKON- CHROM	LEITZ Anastigmat HEKTOR , 73mm focus, f:1.9, (ultra speed lens) in focusing mount, including special sun-shade, but with chrome finish	159.00
50,390 HEGRA- CHROM	LEITZ Anastigmat HEKTOR , 73mm focus, f:1.9, (ultra speed lens) in special spiral focusing mount which does not require rotation of lens when being focused (in chrome finish only)	159.00
50,400 ELANG- KUP	LEITZ Anastigmat ELMAR , 90mm focus, f:4, (medium telephoto lens) in focusing mount.....	76.50
50,410 ELANG- CHROM	LEITZ Anastigmat ELMAR , 90mm focus, f:4, (medium telephoto lens) in focusing mount, but with chrome finish	78.00
50,420 ELZEN- KUP	LEITZ Anastigmat ELMAR , 105mm focus, f:6.3, (light telephoto lens) in focusing mount, including special sunshade	57.00
50,430 ELZEN- CHROM	LEITZ Anastigmat ELMAR , 105mm focus, f:6.3, (light telephoto lens) in focusing mount, including special sunshade, but with chrome finish	58.50
50,440 EFERN- KUP	LEITZ Anastigmat ELMAR , 135mm, f:4.5, (full tele-photo lens) in focusing mount.....	82.50
50,450 EFERN- CHROM	LEITZ Anastigmat ELMAR , 135mm, f:4.5, (full tele-photo lens) in focusing mount, but with chrome finish	84.00
50,460 HEFAR- CHROM	LEITZ Anastigmat HEKTOR , 135mm focus, f:4.5, (full telephoto lens) embodying the HEKTOR optical principles in a telephoto lens, yielding exceptional results, in focusing mount (in chrome finish only).....	102.00

LEICA FILTERS

51,020 FIHEL	Yellow Filter O , (very light).....	4.50
51,030 FIGRO	Yellow Filter I , (light).....	4.50

Cat. No. and Code Word		Price
51,040 FIGAM	Yellow Filter II, (medium)	\$4.50
51,050 FIGEK	Yellow Filter III, (dark)	4.50
51,060 FIRAD	Graduated Sky Filter	7.20
51,070 FIOLA	U.V. (ultra violet) Protection Filter, two times factor.	4.95
51,090 FIKYB	Infra Red Filter	6.00

CAMERA ACCESSORIES

51,500 LEDQA	WESTON LEICAMETER MODEL B , improved type with double sensitiveness, calibrated especially for the LEICA Camera, but may also be used for all other cameras. Metal calculator disk gives correct readings for the greatest range of light intensities. Complete with soft cord, leather "zipper" protective case, and instruction booklet	27.75
51,520 LEDYD	LEICASCOP (extinction type) Exposure Meter , calibrated for LEICA Camera.....	6.75
51,530 VIDOM	VIDOM Universal View Finder , with adjustable masking aperture and parallax adjustment, for use with all LEICA Cameras and lenses.....	21.75
51,560 AUFSSU	Reflecting View Finder for LEICA Camera.....	9.00
51,600 WEISU	Special View Finder for wide angle 35mm ELMAR lens to be inserted in clip on top of LEICA Camera.....	7.20
51,610 SUWOO	Special View Finder for 50mm lens, for use on single exposure LEICA Camera No. 50,110.....	6.00
51,755 IBSOR	IBSOR SHUTTER , for use on camera lenses when focal plane shutter is not to be used. This shutter is supplied with the OLIGO Single Exposure Camera, but will be found useful in certain work when used in conjunction with the regular models of LEICA Cameras..	22.50
51,760 FISON	Lens Sunshade , metal, designed for all 50mm LEICA lenses but may be used on all LEICA lenses excepting HEKTOR 73mm, f:1.9 and ELMAR 105mm, f:6.3 lenses.	.90
51,790 FIKUS	Lens Sunshade , metal, adjustable to absolutely protect all LEICA lenses excepting HEKTOR 73mm, f:1.9 and ELMAR 105mm, f:6.3 lenses. Barrel is calibrated for the various focal length lenses and may be adjusted accordingly	4.95
51,810 VACUB	LEICA Synchronized Photoflash Unit , complete, with upright pillar (which accommodates batteries) with lug which fits into clip in all LEICA Cameras, set of batteries, receptacle for miniature testing lamp and standard Photoflash lamp, electrical connection for shutter release button, and folding metal reflector....	6.00
51,820 FIBLA	Spirit Level (fits into clip on all LEICA Cameras).....	2.10
51,840 FIDRI	Wire Cable Release , 10 ft. long, for LEICA Cameras with focal plane shutter.....	3.30
51,850 FISEX	Wire Cable Release , 20 ft. long, for LEICA Cameras with focal plane shutter.....	4.05
51,870 NATRA	LEICA Negative Viewer and Marker , with polished metal film channel, film-notching punch, and magnifying lens. Permits negatives to be seen clearly, distinctly and greatly enlarged so that detail in each is	

		Price
	quickly noted without the necessity of placing in enlarger	\$13.50
51,890 FILCA	Spare Roll Film Magazine for LEICA Camera (all models)	2.70
51,920 KO0BF	Spare Roll Film Magazine for LEICA Camera Model FF No. 50,070. Accommodates rolls of 33 feet.....	0.75
51,930 K00AS	Spare Film Holder for Single Exposure LEICA Camera (No. 50,110)	5.40
51,940 ASPUL	Film Winder with spring clip for holding film while winding LEICA magazine spool.....	4.05
51,950 AGRIF	Hand Film Winder for use in loading LEICA magazine spools in darkroom.....	.60
51,960 ABLON	Film Trimming Guide , of hinged metal, used to shape and trim ends of film for loading into film magazine..	1.65
51,965 ANZOO	Film Trimming Guide , for use with film of Camera FF, No. 50,070	2.40
51,970 FIAKU	Ball Jointed Tripod Head for use when mounting LEICA Camera in any fixed position.....	3.00
51,980 FARUX	Panorama Tripod Head , calibrated both for vertical and horizontal pictures with the LEICA Camera and any of the 50mm LEICA lenses. This panorama head permits the interchange of calibration rings so that perfectly matched pictures can be made with any of the LEICA lenses. Rings for other than the 50mm lenses are sold separately.....	6.60
52,040 FIAVI	Angle Bracket for convenience in attaching and leveling LEICA Camera to panorama head.....	4.05
53,020 ESMOS	Eveready Case , for LEICA Model E and range finder FOKOS attached	8.40
53,030 ESFUS	Eveready Case , for LEICA Model F with SUMMAR 50mm, f:2, collapsible mount	9.00
53,040 ESFOO	Eveready Case , for LEICA Camera Model FF No. 50,070, cowhide, with neck-strap	10.80
53,070 ETNEU	Combination Case , brown cowhide leather, with strap handle and shoulder strap. Space for LEICA (models A, C, D, E or F), four of the LEICA lenses, universal view finder, angle view finder, three front lenses, two extra film magazines and four filters.....	18.00

LEICA FILMS

56,000 FLIXY	PERUTZ SPECIAL FINE GRAIN, ANTI-HALO ORTHOCHROMATIC FILM (approx. 18-19° Scheiner). The finest-grained film available. 36 exposures in special metal daylight loading and unloading cartridge, hermetically sealed in lead tube.....	.99
56,010 FUJMA	PERUTZ SPECIAL FINE GRAIN, ANTI-HALO ORTHOCHROMATIC FILM (approx. 18-19° Scheiner). The finest-grained film available. 30-ft. rolls.....	2.70
56,020 FLISO	PERUTZ NEO-PERSENSO ORTHOCHROMATIC FILM (approx. 22-23° Scheiner). A speedy, fine-grained film with excellent characteristics. 36 exposures in special metal daylight loading and unloading cartridge, hermetically sealed in lead tube.....	.99
56,030 FUJLO	PERUTZ NEO-PERSENSO ORTHOCHROMATIC FILM (approx. 22-23° Scheiner). A speedy, fine-grained film with excellent characteristics. 30-ft. rolls.....	2.70
56,060 FLESA	PERUTZ PEROMNIA PANCHROMATIC FILM (approx. 24-25° Scheiner). The ideal speed panchromatic film with surprisingly fine grain. 36 exposures in special metal daylight loading and unloading cartridge, hermetically sealed in lead tube.....	1.08

**Cat. No.
and Code
Word**

Price

56,070 FLEWU	PERUTZ PEROMNIA PANCHROMATIC FILM (approx. 24-25° Scheiner). The ideal speed panchromatic film with surprisingly fine grain. 30-ft. rolls.....per roll	\$3.15
56,080 FIGKA	DUPONT SUPERIOR PANCHROMATIC FILM (approx. 24° Scheiner). Daylight loading and unloading spools of 30 exposures..... per spool	.70
56,090 FUJEP	DUPONT MICROPAN PANCHROMATIC FILM (approx. 17° Scheiner). A special, fine-grained panchromatic film with excellent contrast, useful for micro and copy work, as well as general photography. Daylight loading and unloading spools of 30 exposures.... per spool	.90
56,100 FIGIX	DUPONT INFRA-D FILM (approx. 17° Scheiner). For special infra-red photography and effect work. Daylight loading and unloading spools of 30 exposures per spool	1.15
56,110 FUJDU	DUPONT POSITIVE SAFETY FILM . For film slides and film positives, also copy-work where strong contrast is desired. 100-ft. rolls.....per roll	4.00

DEVELOPING APPARATUS

56,400 FETAN	REELO All Bakelite Developing Tank, Model A (for LEICA and all other 35mm cine film up to 5½ ft. lengths), complete with tank lid, grooved reel, and special film trimming and cutting guide.....	7.25
56,490 CORUN	CORREX All Bakelite Developing Tank , complete with reel and apron.....	9.30
56,630 CORET	Tank Thermometer calibrated in Fahrenheit for use with REELO or CORREX Tank.....	1.20
56,640 FILEP	Developer , Perutz Fine-Grain Compensating, packed ten tubes per carton..... per carton	2.70

STEREO APPARATUS

57,200 VOROD	STEREOLY Attachment , for taking stereo pictures with the LEICA models D or F, in case	37.50
57,230 VOTRA	Stereo Viewer , for LEICA pictures, taken with the STEREOLY Attachments No. 57,200 or No. 57,210, without stand, in case	37.50

COPY AND REPRODUCTION APPARATUS

57,600 FULDY	Sliding Focusing Copying Attachment, Model 1 , consisting of sliding attachment which holds LEICA Camera and ground-glass focusing screen.....	24.75
57,610 FULET	Focusing Copy Attachment, Model 2 , similar to No. 57,600, but does not contain the sliding camera attachment. The ground-glass screen is manually removed to make space for the LEICA Camera. Other than the inconvenience involved, it produces the same results as No. 57,600.....	13.50
57,620 VEARM	Sliding Arm for attaching LEICA and copy attachments Nos. 57,600 and 57,610 to upright of enlarger.....	10.50
57,630 FOMAG	Magnifier with adjustable collar for Copy Attachment, models Nos. 1 and 2.....	6.60
57,635 FULOR	1.2cm Extension Tube , for use with Copy Attachment, models No. 1 and 2, and also the UDIMO projector....	2.40
57,640 UBECD	2.2cm Extension Tube , for use with Copy Attachment, models 1 and 2, and also the UDIMO Projector.....	2.40
57,650 FULFO	3cm Extension Tube , for use with Copy Attachment, models No. 1 and 2.....	2.70

**Cat. No.
and Code
Word**

Price

57,660 FULGX	6cm Extension Tube , for use with Copy Attachment, models No. 1 and 2.....	\$3.60
57,670 FULHI	9cm Extension Tube , for use with Copy Attachment, models No. 1 and 2.....	4.50
57,680 STARE	Collapsible Reproduction Stand , consisting of metal rods which assemble to form a convenient stand for the camera when copying by means of the Front Lenses. Complete, in canvas carrying case	27.75
57,690 STALI	Illuminator for reproduction stand with two 40-watt 110-volt lamps, cord and plug.....	17.40
57,700 STAF0	Illuminator for reproduction work with four 40-watt 110-volt lamps, cord and plug.....	37.50
57,730 ELPRO	Front Lens I for ELMAR 50mm lens (covers areas from 16 9/16 x 24 13/16 to 8 9/16 x 12 7/8 in.).....	5.70
57,740 ELPIK	Front Lens II for ELMAR 50mm lens (covers areas from 8 7/16 x 12 5/8 to 5 5/8 x 8 1/2 in.).....	5.70
57,750 ELPET	Front Lens III for ELMAR 50mm lens (covers areas from 4 1/4 x 6 5/16 to 3 3/8 x 5 in.).....	5.70
57,760 HEPRO	Front Lens I for HEKTOR 50mm lens (covers area same as Front Lens No. 57,730).....	5.70
57,770 HEPIK	Front Lens II for HEKTOR 50mm lens (covers area same as Front Lens No. 57,740).....	5.70
57,780 HEPET	Front Lens III for HEKTOR 50mm lens (covers area same as Front Lens No. 57,750).....	5.70
57,790 VORGI	Front Lens Reducer , for accommodating HEKTOR front lenses on SUMMAR 50mm f:2 lens No. 50,370.....	1.35
57,800 FIRGI	Adapter Ring , for attaching LEICA filters on 50mm lens when Front Lens is being used on camera lens.....	.45
57,810 BELUN	Auxiliary Reproduction Device for LEICA with interchangeable ELMAR 50mm, f:3.5 lens, for photographing small objects in natural size (1:1) consisting of an intermediate collar marked 1:1 and tripod with base-plate and clamping collar.....	12.00
57,815 BESUM	Auxiliary Reproduction Device , same as No. 57,810, but for SUMMAR 50mm, f:1.2 lens.....	12.00
57,820 BEINS	Auxiliary Reproduction Device , same as No. 57,810, but for ELMAR 35mm, f:3.5 lens.....	12.00
57,830 BEMAR	Auxiliary Reproduction Device for the LEICA Camera with interchangeable ELMAR lens, 50mm, f:3.5, for photographing small objects at a slightly reduced ratio (scale 1:1.5, 1:2, and 1:3), consisting of three different intermediate collars marked with the respective scale, with three rings and four adjustable legs.....	19.50
57,835 BESOT	Auxiliary Reproduction Device , same as No. 57,830, but for SUMMAR 50mm, f:2 lens.....	19.50
57,840 BEKUR	Auxiliary Reproduction Device , same as No. 57,830, but for ELMAR 35mm, f:3.5 lens.....	19.50
57,850 BEVOR	Setting Device for the LEICA Camera with interchangeable lenses ELMAR or HEKTOR 50mm focus in connection with supplementary front lenses Nos. 2 or 3, consisting of clamping ring with 4 adjustable legs....	9.60
57,855 BEFUS	Setting Device same as No. 57,850, but for SUMMAR 50mm, f:2 lens	9.60

**Cat. No.
and Code
Word**

Price

57,860 BESAL	Universal Focusing Arrangement which combines in itself the working possibilities of the BEMAR No. 57,830 and BEVOR No. 57,850 devices, consisting of a universal clamping ring which fits the two sets of extension legs for the BEMAR and BEVOR attachments, three intermediate extension tubes with markings 1:1.5, 1:2, and 1:3, and four auxiliary rods No. 57,880...	\$27.00
57,865 BEVIV	Universal Focusing Arrangement , same as No. 57,860 but for SUMMAR 50mm, f:2 lens.....	27.00
57,890 BELOS	Small Illuminating Lamp with 25-watt lamp for direct connection (please state voltage).....	7.95

PHOTOMICROGRAPHIC ACCESSORIES

58,300 FIROC	Micro Adapter , for attaching LEICA Camera to draw-tube of microscope.....	3.60
58,310 MIKAS	Micro Iiso Attachment for the LEICA Camera for use in taking photographs through the microscope. This attachment is equipped with an extension tube, Compur shutter, reflecting focusing magnifier, Periplan 10X eye-piece and two wire cable releases, complete in case	83.60
58,320 AUTAS	Automatic Release for Micro IBSO Attachment.....	6.00
58,330 MIDAP	Conical Adapter of Micro IBSO Attachment.....	14.50

CLINICAL PHOTOGRAPHY EQUIPMENT

58,500 OPFAS	Equipment for Photographing Surgical Operations consisting of support with handle and chest brace, large telescopic finder, two Nitraphot lamps with aluminum reflectors	120.00
58,540 VEKOT	Illuminator Box for X-Ray reproduction, 13x18cm with four OSRAM-ZIER lamps 15-watt 110-volt.....	30.75
58,550 VIKUL	Illuminator Box for X-Ray reproduction, 24x30cm with three SOFIT lamps 25-watt 110-volt.....	42.00
58,560 VEKAS	Illuminator Box for X-Ray reproduction, 40x50cm with six frosted SOFIT lamps 25-watt 110-volt, with ground, opal and special glass plates.....	66.00
59,000 ELDUR	LEICA Positive Printing Apparatus for LEICA glass diapositives 50x50mm	18.90
59,010 ELDIA	ELDIA Printing Apparatus , for printing paper or film strips from LEICA negatives, complete with window for LEICA negatives	18.60
59,040 LAVER	Combination Professional Printer accommodating all film paper and glass slide pictures from miniature negatives. Self-contained illumination and rheostat control, complete	93.00
59,110 USTOL	Paper Slide Masks , aperture 1x1½ in., for use with standard 50x50mm glass slides. One side is coated with a special tin-foil compound which deflects the heat from the lamp house and protects the slide from excessive heat	2.10
59,120 ULSMA	Gevaert (Medium) 50x50mm Lantern Plates for black tones, Grade A glass.....per dozen	.60*

Cat. No. and Code Word		Price
59,130 ULSOB	Gevaert (Contrast) 50x50mm Lantern Plates for black tones, Grade A glass..... per dozen	\$.60*
59,150 UGLIT	Cover Glass Plates 50x50mm for glass positives per hundred	4.05
59,160 UMASK	Black Paper Masks 50x50mm with 24x36mm aperture per hundred	1.20

PROJECTION APPARATUS

59,300 UDIMO	UDIMO 100 Projector , accommodates standard 100 watt G. E. Mazda projection bulb reflector, two stationary condenser lenses of 52.5mm diameter, removable heat absorption filter, support for revolving front attachment, accommodates all UDIMO accessories interchangeably, 8 ft. cord with switch and plug connections but without interchangeable condenser and attachments	40.00
59,330 UDAVI	Carrying Case , of non-warping wood, for carrying the UDIMO 100 No. 59,300 Projector and small accessories	12.00
59,370 PROG- BIR	UDIMO 300 Projector , accommodates standard 300-watt G. E. Mazda projection bulb, lamp house of improved and enlarged design, special condenser lens, accommodates all UDIMO accessories interchangeably. This model is useful for halls and projection where an intense illumination is necessary, as for example, when projecting natural color slides. Without interchangeable condenser and attachments.....	57.00
59,390 BSIUU	Carrying Case , for UDIMO 300 Projector	16.50
59,400 PROG- CAP	UDIMO 500 Projector , accommodates standard 500-watt G. E. Mazda projection bulb, special large lamp house, water-cooled type heat absorption filter; accommodates all UDIMO accessories interchangeably. This Projector is designed for large halls and auditoriums; for extra large screen images and natural color projection where the maximum of illumination is necessary. Without interchangeable condenser and attachments..	81.00
59,420 BUUCP	Carrying Case for UDIMO 500 Projector.....	18.00
59,600 UBEMI	Standard Pre-focus Projection Lamp , tubular, 100-watt, for use in UDIMO 100 Projector No. 59,300.....	2.00*
59,610 PROF- VEF	Standard Pre-focus Projection Lamp , tubular, 300-watt, for use in UDIMO 300 Projector No. 59,370.....	2.90*
59,620 PROG- ELF	Standard Pre-focus Projection Lamp , tubular, 500-watt, for use in UDIMO 500 Projector, No. 59,400.....	3.00*

THE FOLLOWING ACCESSORIES ARE INTERCHANGEABLE ON ALL PROJECTORS

59,700 UKEDU	LEICA Film Attachment for interchangeable use of LEICA lenses, removable fire-protection drums, film sliding gate with 24x36mm window.....	17.50
59,710 BRUUM	Interchangeable Condenser marked "5" for use with SUMMAR, HEKTOR, and ELMAR 50mm lenses. For UDIMO-100 and UDIMO-300 projectors only.....	4.00

Cat. No. and Code Word		Price
59,715 DLUWU	Interchangeable Condenser marked "5 VIII K" for use with SUMMAR, HEKTOR, and ELMAR 50mm lenses. For UDIMO-500 projector only.....	\$4.00
59,720 UDAKI	Interchangeable Condenser marked "7.3-8-9" for use with LEICA lenses HEKTOR 73mm, ELMAR 90mm, and special projection lens MILAR 80mm focus.....	4.00
59,730 UBIKU	Interchangeable Condenser marked "10.5-12-13.5" for use with LEICA lenses ELMAR 105mm, ELMAR 135mm, and special projection lens DIMAX 120mm focus.....	4.00
FILM AND GLASS SLIDE SLIDING GATES		
59,800 UDUHS	Film Sliding Gate with window for LEICA, size 24x36mm	9.00
59,810 UBEPU	Film Sliding Gate with window for standard size 18x24mm	9.00
59,820 UDAPA	Glass Slide Sliding Gate with round aperture of 43mm diameter for LEICA glass positives 50x50mm.....	1.50
59,830 UDYGE	Glass Slide Sliding Gate with round aperture of 48mm diameter for positives 30x40mm mounted between glass plates 50x50mm	1.50
59,840 UDALU	Glass Slide Sliding Gate with square aperture of 24x36mm for LEICA positives mounted between glass plates measuring 35x120mm.....	1.50
59,850 UBECD	Extension Tube (length 22mm) for UDIMO Projectors. This tube places LEICA lenses in position for projecting pictures at close distances for reading or enlarging purposes	2.40
59,860 UDOZU	Base Tube , for special projection lenses in which both the 80 and 120mm focus projection lenses can be used interchangeably. The tube is provided with thread so that it can be screwed to the front of the projector...	5.70
59,870 UDAOB	Special Projection Lens MILAR , of 80mm. focus.....	19.20
59,880 UPEOB	Special Projection Lens DIMAX , of 120mm focus.....	26.40
59,890 UBAFE	Glass Slide Attachment for interchangeable use with LEICA lenses, including sliding gate with window for 50x50mm glass positive slides.....	6.15
59,900 UKLIB	Slide Changer for LEICA glass slides 50x50mm.....	3.45
59,910 UBEOL	Lower Plane Glass Plate with window 18x24mm for interchangeable use with the normal glass plate of the film sliding gate No. 59,800 for LEICA size (24x36mm)	2.40
59,920 UDKIP	Elevator Plate of metal for tilting the projectors.....	1.80

ENLARGING, READING, AND PROJECTION EQUIPMENT

60,100 VOKOM	Complete Enlarger, Reading Stand and Projector , for use with single frame, LEICA, 3 x 4cm and 4 x 4cm sizes including: Baseboard with 50cm upright rod, adjustable
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lamp housing, special ventilation ring, 100-watt projection and reading bulb for a direct connection, 75-watt bulb for enlarging, new film guide and holder, horizontal rotating film stage with frame insert for LEICA size, objective adapter with worm screw and threaded ring for LEICA or VAROE objectives, light proof reading box with inclined ground glass for viewing projected image, auxiliary condenser, special projection mirror in ball joint support for attaching below the objective, **without** objective..... \$105.00

60,110 **Enlarger Outfit only**, of No. 60,100 unit consisting of
VOGOS lamp housing, rotary film carrier, threaded lens mount, 75-watt bulb for enlarging, lamp, metal upright pillar, and wooden baseboard, without objective..... **58.50**

60,180 **Special Ventilating Ring** of No. 60,100 for use with 100-
VORYM watt lamp **6.75**
(Can likewise be used with enlargers Nos. 60,300, 60,430 and 60,450 when employing Photofood bulbs. This would also require the use of Condenser No. 61,380.)

ENLARGING APPARATUS

60,300 **VALOY Universal Enlarging Apparatus**, for use with
VALOY single frame, LEICA double frame 3x4cm and 4x4cm negatives, with lever for operating built-in pressure plate for holding negatives in flat plane, with 75-watt, 110-volt lamp, with thread permitting the use of LEICA lenses, but without lens or easel (paper holder) **49.50**

60,320 **Orange Filter** for VALOY enlarger to enable negative
FYLTO to be focused directly on sensitive paper..... **8.70**

60,330 **Special Attachment Ring** with calibrated diaphragm
VALAU scale for attaching to LEICA ELMAR 50mm lens, when used on the VALOY enlarger..... **3.60**

60,450 **FOCOMAT Enlarger**, autofocusing enlarging for LEICA
VOMAT and up to 3x4cm and 4x4cm negatives. Similar to VALOY enlarger in design and operation, but has provision for automatic focus. LEICA Camera lenses may be used in the FOCOMAT. Complete, with 75-watt opal lamp, metal masking plate for LEICA negatives, lamp housing, upright pillar, baseboard, and screw-flange for screwing lens in position, **but without lens..** **84.00**

60,460 **Orange Filter** for FOCOMAT enlarger No. 60,450 **8.70**
FYSTY

60,470 **VALFA Enlarger**, consisting of: Baseboard, 32 in.
VALFA (80cm) Metal Upright Pillar, Lamp Housing with supporting arm, 75-watt Opal Lamp, cord, plug, switch, two condenser lenses, Film Stage with Special film-guide and side troughs, slip-in metal mask 4¼x6cm and double glass plate, 4x7½ in., with non-interchangeable 75mm f:3.5 Leitz enlarging lens, equipped with screw-thread focusing mount, iris diaphragm and adjusting ring. Without enlarging easel but with two clamping screws for fastening easel in position..... **120.00**

60,480 **Orange Filter** in swinging mount for use with VALFA
FLAUS Enlarger **15.00**

**Cat. No.
and Code
Word**

Price

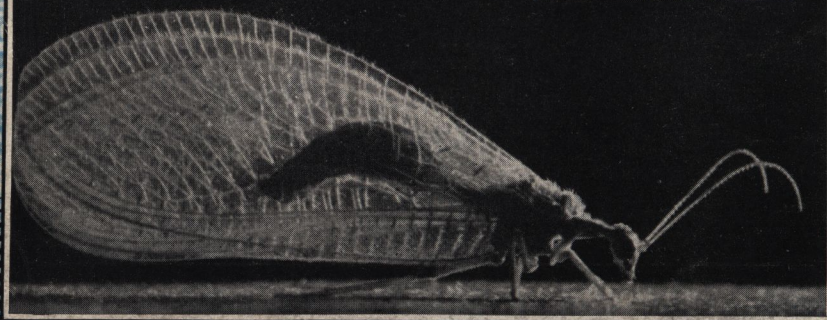
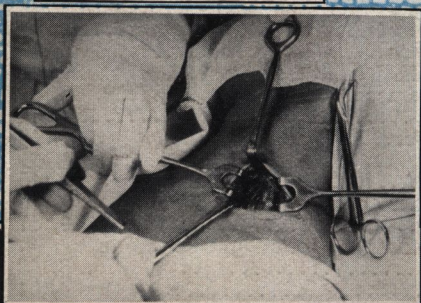
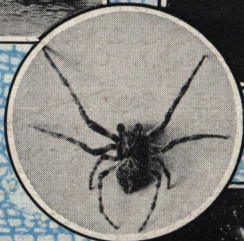
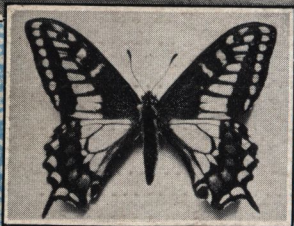
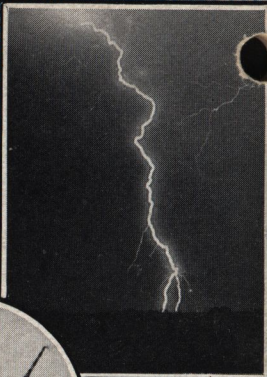
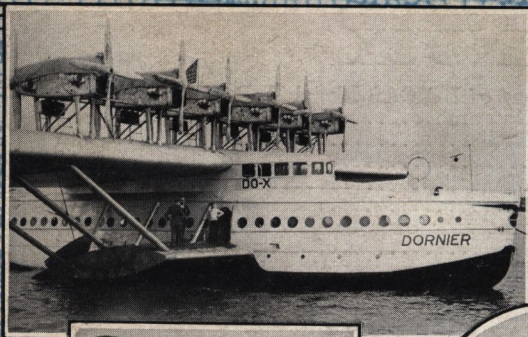
60,800 REGIL	Illumination Control Rheostat , for 110-volt A.C. or D.C. current, with seven steps of illumination, for use with standard Photoflood lamps when enlarging upon chloride and bromo-chloride papers. This device not only reduces heat created by lamp, but also offers the worker a complete control of the illumination which can be used to produce the desired results in enlarging with greater ease and assuredness. Complete, with rubber-covered 5 ft. extension cord, plug, and control panel	\$18.00
60,890 VERUP	Metal Upright Pillar for VALOY Enlarger 80cm.....	8.10
60,900 VERYN	Metal Upright Pillar for VALOY Enlarger 100cm.....	9.00
60,920 VERBE	Baseboard for VALOY and VALFA Enlargers.....	10.50
61,310 FELIS	Enlarging Easel for paper sizes up to 8x10 in., with metal masking bands. Maximum picture area 6½x8½ in.	16.50
61,320 FELUK	Enlarging Easel for paper sizes up to 11x14 in., with metal masking bands. Maximum picture area 9x11 in.	19.50
61,350 VEKIP	Metal Bracket with step arrangement, for holding enlarging easel in tilted position to overcome distortion in negative	1.50
61,360 VAROB	Special 50mm ELMAR Lens with iris diaphragm, for use on enlargers, Nos. 60,300, or 60,450. This lens cannot be used on the LEICA Camera	30.00
61,370 VULPE	Adjustable Magnifying Glass for critical focusing of image with enlargers	15.75
61,380 VOBIT	Special Diffusing Condenser , for use with the Enlargers Nos. 60,110, 60,300, and 60,450 in connection with Photoflood bulbs.....	5.70

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56,630	1.20
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59,010	18.90
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59,110	2.10
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59,13060*
59,150	4.05
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59,840	1.65		
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