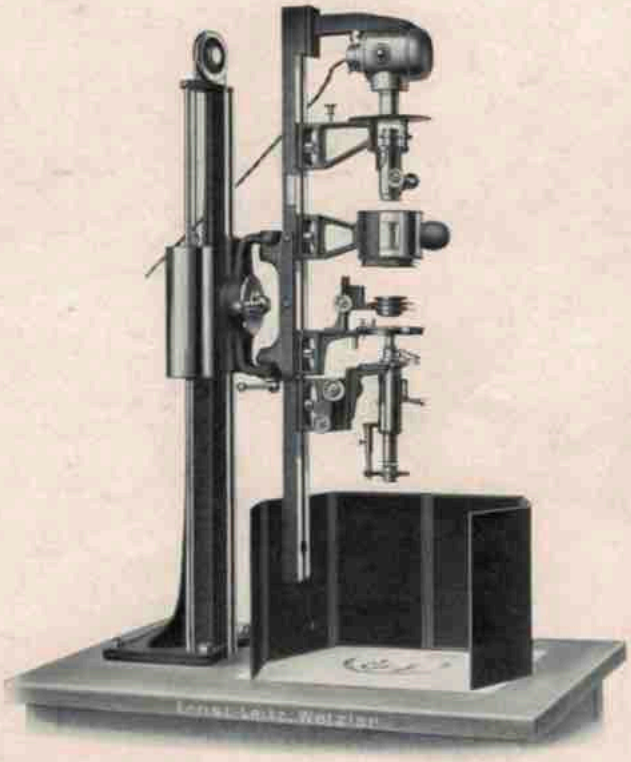
Leitz

Directions for Using the

"Edipolaris"

Demonstration and Universal Apparatus for Work in Polarized Light.



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NOTE.

The illustrations contained in this list do not necessarily conform in every detail to the actual design and should not be regarded as binding upon us. It goes without saying that it is our constant aim to embody in our apparatus every improvement which may suggest itself in the course of time.

Directions for Using the

Leitz-"Edipolaris"

Demonstration and Universal Apparatus for Working in Polarized Light.

(The apparatus being an instrument for use in practical classes and for personal use in observation, drawing and photography as well as for projecting on the screen during lectures).

Directions for Setting up the Apparatus.

1. Screw the cast iron upright upon the wooden table by means of the four screws. To accomplish this remove the table-drawer, so as to be able to place the washer plates under the screw holes, and pass the screw bolts through them from below. Apply the screw nuts, and tighten them up firmly.

2. **Attaching the optical bench to the upright:** Insert the optical bench into the track of the vertical upright, noting that the eyelet of the optical bench should be at the top. By means of the clamping wheel at the back, not forgetting to place the washer between the clamping wheel and the upright, the optical bench is securely tightende.

3. **Putting the Balance Weight in operation:** Release the small clamping screw on the bracket piece at the top of the upright, introduce through the hole the guiding rod, pass it through the balance weight, and insert its lower end into the hole in the base. Now tighten the clamping screw, and finally connect the eyelet of the balance weight with the one at the carriage of the optical bench by a wire rope, passing the latter over the pulley. The counterweight serves to prevent a sudden descent of the optical bench, when the clamping wheel is released.

4. **Connecting the Lamp:** Slide the housing of the Liliput arc lamp or of the filament bulb, as the case may be, from above into the upper end of the track of the optical bench, and, letting it go down as far as the stop, clamp it tight with the aid of the eccentric lever. Between the lamp and the current outlet, it is necessary to connect a resistance or transformer to suit the current conditions.

A. General Directions.

Transition from Vertical to Horizontal Projektion: Release the handle „h" (Fig. 2, pg. 6) turn the optical bench, through an angle of 90°, release the clamping handle „H" at the upright, and set the optical bench horizontal.

Selection and Operation of the Lamp: For horizontal projection (upon a screen) the Liliput arc lamp should be given preference, whereas the Liliput arc lamp or the low-voltage filament lamp may be employed for vertical projection upon the table surface. When using the latter, all

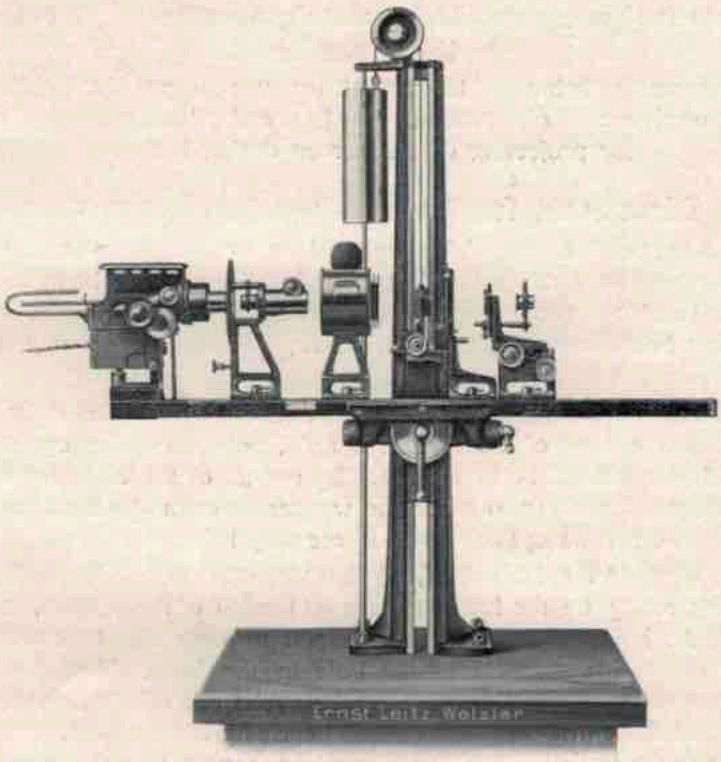


Fig. 1.

that is necessary is to screen-off all daylight from the table surface. As a rule, it is sufficient to employ for this purpose the foldable cardboard screen supplied with the apparatus. A more perfect result may be obtained with the aid of a special curtain screening device, which attaches to the collimator-support by means of a screw fitted to the latter.

When using the arc lamp note that the two carbon points should be clear of one another. Also in the case of a direct current attention should be paid to the polarity. The thicker carbon situated in the direction

of the optical axis should glow more intensely than the thinner carbon. Two screws, one situated at the end, the other at the side of the arclamp, serve the centring of same.

During continuous use the low-voltage lamp proves more convenient but its light is less intense than that of the arc lamp. The filament bulb may be centred, by means of the screw fitted to the base of the lamp. It may be set in aligenment with the optical axis, after releasing the clamp at the housing in shifting and turning the bulb.

Adjusting the Saddle Stands on the Optical Bench: The saddle stands, which serve as carriers of the various optical components, should be introduced, in succession through the enlarged aperture at the free end of the optical bench, in the following manner:

Saddle Stand with Collimator: „C" (Fig. 2). This stand carries the illuminating system, the polarizer, and the collimator lens, the latter being provided with a rack and pinion motion. This saddle stand should be moved upward to rest against the lamp, and there clamped in position, by tightening the clamping lever.

Saddle Stand with Water Cooling Chamber and Filter Carrier: „W" (Fig. 2). Remove the stopper, fill the chamber completely with distilled water, and place the stopper back.

Move the cooling chamber along the optical bench, towards the collimator, so as to leave sufficient room for the range of the rack and pinion motion of the collimator lens.

When using the filament lamp as a source of light, the cooling chamber may be dispensed with.

Saddle Stand with Condenser Carrier and Object Stage: „K" (Fig. 2). Push this stand up to the point marked by the index line on the optical bench. To the stage affix the object-holder and the stage clips.

Saddle Stand with Carrier for the Projection Units „O" (Fig. 2) with coarse and fine adjustment: Move the stand close to the saddle stand „K". It serves to accommodate the projection microscope or the projection lenses, respectively

Special Modes of Projection.

B. Micro Projection.

(Orthoscopic and conoscopic micro-projection in polarized light for all purposes of petrography, mineralogy, biology, and other technical problems).

The Projection Microscope should be introduced into the saddle stand „O" and there clamped in place by means of the eccentric lever. The upper end of the tube is fitted with an objective-clutch changer. Each objective screws into a separate centering collar. The objective should be attached to the clutch changer in the following manner: With the left hand compress the spring of the clutch, with the other insert the objective into the cone, and then apply a turning motion until the slanted pin at the centering collar rests upon the small roller of the clutch, and then releases the spring. The centring of the objectives needs to be carried out only once with the aid of the provided watch Keys; the objectives remaining permanently centred even when being interchanged.

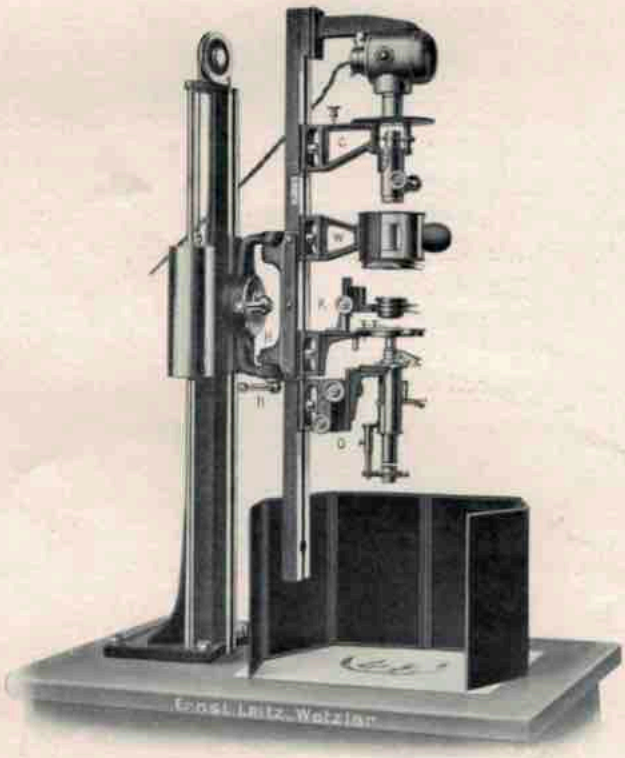


Fig. 2.

The objectives should never be detached from the collars, as this would destroy the centering adjustment in the event of the collars being mixed.

The tube is furthermore provided with:

a **slit for the introduction of selenite and mica plates**

or a **„Berek" compensator**

a **„Bertrand" auxiliary lens** in sliding mounting, for conoscopic projection, which may be centered and likewise focused by displacing same along the axis of the tube. It has permanently attached to it an iris-diaphragm, manipulated by handle.

The Oculars are introduced at the lower tube end. Two notches set at an angle of 45° are provided for the accommodation of eyepieces with cross-lines.

The analyser attaches to a pin at the side of the tube and is to be moved close to the ocular The analyser can be rotated, is provided with notches, and may be readily swung aside.

The illumination is furnished by **two condensers,** which screw into the centering mount, and together with the latter, slip into the condenser carrier. The use for which the condensers are primarily intended are inscribed on their mounts.

The **preparation** should be laid upon the stage with the **cover-glass facing the objective.** The object holder protects the cover-glass from being scratched.

Adjusting the illumination: The correct illumination may be found **systematically** by the following simple manner:

1. Set the rack and pinion motion of the **collimator,** so that the back surface of the condenser is completely filled with light (and if necessary, centre the lamp).

2. Focus the microscope, without analyser in operation, and set the **condenser** with the aid of the rack and pinion for maximum brightness, (center the condenser, if necessary).

3. Re-set the **collimator** with the aid of its rack and pinion, until the illumination becomes uniform.

This simple procedure should be adopted, without exception, as it furnishes correct means of illumination rapidly and faultlessly.

Objective	Aperture	Magnification with ocular		Condenser to be used.
		No. 1. (5 x)	No. 2. (6 x)	
1 (40 mm)	0.11	16	19	Spectacle Lens Condenser
2 (24 mm)	0.21	29	35	
3 (16 mm)	0.25	51	62	Lower portion of the two-lens condenser.
3a (13 mm)	0.36	68	81	
4 (10 mm)	0.37	95	114	
5 (5.4mm)	0.64	165	200	Complete two-lens condenser.
6 (4 mm)	0.82	225	270	
7 (3 mm)	0.85	310	375	
1/12 (2 mm)	1.30	450	540	

Orthoscopic Micro-projection: The magnifications given in the preceding table are the so-called conventional magnifications, referring to the distance of 250 mm vision. They rise, or diminish in proportion to the distance of the ocular from the screen.

Objective No. 3 (16 mm) may likewise be used in conjunction with the spectacle lens condenser, and Objective No. 4 (10 mm) likewise with the complete two-lens condenser.

The object stage serves furthermore for the accommodation of the Leitz universal revolving stage after Fedorow.

Conoscopic Micro-Projection: Objectives from No. 4 (10 mm) upwards, according to the required aperture, the complete two-lens condenser, the „Bertrand" auxiliary lens and the ocular should be used for conoscopic micro-projection. The interference figure is focused through shifting the „Bertrand" auxiliary lens along the microscope axis.

When the **interference figure of a small mineral grain,** contained in a rock section, is to be viewed, the iris-diaphragm of the „Bertrand" lens should be closed down sufficiently. It is so arranged that the image of the rock section lies exactly in its plane.

The extent of stopping down the image may be controlled with the aid of a magnifier mounted beneath the analyser, the latter being swung aside while this is being done.

C. Projection of General Features and of Physical Phenomena.

These comprise general views of objects up to 24 mm. in diameter, especially for demonstrating the presence of double refraction and polarisation in calcite-rhombs, complementary interferences, dependence of the interference colors upon thickness, intensity of the double refraction, and orientation of the section, scale of interference colors, spectrum analysis, of interference colors, optical rotation, dischroism, accidental double refraction, interference figures, dispersion of the optical axis, dependence of the angle of the optical axis upon the temperature.

Directions for carrying out these demonstrations will be found in our publication "Elementary Introduction into Crystaloptics", which may be had on application. We supply also a suitable set of preparations, together with the requisite descriptive text.

1. In Parallel Light.

Into the slider for the **projection unit** introduce, by means of the respective adapters, the projection objective of 64 mm or 80 mm focal lengths. Attach the analyser to the tubular fitting, and move it as close to the objective as possible. Introduce into the condenser carrier those condensers marked to correspond with the objectives utilized. The condenser has a revolving ring, for the interposition of selenite- and mica-plates.

The adjustment of the illumination conforms exactly to the rules given before in connection with micro-projection.

A small **spectroscope** serves for demonstrating the spectral analysis of interference colors. This spectroscope attaches beneath the analyser in such a manner that it may be easily placed in and out of operation. It is provided with an adjustable slit, as well as a movable lens for focusing the spectrum.

For demonstrating the fundamental laws of double refraction and polarization, produced by a calcite-rhomb, the condenser should be replaced in its carrier by a **small iris-diaphragm.** The latter has a rotating mount for the reception of a quartz-plate, cut at right angles to the optical axis, being 3.75 mm thick (for color mixing experiments) or of a selenite plate.

2. In Convergent Light.

(Interference Figures).

Into the condenser carrier introduce the **two lens condenser,** and **underneath the stage** slide a corresponding condenser which with the guide pin provided for this purpose is moved upward as far as possible. In other respects the arrangement is the same as that adopted in the case of parallel light. With the aid of the projection objective, the image should be focused upon the back surface of the lower condenser. The analyser is to be moved away from the projection lens, to that point where the pencil of rays has its smallest cross section. The illumination should then be regulated by adjusting the position of the upper condenser. In this manner it will be possible to likewise demonstrate interference figures in very thick preparations.

D. Photography.

(Photo-micrography and Records of General Features).

Photographs may be taken with the aid of a camera provided with an automatic shutter, having time and instantaneous release. This Camera attaches, by means of a clamp, to the upright, and, by another clamp, to the optical bench. A light-proof connection between the projection-lens and the camara is made by the aid of a **plate** carrying two auxiliary lenses of 25 and 40 cm focus, the plate attaching itself to the guiding pin of the analyser. The purpose of the auxiliary lenses is to obtain for photo-micrography, a tele-centric exit of the rays from the projection-lenses, so as to

(1) obviate astigmatic defects in the image due to the analyser,

(2) to be able to employ the microscope objectives under the most favorable conditions in respect to their optical correction.

In every case, such an auxiliary lens should be put in operation, the focal length of which comes nearest to the distance, which exists between analyser and the photographic plate. The image should be focused

Micro Projection

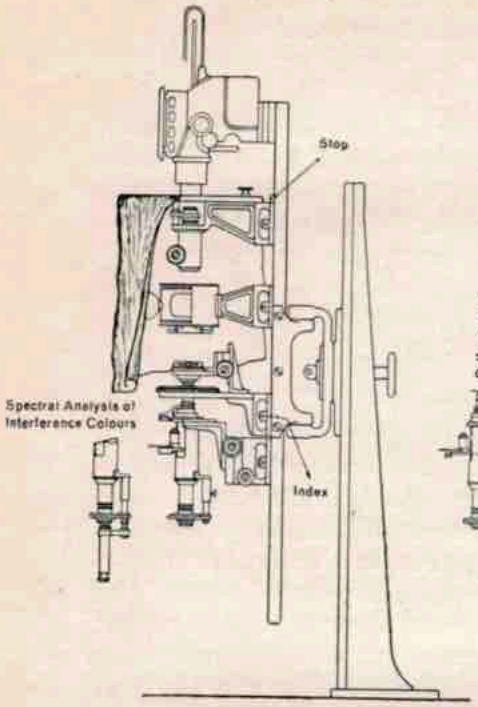
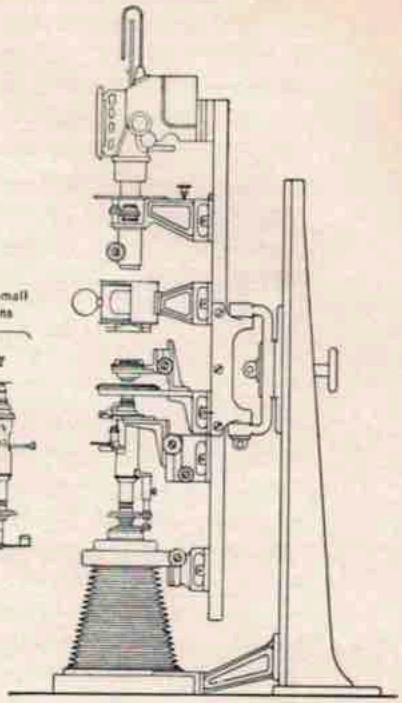
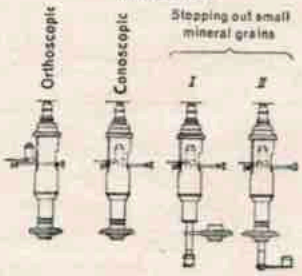


Photo-micrography



Procedure



Condensers for



Objectives 5—7



Objectives 3—4 same as with Objectives 5—7 but frontlens removed



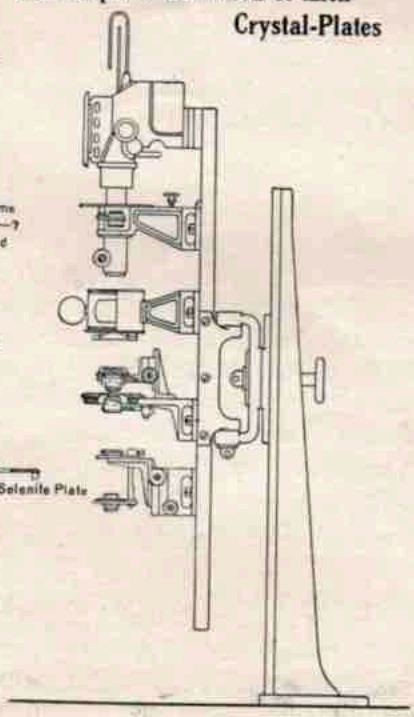
Objectives 1—2



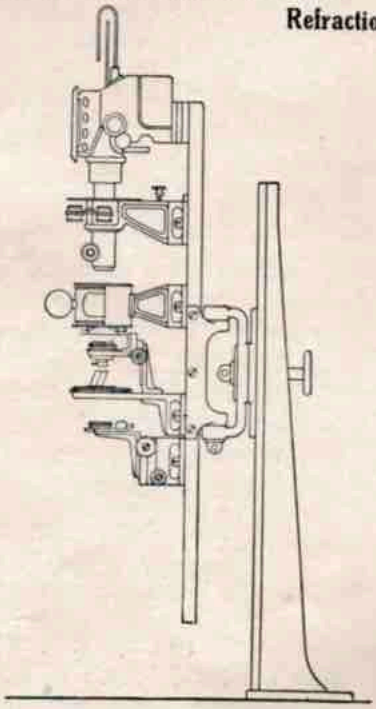
Objectives From 64 and 80 mm

Selenite Plate

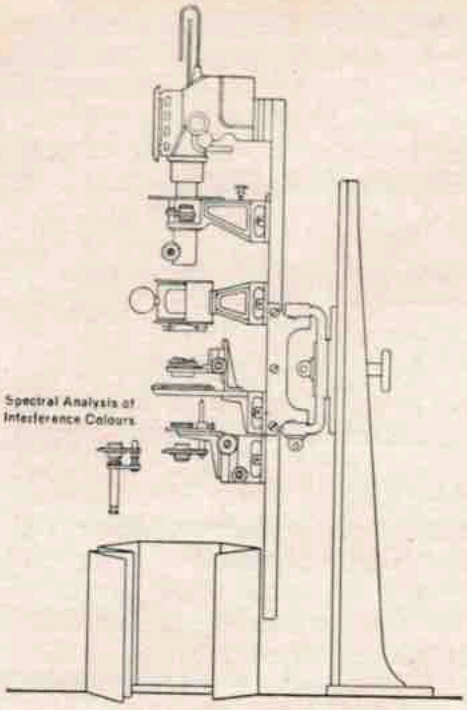
Conoscopic Observation of thick Crystal-Plates



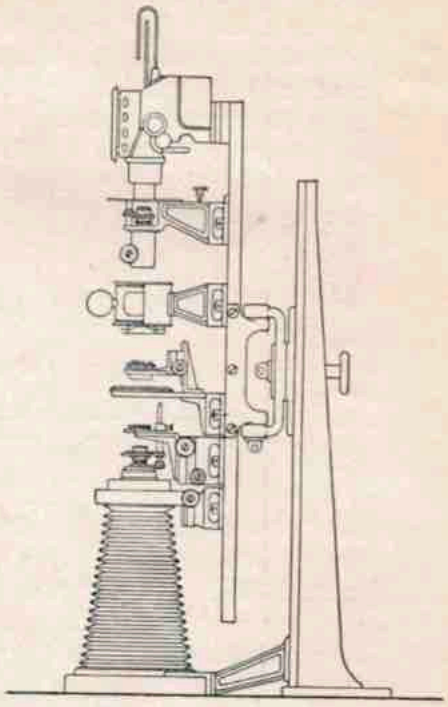
Fundamental Experiments on Double Refraction



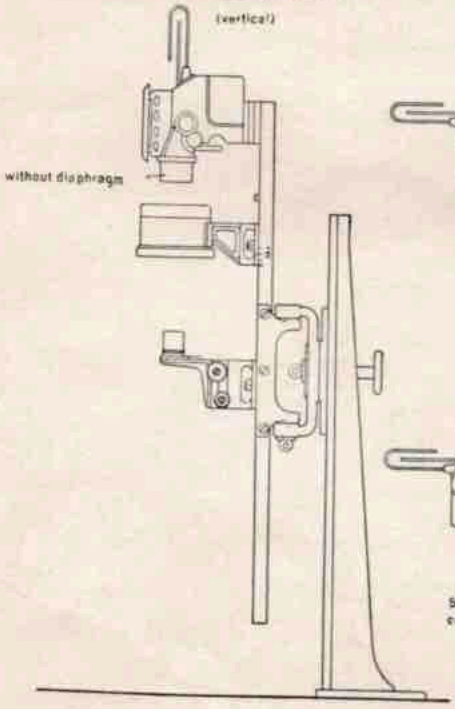
Projection of Large Crystal Plates



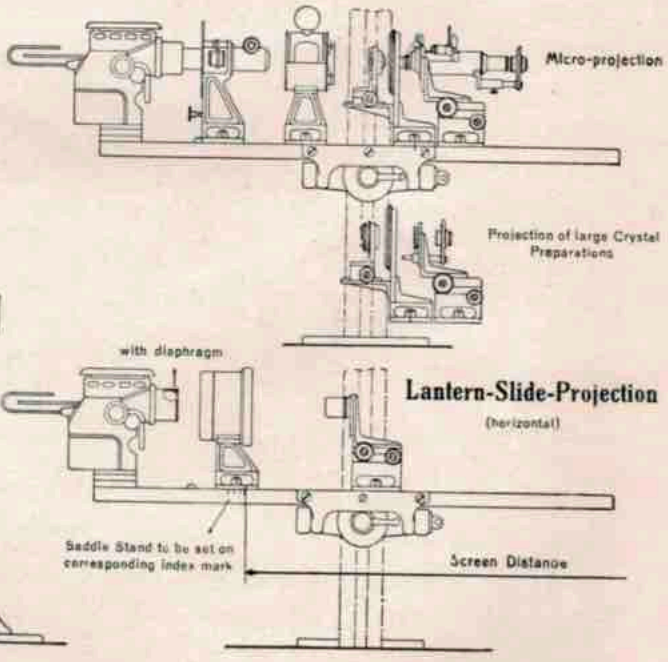
Photography of Large Crystal Plates



Lantern-Slide-Projection



Projection of Minerals



upon a paper focusing screen, inserted into the frame in the place of the ground glass focusing screen. The image should be viewed for sharp focusing, and while regulating the illumination, through the observation window situated at the lens board of the camera or by releasing the catch and lifting aside the bellows. The observation window is controlled by a wire spring release. The plate holders are available for plates of a size up to 7 × 5 in. and for plates of smaller size through the use of kits. Light-filters may be introduced into the holder situated at the cooling chamber.

E. Projection of Lantern Slides.

From the optical bench, remove all saddle stands, with the exception of the source of light, insert the large two-lens condenser with lantern slide frame into the optical bench up to the index-mark, which records the screen distance. Next, put in the saddle stand with carrier for the projection objective, and in this carrier introduce the same slide fitting, as used for projecting general features, the screw thread of which will receive the lantern slide projection lens, which is an **anastigmatically corrected objective of a focal length of f = 120 mm.**

When lantern slides are to be projected with the filament lamp, an auxiliary lens should be inserted into the mounting at the lamp housing.

Complete equipments and Prices.

A. Stand and Source of Light.

	Codeword	Price $
Wooden table with drawer, upright, optical bench adjustable in height, with two turn-sockets and counterpoise weight	Edpol	200.00
Liliput Arc Lamp with clockwork feed	Edput	55.00
Rheostat for use with the Liliput arc lamp on **110-volt**	Rearn	8.50
Ditto for use on **220-Volt**	Reana	12.50
Special Leitz Lamp with low voltage filament bulb 6-volt; 5 ampere, in housing	Edani	26.00
Rheostat adjustable, with ammeter, for Special Leitz Lamp, **110-Volt,** D. C.	Rekur	45.00
Ditto for **220-Volt** D. C.	Regam	52.00
Transformer, adjustable, with ammeter for Special Leitz Lamp 110 and 220 Volt A. C.	Redyx	40.00
Two Renewal Lamps for the Special Leitz lamp	Edamo	4.00
Light-Screening Curtain for vertical projection in lighted rooms, for use with the Special Leitz Lamp	Edhan	13.00

(The Liliput arc lamp and the filament lamp are interchangeable against each other).

B. Micro Projection.

1. **Saddle Stand** with lamp condenser, polariser and collimator	Edlok	100.00
2. **Saddle Stand** with cooling chamber and filter holder	Edkul	22.50
3. **Saddle Stand** with rotatable graduated object stage, provided with vernier reading to 0.1°, removable ring plate, detachable condenser carrier with rack and pinion motion, object support and two stage clips	Edseh	65.00
4. **Centring Mount** for condensers	Edzen	7.00
5. **Spectacle Lens Condenser** for Objectives Nos. 1 (40 mm) and 2 (24 mm)	Edbri	3.00
6. **Two-lens Condenser** N. A. 1.20, with unscrewable front lens and iris-diaphragm	Edser	11.00
7. **Saddle Stand** with tube carrier, coarse adjustment by rack and pinion motion, micrometer screw with new patented ball bearing sliders	Edute	65.00
8. **Slide and Microscope tube,** objective clutch changer, tube slit set at an angle of 45° for the reception of compensators, „Bertrand" auxiliary lens in centring and focusing mount, with iris-diaphragm	Edubs	70.00
9. **Analyser,** revolving, graduated and notched, with detachable and swing-out holder	Edlys	45.00
10. **Holder** with auxiliary magnifier	Edlup	17.00

	Codeword	Prices $
11. Objectives No. 1 (40 mm), No. 2 (24 mm), No. 4 (10 mm) and No. 6 (4 mm), free from polarisation, with a centring collar	Edopt	59.00
12. Ocular I (5×) with cross-lines and focusable eye-lens	Edoku	5.75
13. Ocular II (6×)	Eduka	2.75
14. Selenite Plate red, 1 st order, in mounting fitting the tube slit	Edyps	4.00
15. Mica-Plate ¼ und. in mounting fitting the tube-slit	Edgli	3.50
16. Folding Cardboard Light-screen	Edirm	3.50
Total for Set "B"	Edmik	484.00

Additional objectives and oculars may be supplied for this set, if required. When ordering, please state expressly that objectives free from polarisation are to be supplied, and also order for each objective a centring collar. Oculars with cross-lines should in all cases be ordered with focusable eye-lenses.

C. Projection of General Features and Projection of Physical Phenomena

(As a supplement to Set "B")

	Codeword	Prices $
17. Slide for low power objectives with sleeve for the reception of the analyser	Edsit	10.00
18. Objectives f = 64 mm. and f = 80 mm	Edsum	18.00
19. Spectroscope with holder and focusable projection lens	Edspe	35.00
20. Condensor for objectives of 64 mm. and 80 mm. focus, with rotatable ring for the reception of compensators	Edsyn	15.00
21. Selenite-Plate, red 1 st order 29 mm diameter, in mounting	Edgip	12.00
22. Mica Plate, ¼ und. 29 mm diameter, in mounting	Edlim	5.00
23. Sliding Sleeve, for insertion into the condenser carrier, with small iris-diaphragm and rotatable ring for quartz-or selenite plates	Edyse	18.00
24. Two lens condenser N. A. 1.20, with ground-off front lens and holder for attachment under the ob-object stage	Edsal	15.—
Total for Set "C"	Edphy	128.00

In the event of the **Set C only** being required, without the Micro-projection Set B, the above Set C should be supplemented by the following items from section B, viz. Nos. 1, 2, 3, 4, 6, 7, 9, 16.

Total for this Set:	Edsox	319.00

	Codeword	Prices $
25. Set of 33 Preparations for the demonstration of all important crystaloptic phenomena, together with explanatory notes, and directions for carrying out the experiments, in case	Kisal	241.00

D. Photography.

(As Supplement to Sets "B" and "C".)

26. Camera with bellows 60 cm. long, lens board with rack and pinion motion, time and instantaneous shutter, light-proof connecting sleeve, observation window at the side of the lens board, paper focusing screen in wooden frame, two plate holders for plates 5 × 7 in. with kits for smaller size down to $3^1/_4 \times 4^1/_4$ in.	Edkam	130.00
27. Light-proof Connecting Sleeve with two dioptre-auxiliary lenses of 25 and 40 cm. focus	Edkib	15.00
Total for Set "D"	Edfot	145.00

E. Lantern Slide Projection Attachment.

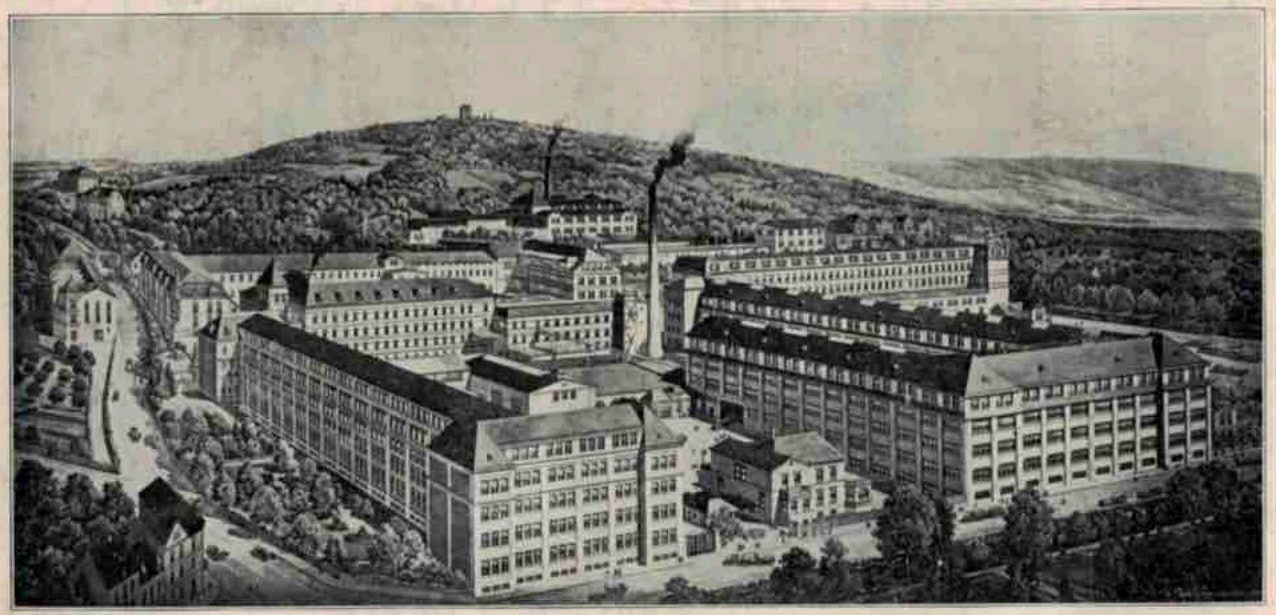
	Codeword	Prices $
28. Carrier with double condenser and two lantern slide frames	Eddon	40.00
29. Anastigmatic Projection Lens, f = 120 mm . . .	Eddas	15.00
Total for Set "E"	Eddio	55.00

In the event of Set "B" having been selected without "C", it should be supplemented by the following items:

17. Slide-fitting to which the projection lens is to be screwed	Edjek	11.00
For projecting lantern slides with the filament lamp, it will be necessary to add:		
30. Auxiliary Lens for insertion into the filament bulb fitting	Edhil	7.50

Note:

In the event of water having clouded the sides of the cooling chamber, the latter should be cleaned with strongly diluted hydrochloric acid, and **not** with alcohol.



Ernst Leitz, Optical Works, Wetzlar

Price List for Pamphlet No. 2268

Directions for Using the "Edipolaris"

Code Word	Price	Code Word	Price
Page 13		Page 14	
Edpol	$256.00	Edyps	$ 4.50
Edput	86.00	Edgli	3.50
Rearn	11.50	Edirm	4.00
Reana	13.50	Edmik	604.50
Edani	33.00	Edsit	13.00
Rekur	40.00	Edsum	21.00
Regam	48.00	Edspe: now iiakt	50.00
Redyx	35.00	Edsyn	18.00
Edamo	2.50MCP	Edgip	15.00
Edhan	17.00	Edlim	6.00
Edlok	127.00	Edyse	21.00
Edkul	25.00	Edsal	18.00
Edsch	87.00	Edphy	162.00
Edzen	8.50	Edsox	403.00
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