Leitz

PANPHOT



The Perfect Combination

of

Polarising or Ore Microscope

and

Reflex Camera

Fig. 1. Microscope for work in incident polarised light.

ERNST LEITZ, WETZLAR

Leitz

PANPHOT

The perfect combination of polarising microscope and reflex camera.

Compared with all existing types of polarising microscope, the Leitz "Panphot" is a distinct novelty, as the microscope and reflex camera are skilfully combined in a single piece of apparatus. The instrument is both a high-grade polarising research microscope and a photomicrographic outfit. It may also be used for demonstrating to a small circle of observers, and for micro-drawing. The change-over from visual work to photomicrography is effected by a single manipulation — the withdrawal or insertion of the lateral viewing tube. This enables the microscopic image to be observed visually and photographed in rapid succession. Microscope accessories such as heating stages, the Integrating Stage, the Universal Rotating Stage and the microphotometer can be used with the Panphot. The apparatus may therefore be regarded as the most perfect of its type extant.

The microscope and camera form with the light source a single unit and therefore always remain in perfect centre. Yet both the microscope carrier and the camera carrier can be screwed off the main body. Owing to its extremely compact design, the instrument takes up comparatively little space, and all the controls are located within easy reach of the worker seated in front of it.

Scope of the "Panphot."

1. One and the same instrument can be used without alteration
   as a **routine microscope** for visual work,
   as a **photomicrographic apparatus,**
   as a **macro-camera,**
   as a **micro drawing apparatus, and table projection apparatus,**
   as a **micro-projector,** for long-distance projection.
2. All modes of illumination may be used in rapid succession and in any sequence, the light source and optical parts always remaining in perfect centre:

Transmitted Light:	bright field — dark field — polarised light.
Incident Light:	bright field with vertical incidence by a prism or plane glass plate in the vertical illuminator (internal illumination) — bright and dark field with concentric oblique incidence by Ultropak objectives (external illumination) — polarised light.
Oblique Illumination	with the aid of the revolving mirror inside the housing of the apparatus.
Fluorescence Illumination	in transmitted and incident light.

Features of the "Panphot".

1. Low initial and working costs, small space requirements.

2. Always ready for use, as the **light source, microscope and camera are always in perfect centre**; rapid change-over from visual work to photomicrography, with all the controls readily accessible by the worker without changing his position. No remote focusing controls necessary.

3. Freely accessible object stage facing the observer.

4. Extreme rigidity of the apparatus, eliminating all trace of vibration even when working at the highest magnifications.

5. The operator works the instrument in a sitting position, with his head in the normal, comfortable attitude.

6. Monocular and **binocular** observation, thanks to the rapid interchangeability of the body tubes as on any large research microscope.

7. Fine adjustment of the image with **micrometer screw on double ball bearings** as a protection against the heavy weight of the binocular body.

8. Existing objectives and eyepieces can be used.

9. Photographs of extensive objects in transmitted light on an object stage with condenser lenses of specially large diameter and photographic lenses with focal lengths ranging from 20 to 100 mm.

10. All microscope accessories (universal rotating stages, integrating stages, etc.) can be used, as on an ordinary microscope.

11. **Convenient means of varying the magnification** on the ground glass screen owing to the **extensible bellows.**

12. Possibility of using the micro-camera for photomacrography owing to the extensible bellows.

13. Provision of an **unreversed image** sharp right up to the periphery, owing to the direct projection of the microscopic image on to the photographic plate **without the interposition of large, sensitive deflecting mirrors.**

14. Possibility of using the slow motion and cine cameras for cinematography in conjunction with the **vertical** microscope.

15. Choice of light sources — filament lamp or arc lamp — and a combination of both.

16. Photographs of two objects in juxtaposition in the comparison microscope.

Technical Description of the Apparatus.

Base.

The main body of the Panphot is a single casting 35 x 40 x 60 cm (14" x 16" x 24") mounted on four rubber shock absorbers. Its vertical column carries the principal components — microscope, camera and illuminating device. These are easily removable and interchangeable with other parts. Due to this interchangeability of its separate components, the Panphot may be purchased at the outset in the form of a very simple outfit, and afterwards added to and built up at any time into a complete instrument by purchasing the accessories required for any particular type of work. When the apparatus is used in the laboratory, it is advisable to purchase our work table (Fig. 10), in the several drawers of which the separate components can be kept ready at hand as needed. To eliminate vibration, the Panphot may be mounted on a resilient table fitted with six strong springs, while a resilient table top can be built into the work table.

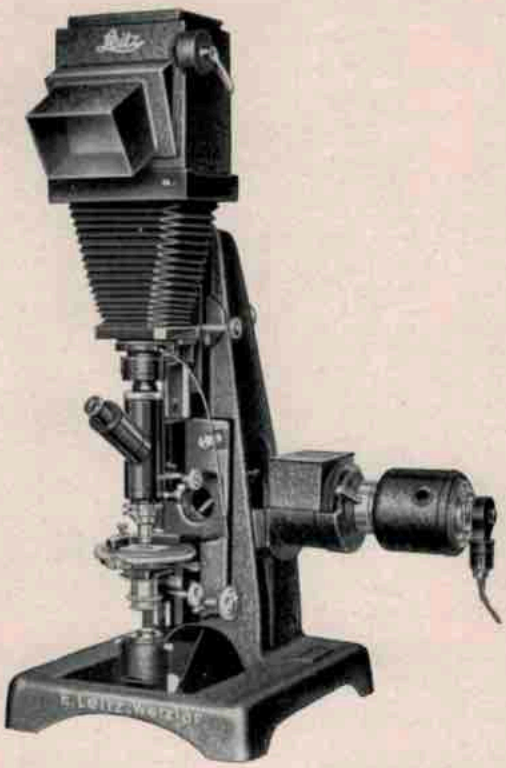


Fig. 2. Microscope for working in transmitted polarised light.

Microscope.

The microscope as the principal part of the apparatus is a large universal instrument, in so far as the utmost variety is permissible in the choice of the body, the substage and the object stage and their possible combinations. Coarse focusing of the image is effected by raising and lowering the stage with a strong rack-and-pinion motion. The stage is of the round, revolving and centred type, fitted with scale, vernier and clamping screw. Fine focusing is effected by the micrometer screw on the upper portion of the microscope. The slide track of the micrometer screw is mounted on double ball bearings to protect it from the weight of the binocular body or of a camera attachment. The **standard body tube** for petrographic work (Fig. 3) is a wide tube similar to that of our large polarising microscopes; it incorporates a second lateral, inclined observation tube. The standard tube also has a

rotating and removable anastigmatic tube analyser which can be put in and out of action. A **Bertrand auxiliary lens** (for extra price, see page 14) can be screwed on to the eyepieces, or built in to the tube so that it can be put in and out of action. A mechanical stage can be screwed on to the ordinary object stage for systematically traversing thin sections or polished surfaces. The objectives are rapidly interchangeable by means of the detachable carrier with three-point objective changing clutch, or of the nosepiece with independently centring threads for each objective. These devices fit the lower end of the tube changing slide.

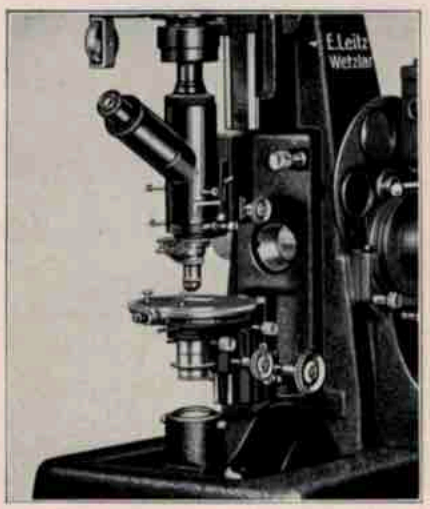


Fig. 3. Partial view of the Panphot Microscope for work in transmitted polarised light.



Fig. 4. Arrangement for photographing general features of thin sections without eyepiece in transmitted polarised light.

The **substage for transmitted light** (Fig. 5) is vertically adjustable by rack and pinion. It has a double condenser system, the top component of which may be swung out of the path of the rays as required, according to the focal length of the objective used. Between the two components of the condenser is the aperture iris diaphragm for the objectives of higher power. For objective No. 1, however, the aperture iris is located at the lower end of the substage. The swing-out portion of the condenser, intended for use with higher-power objectives only, is mounted on a carrier which fits into a dovetail slide. This slide also serves for the reception of one of our reflecting condensers for dark-ground illumination. A further component of the substage is the microscope mirror in mount fitting the dovetail slide at the front of the frame-shaped baseplate, and rigidly connected with a vertically adjustable long-focus condenser lens. This is used for objectives Nos. 1 and 2, and, reversed, for the objectives of higher power. *) For microscopic work in ordinary daylight we supply, additionally, for the Panphot microscope, an

*) When working with the Universal Rotating Stage, a condenser of special design is used (page 17, Section G)

interchangeable, rotating plane and concave mirror. This is mounted on a carrier which fits the same dovetail slide at the front of the baseplate as is usually occupied by the plane mirror and condenser lens for artificial light.

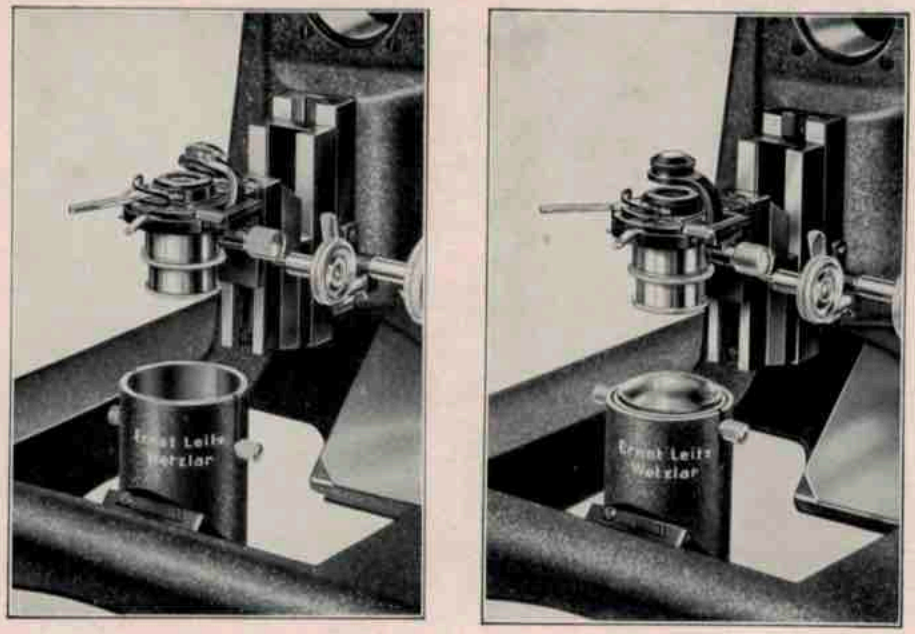


Fig. 5. Substage for transmitted light.

The same substage remains in use when the analyser and the photographic lens (of about 6 cm focus) are inserted in the tube changing slide for photographing general features (Fig. 4), after the polarising body and the objective changing device have been removed. To save using a second analyser, that in the polarising body can be removed by loosening the screw that holds it in position. This enables slightly magnified photographs of the general features of thin sections to be taken in polarised light with the Panphot polarising microscope.

For examining specimens of ores, coals and metals in incident polarised light, the illuminating apparatus used is our large **Vertical Illuminator** with objective changing and centring device, in conjunction with a compensating prism and a plane glass plate as the reflecting elements. The vertical illuminator also includes a polariser which slips into its light entrance tube. Its equipment is completed by a collecting lens with iris diaphragm, adjustable half-stop and arrangement for oblique illumination, which are secured to the vertical illuminator by a spring clip.

In cases where slightly magnified general features photographs of polished specimens of the above-mentioned materials have to be taken, the vertical illuminator is replaced by a second illuminator having a large plane glass plate (Fig. 6) and used with a short-focus photographic lens. The light-proof

connection between objective and camera is effected by a wide tube without eyepiece sleeve, carrying at its upper end a light-screening collar.

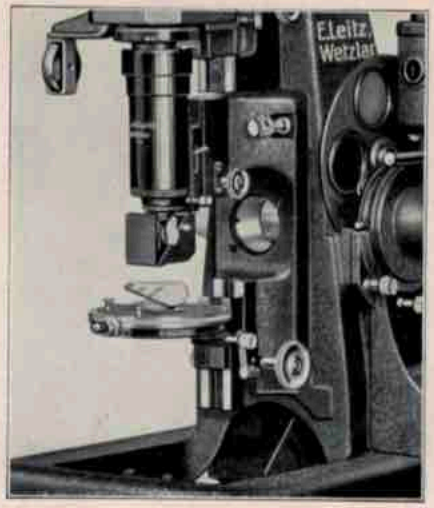


Fig. 6. Illuminator for photographing general features of polished ore specimens with the Panphot.

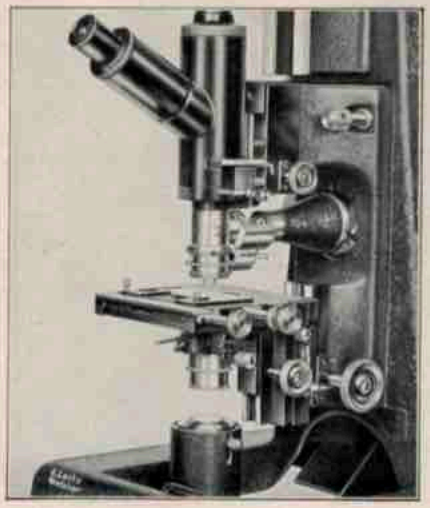


Fig. 7. Polarising "Ultropak" on the Panphot Microscope.

Mention should also be made of the **Ultropak** for incident light illumination (Fig. 7), this being interchangeable with the three-point objective changing clutch or the ordinary vertical illuminator. With the Ultropak, the light entering at right angles to the optical axis is concentrated on to the object by a ring or reflecting condenser. This method of external illumination yields images free from glare and which, depending on the structure of the object, may exhibit the characteristics of a bright field or a dark field or, occasionally, a combination of both. For this reason, the Ultropak is also termed "ultra-illumination in incident light." Of special importance is the arrangement for polarised light designed for the Ultropak; this entirely obviates flare, with the result that, in objects that are prone to set up reflexes, their structure may be detected with extreme clarity in its finest details.

Illuminating Arrangement.

The illuminating arrangement on the Panphot allows of the use of a low voltage filament lamp or an arc lamp as the source of light. A more practical arrangement is the combination of both (see frontispiece), as the low voltage lamp can then be used for visual work, and the arc lamp for photomicrography alone.

Attached to the vertical carrier of the main body of the apparatus is the revolving ground glass screen and filter holder. This contains a blue glass frosted on one side and a similar glass frosted on both sides, for obtaining a diffused light resembling ordinary daylight, together with a yellow-green filter of spectrally pure glass for photomicrography. Immediately alongside

the filter disc is the holder for the U-shaped cell, and the aspherical hard glass illuminating lens in helical focusing mount. On the mount of the illuminating lens a thread is cut, into which the housing containing the pre-centred low voltage bulb 6 volts 5 amps. is screwed. The arc lamp with clockwork feed, interchangeable with the filament lamp, is mounted on a lateral arm screwed to the baseplate. From this it may easily be detached by means of a changing slide.

When the two light sources are combined, an aspherical hard glass illuminating lens in helical focusing mount is provided for each. The diverting mirror for the vertically arranged low voltage filament lamp has a device for conveniently swinging it in and out as required.

Reflex Camera Attachment.

The camera of the Panphot has purposely been placed above the eyepiece **so as to obviate the need for a diverting mirror of large dimensions which would detract from the quality of the image.** It has a **variable bellows extension** and is normally arranged for 9x12 cm. plates. Its outfit includes a ground and a clear glass focusing screen, two metal dark slides, a rack-and-pinion motion to the lens panel for focusing photographic lenses when taking photomacrographs, a time and instantaneous shutter (arranged for speeds of $^1/_{125}$ to 1 second) with wire release, together with a focusing magnifier for controlling the sharpness of the image on the ground glass screen. A steel tape measure attached to the panel of the camera serves for reading off the bellows extension.

The reflex camera attachment which fits to the upper end of the prismatic bar, together with the mirror which may be swung out of the path of the rays by a simple movement, permits of the observation of that portion of the specimen which has just been observed in the viewing tube of the microscope, without the observer changing his position. After the mirror has been swung out, the image from the microscope passes through on to the photographic plate in the camera attachment. **The two image planes of the reflex camera attachment are adjusted in such a way that both images are equally sharp.**

For special purposes (photographing sections of the brain or of silicotic lungs), we have also constructed reflex cameras for the Panphot to take plates 13x18 cm. and 18x18 cm. The dimensions of these cameras cannot of course be adapted to those of the rest of the apparatus.

Our Camera Attachments (Macca, Makam and Micro Leica) may of course also be used in place of the camera with variable bellows extension. If a Leica camera is already available, it is merely necessary to procure the micro attachment (Codeword: "Mikas"), and, preferably, the automatic release (Codeword: "Autas"). Holders can also be supplied for attaching the slow motion camera (see Special List) or a sub-standard cinematograph camera, (e. g., Agfa or Siemens). Prices on application.

Arrangement for Photomacrography.

For taking photomacrographs the interchangeable carrier for the microscope or large object stage is removed, and in its place a wooden stage plate covered with felt is placed on the rectangular base plate of the Panphot.

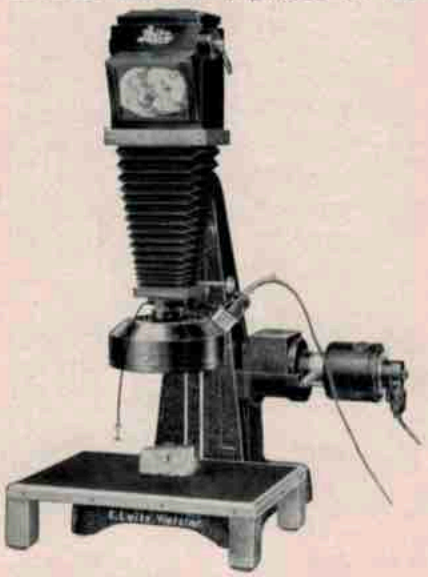


Fig. 8. Arrangement for taking photomacrographs with the Panphot.

The objects to be photographed are laid on this horizontal stage plate. The photographic lenses are screwed into the lens panel of the camera.

In order to obtain critical illumination of macroscopic objects, our **Ring Illuminator** can be attached to the camera. It is specially recommended for photographing objects with irregular orhighly reflecting surfaces. The annular arrangement of the illuminating bulbs provides illumination which is absolutely even on all sides and entirely free from reflexes. Depending on the nature of the object and the position of the illuminating arrangement, this illumination may be of the nature of bright or dark field.

Accessories for the Panphot Polarising Microscope.

The Integrating Stage for the planimetric analysis of rocks and materials can be supplied for the Panphot polarising microscope. A description of the Integrating Stage is contained in a separate catalogue. Directions for using it are also available.

The Micro Photometer can also be attached to the Panphot microscope for photometric reflection measurements. Fig. 9 shows this arrangement. A detailed description of the microscope photometer is contained in a special list. The calibration of the apparatus and the method of evaluating the measurements are fully dealt with there.

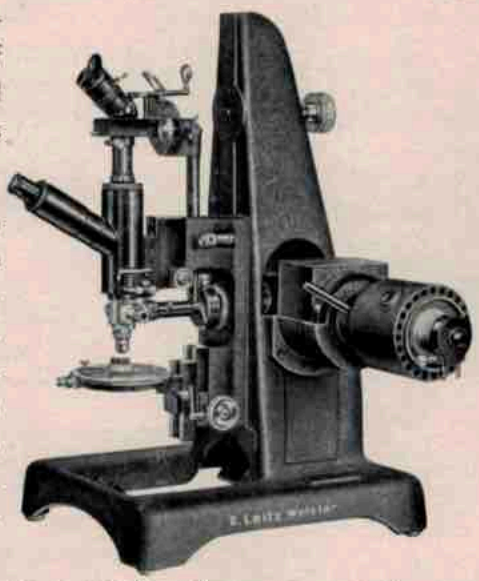


Fig. 9. Slit Micro Photometer on the Panphot for reflection measurements.

Work Table for the Panphot.

Many Panphot users have expressed the desire to have a rigid work table on which the Panphot can be erected, including lock-up drawers for storing loose accessories and optical parts. At first we felt there would be very few who would care to have a table of this kind, constructed by us; but actual experience has proved the contrary. The practical design of the table and, particularly, the fitting of a pull-out drawing board (which may be replaced by a built-in resilient table, if desired) are features much appreciated by all users. The outside dimensions of the table are shown in Fig. 10. To the basic price of the table must be added the cost of fitting the drawers, this item varying considerably with the extent of the Panphot equipment.

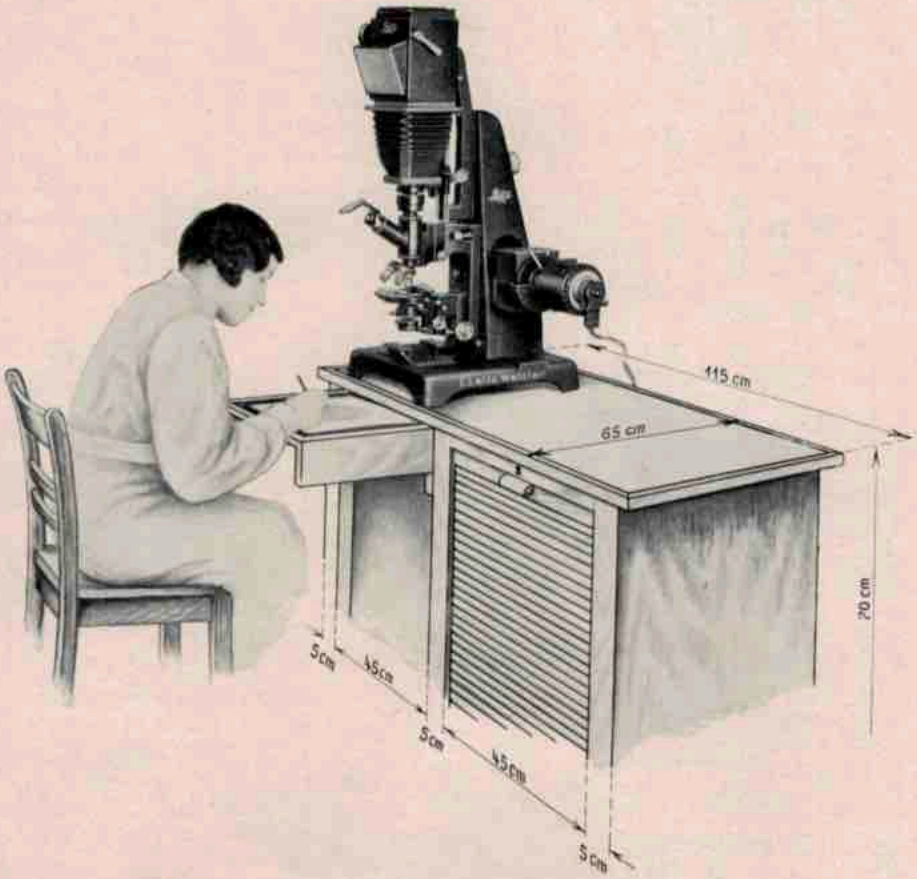


Fig. 10. Work Table for the Panphot, with pull-out drawing surface and lock-up cupboard.

Panphot outfits:

A. For work in transmitted polarised light with filament lamp illumination:

Codeword

1. **Heavy cast iron body comprising:**

The portion of the illuminating arrangement which is necessary in all cases, i. e., the aspherical hard glass illuminating lens in helical focusing mount, the holder for cooling cell and filters, and revolving filter disc with one daylight screen frosted on one side and one frosted on both sides, yellow-green filter of spectrally pure glass for photomicrography, the iris diaphragm and the light screening tube are built in on the right hand side of the column. At the height of the optical axis and within the hollow column is the revolving diverting mirror for the illuminating rays. This is provided for obtaining oblique and vertical illumination, and is operated from the outside. A fixed mirror in the lower part of the column, and a further interchangeable mirror at the front of the base complete this part of the outfit. In one with the latter mirror of smaller dimensions situated in the axis of the microscope is a focusing long-focus condenser lens. Interchangeable with this mirror is a rotating plane and concave microscope mirror for working in daylight. Light screening cover to place on the base when drawing or demonstrating micro images.

The straight front surface of the column is arranged for taking and rapidly interchanging the microscope and the large object stage respectively . . . . . **iraki**

If the Panphot microscope is equipped with the combined filament lamp and arc lamp illuminating arrangement (see p. 14), the price of the body is reduced to . . . . . *iqeti*

2a) **Light Source:** pre-centred low voltage filament lamp 6 volts 5 amps., in screw-on light-proof housing, together with plug and spare bulb . . . . . **pciib**

b) Flex with two connections, to connect the lamp to the resistance . . . . . **pdsii**

c) Flex with plug, connection and press switch *1, to connect the resistance to the mains . . . . . **beeul**

For resistances or transformer, see page 17.

3. **Microscope,** consisting of:

a) Detachable **cast iron carrier** which may be conveniently attached to the vertical column. Body with micrometer screw for the fine focusing of the image, tube changing slide for the insertion of all different types of body tubes and carriers with revolving nosepiece, Ultropak, etc. Lower part with rack-and-pinion focusing motion for the coarse focusing of the image by vertical adjustment of the interchangeable object stage **peiiz**

*1) When the transformer is used, the flex "beeul" is not required.

	Codeword
b) **Large, interchangeable polarising body** with lateral inclined **observation tube** which may be put in and out of action, with rotating, anastigmatic tube analyser reading at intervals of 5° and capable of being put in and out of action	pfiiy
c) **Large substage** with 2 aperture iris diaphragms, two-lens condenser system and polariser, on dovetail slide . . .	piisd
d) **Gypsum plate,** red 1st order, in metal mount	Kogip
e) **Mica plate**, ¼ W. L., in metal mount	Komer
f) **Objective changing clutch** *), on detachable carrier, with **3 centring collars** and slit for taking compensators . . .	piitz
g) Large, centred revolving **object stage**, diameter 120 mm, with scale, vernier and clamping screw, capable of being fixed at any height in the dovetail slide	piiue
h) Additional cost for object stage rotating on **ball bearings**	pnlii
4. **Optical Outfit:**	
a) Achromatic dry objective No. 1, free from polarisation, initial magnification × 3.2	Petta
b) Achromatic dry objective No. 3, free from polarisation, initial magnification × 10	Petri
c) Achromatic dry objective No. 6L, free from polarisation, initial magnification × 45	iazyi
d) Huyghens eyepiece × 5, with cross-lines and focusing eye-lens	piivs
e) Huyghens eyepiece × 8 with cross-lines and focusing eye-lens	piiwf
f) Huyghens eyepiece × 6 with focusing eye-lens and eyepiece micrometer, 10 mm divided into 100 parts	qiikn
5 a) **Vertical Photographic Camera** on interchangeable carrier, enabling it to be easily attached to and removed from the vertical column, with prismatic bench 40 cm (16") long, bellows for 9×12 cm plate size, rack-and-pinion motion to the lens panel for focusing the image when taking photomacrographs, time and instantaneous shutter with wire release, tape measure on holder for measuring the bellows extension, light screening tube for the microscope, one ground and one clear glass focusing screen, two metal dark slides and focusing magnifier	iqali
b) **Reflex Camera Attachment** on saddlestand for conveniently observing the image on the ground glass screen from the observer's position at the microscope	piiah
6. **Complete Outfit,** but **without** resistance for the lamp . .	qiila
7. **Accessories:**	
a) **Mechanical Stage** **), arranged for displacing the specimens in both directions up to 30 mm, to screw on to the round object stage	Pirux

*) The following can be supplied instead of the objective changing clutch:

Revolving Nosepiece with 3 independently centring objective threads, on detachable carrier, with slit for taking compensators	qiicw
Revolving Nosepiece with 4 independently centring objective threads, on detachable carrier, with slit for taking compensators	qiiop

) Cannot be used with the **quadruple nosepiece.

	Codeword
b) **Eyepiece Crossline Micrometer** with squares having sides 0.5 mm long	ickri
Ditto, with squares having sides 1 mm long	iclti
Ditto, with squares having sides 2 mm long	icmvi
c) **Bertrand Auxiliary Lens** with helical mount and diaphragm **to screw on to the eyepiece,** with setting index for different eyepieces	qiigy
d) **Bertrand Auxiliary Lens** built into the tube and capable of being put in and out of action (cannot be supplied subsequently). **Extra Price**	qiihm
B. Accessories for photographing general features of thin sections in polarised light (Fig. 4):	
1. Allowing for the use of the polariser and tube analyser of the microscope:	
Interchangeable carrier with slide and diopter lens, on which the existing analyser is placed	ipami
Intermediate sleeve for the existing polariser	ipboi
Objective 64 mm focus, on interchangeable carrier, with stage inset and condenser	ipcqi
	ipdsi
2. Allowing for the use of a new analyser and polariser:	
Interchangeable carrier, with slide, diopter lens and analyser	ipeui
Slip-in polariser	ipsvi
Intermediate sleeve for the polariser	ipboi
Objective 64 mm focus, on interchangeable carrier, with stage inset and condenser	ipcqi
	ipkei
C. For work in incident polarised light:	
1. **Heavy cast iron body**, consisting of: Obelisk-shaped column, ending in a broad frame-shaped foot, with the revolving filter disc with one daylight screen frosted on one side and one frosted on both sides, yellow-green filter of spectrally pure glass for photomicrography. At the level of the optical axis and within the hollow column is the revolving diverting mirror for obtaining vertical and oblique illumination; this may be operated from the outside. A fixed mirror in the lower part of the column completes this portion of the outfit	iudni
2. **Combined Filament Lamp and Arc Lamp Illuminating Arrangement** (Alternative illumination):	
a) Low voltage lamp 6 volts 5 amps. with aspherical hard glass illuminating lens in helical focusing mount, iris diaphragm and swing-out diverting mirror, cooling cell with heat absorbing filter, a second aspherical hard glass illuminating lens in helical focusing mount and iris diaphragm for the arc lamp, on carrier	qyiik
b) Flex with 2 connections, to connect the lamp to the resistance	pdsii

	Codeword
c) Flex with plug, connection and press switch *), to connect the resistance to the mains . . . . . For resistances and transformer, see page 17.	**beeul**
d) Large Arc Lamp with clockwork feed, for 10 amps. D. C. or 15 amps. A. C. with flex, plug and connection, to connect the lamp to the mains and the resistance . . . . For resistances and carbons, see page 17.	**iwaei**
3. **Microscope** consisting of:	
a) **Detachable cast iron carrier** which may be conveniently attached to the vertical column. Body with micrometer screw for the fine focusing of the image. Tube changing slide for the insertion of the polarising body and the vertical illuminator or the three-point changing clutch on carrier. Lower part with rack-and-pinion focusing motion for the coarse focusing of the image by vertical adjustment of the interchangeable object stage	**peiiz**
b) **Large interchangeable polarising body** with lateral inclined **observation tube** which may be put in and out of action, with rotating, anastigmatic tube analyser (which may be put in and out of action) reading at intervals of 5°	**pfiiy**
c) **Large Vertical Illuminator** on detachable carrier, with compensating prism and plane glass plate in changing device, with iris diaphragm and focusing illuminating lens. **Objective changing and centring device** with slit to take compensators, **4** centring collars, and **polariser** to slip in the light-entrance tube of the vertical illuminator	**qcpii**
d) **Collecting lens** with iris diaphragm and half stop, together with device for oblique illumination, to obtain images free from glare. On spring clips	**iqpoi**
e) **Illuminator for photographs of general features,** on detachable carrier, with plane glass plate **) and intermediate collar for 50 mm Milar. In case	**piiyg**
For above item: **Wide interchangeable tube** without eyepiece sleeve and with **light screening collar** for connecting to the camera when photographing without an eyepiece .	**iponi**
f) Large centred revolving **object stage**, diameter 120 mm, with scale, vernier and clamping screw, capable of being fixed at any height in the dovetail slide	**piiue**
g) Additional cost for object stage rotating on **ball bearings**	**pnlii**
4. **Optical Outfit:**	
a) Milar 50 mm, F/4.5, with iris diaphragm, for photographing general features	**puzii**
b) Achromatic dry objective No. 1 b, free from polarisation, initial magnification × 5.5	**iicvo**
c) Achromatic dry objective No. 3b, free from polarisation, initial magnification × 16.5	**iicwq**
d) Achromatic oil immersion 8 mm, free from polarisation, initial magnification × 25	**iiczw**
e) Fluorite oil immersion 1/12 a, free from polarisation, initial magnification × 60	**iidax**
*) When the transformer is used, the flex "beeul" is not required.	
) For oblique illumination we can supply: **Plane Mirror on interchangeable carrier	**iprti**

	Codeword
f) Huyghens eyepiece × 5 with cross-lines and focusing eye-lens	piivs
g) Huyghens eyepiece × 8 with cross-lines and focusing eye-lens	piiwf
h) Huyghens eyepiece × 6 with focusing eye-lens and eyepiece micrometer, 10 mm divided into 100 parts	qiikn
i) Periplanatic Eyepiece × 8	Perot
5 a) **Vertical Photographic Camera** on interchangeable carrier, enabling it to be easily attached to or removed from the vertical column, with prismatic bench 40 cm (16") long, bellows for 9 × 12 cm plate size, rack-and-pinion motion to the lens panel for focusing the image when taking photomacrographs, time and instantaneous shutter with wire release, tape measure on holder for measuring the bellows extension, light screening tube for the microscope, one ground and one clear glass focusing screen, two metal dark slides, and focusing magnifier	iqali
b) **Reflex Camera Attachment** on saddle stand for conveniently observing the image on the ground glass screen from the observer's position at the microscope	piiah
6. **Hand press** for levelling specimens	Mepux
7. **6 Metal object slides,** ground plane	iwmbi
8 **Complete Outfit,** but **without** resistance for the lamp	iseri

D. Accessories for taking photomacrographs of polished specimens in incident light (Fig. 8):

1. **Wooden Stage,** (Fig. 8), covered with black felt, to hold the object, for placing on the base plate of the Panphot	piiob
2. **Macro Ring Illuminator** on holder, with short bench and saddle stand, for displacing along the prismatic bench, with 12 low voltage bulbs 8 volts 0.6 amps. connected in series, with annular opal glass disc in changing mount, reflector I, intermediate collar, flex with plug and connection, and circuit tester for testing the bulbs For resistance for connecting this illuminating device to the mains, see page 17.	piiqc
3. **Optical Outfit:**	
Milar F/4.5, 10 cm focus, with iris diaphragm	pqrii
Milar F/4.5, 8 cm focus, with iris diaphragm	priin
Milar F/4.5, 65 mm focus, with iris diaphragm	prtii
Milar F/4.5, 40 mm focus, with iris diaphragm	psiim
Milar F/4.5, 30 mm focus, with iris diaphragm	psvii

E. Accessories for work in incident light with the Ultropak (Fig. 7):

Ultropak with sector diaphragms, ground glass discs and glass filters, on detachable centring carrier	plgii
Illuminating Attachment to screw to the Ultropak	agnee

In place of the ordinary Ultropak, we can supply one with a polarising arrangement. This differs from the former by the built-in filter-polariser rotating through 45° and which may be put in and out of action. The polarising arrangement on the Ultropak completely eliminates all traces of glare and enables the objects to be observed with wonderful clarity in their natural colours.

	Codeword
Extra Price for the Ultropak with **Polariser (cannot be supplied subsequently)**	**qkiiw**
Case for above	**iqhzi**

For details regarding the Ultropak accessories, please refer to the main Ultropak list, which deals at length with the optical parts of the Ultropak.

F. Accessories for Photometric Measurements (Fig. 9):

Photometer Head with wide clearance, illuminating tube with adjustable slit and polariser for placing in front of the vertical illuminator; tubular distance piece; 10 sheets of diagram paper; set of light filters with the optical centres of gravity close to Fraunhofer lines C, D and E	**isbli**

G. For using a Universal Rotating Stage:

Removable ring stage plate to the revolving object stage "piiue"	**Ringa**
Condenser with mirror, on slide	**isdpi**

H. Electrical Accessories for the Panphot:

Resistances and spare bulbs for the low voltage filament lamp 6 volts 5 amps.:

For Alternating Current:	
Regulating Transformer for 110/220 volts, with ammeter	**Redyx**
Transformer, without regulation, for 110 and 220 volts	**rakee**
For Direct Current:	
Resistance for 110 volts, with additional regulating resistance and ammeter	**Rekur**
Resistance for 220 volts, with additional regulating resistance and ammeter	**Regam**
Fixed Resistance for 110 volts	**Redig**
Fixed Resistance for 220 volts	**Reduk**
Spare bulb with pre-centred socket, 6 volts 5 amps.	**atiih**

Resistances and Carbons for the Arc Lamp (10 and 15 amps.):

Resistance for 10 amps., 110 volts D. C.	**bpcii**
Resistance for 10 amps., 220 volts D. C.	**bqeii**
Resistance for 15 amps., 110 volts A. C.	**bqiin**
Resistance for 15 amps., 220 volts A. C.	**brgii**
100 Pairs of Carbons for D. C.	**bsiil**
Positive cored carbon 8 × 135 mm	
Negative cored carbon 8 × 110 mm	
100 Pairs of Carbons for A. C.	**btiik**
Solid carbon 8 × 135 mm	
Cored carbon 10 × 110 mm	
For the Ring Illuminator:	
Regulating Resistance for 110/220 volts, with ammeter	**aniio**
Spare bulb, 8 volts 0.6 amps.	**Lisey**
Flex with coupling and plug to connect the resistance to the mains, 5 ft. long	**wiiuv**
Spare U-shaped glass cell	**qiiav**
Heat protecting immersion filter for the cell	**bvpii**

Optical Data of the Microscope Objectives.

Notation			Codeword	Initial Magnification	N. A.	Free working distance mm	
Achromats	Dry lenses	P 1 *	Pekru	2.7	0.08	40	
		P 1	Petta	3.2	0.12	34.5	
		P 1 b	iaywi	4.3	0.15	27	
		P 2	Petme	6	0.20	16	
		P 3	Petri	10	0.25	5.8	
		P 4	Petku	20	0.45	2.0	
		P 5	Petoy	30	0.65	0.75	
		P 6	Petex	45	0.85	0.32	
		P 6 L	iazyi	45	0.65	0.60	
		P 7	Petis	62	0.85	0.28	
		P 7 Corr.	ibazi	62	0.85	0.28	
	Water Immersion	P 1/2 W	ibhoi	50	1.00	0.40	
		P 10	Pewat	90	1.20	0.10	
	Oil-Immersion	P 16 mm	ibcdi	10	0.25	0.65	
		P 8 mm	ibdfi	22	0.65	0.45	
		P 1/12	Pelim	100	1.30	0.11	
Fluorite Systems	Oil-Immersion	1/7 a	Pefam	54	0.95	0.20	
		1/10 a	Pefox	70	1.30	0.18	
		1/12 a	Pefun	95	1.32	0.11	
		1/16 a	ibehi	114	1.32	0.08	

Objectives for Ore Microscopy.

Of the standard objectives, only P 1 and P 2 can be used as they stand for ore microscopy. Otherwise special objectives are required, these having short mounts and being corrected for a tube length of 215 mm and for use without cover glass. They are listed in the following table:

Notation	Initial Magnification	N. A.	Codeword	
Achromat 1 b	5.5	0.15	iicvo	
Achromat 3 b	16.5	0.40	iicwq	
Fluorite objective 6 a	45	0.85	iicxs	
Oil immersion 16 mm	12.5	0.25	iicyu	
Oil immersion 8 mm	25	0.65	iiczw	
Fluorite oil immersion 1/7 a	60	0.95	iidax	
Fluorite oil immersion 1/10 a	80	1.30	iidbz	
Fluorite oil immersion 1/12 a	105	1.32	iidcb	
Fluorite oil immersion 1/16 a	120	1.32	iidef	

Objective centring Collar . . . . . Pizut

Eyepieces.

The eyepieces adapted for use with polarising microscopes are mostly those of the Huyghens type. In all eyepieces serving for the reception of cross-lines or micrometers, the eye-lens can be focused on to the cross-lines or micrometer by turning the milled edge of the eyepiece. When used in conjunction with objectives of higher power (from No. 4 upwards), the quality of the image may be enhanced by using Periplanatic eyepieces. Low-power objectives, however, should be used with Huyghens eyepieces only.

Huyghens Eyepieces.

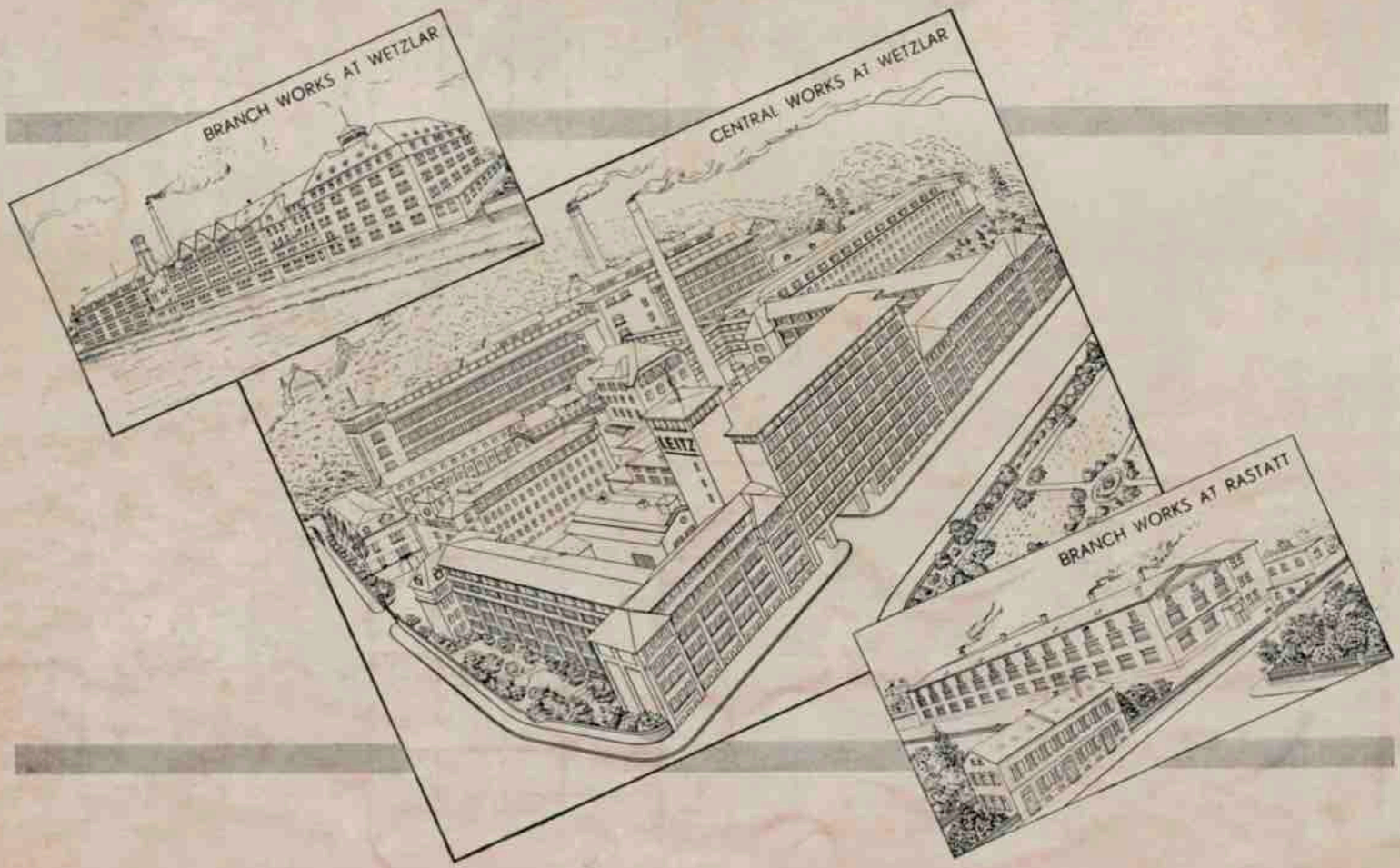
Notation and initial magnification	P×4	P×5	P×6	P×8	P×10
Codeword	**ibksi**	**iblui**	**ibmwi**	**ibnyi**	**ibpci**
Price					

Periplanatic Eyepieces.

Notation and initial magnification	P×4	P×5	P×6	P×8	P×10
Codeword	**Periv**	**Perfu**	**Perse**	**Perot**	**Pezen**
Price					

For Eyepieces of either type:

Focusing eye-lens and cross-lines for one eyepiece. Additional Price: **Pefil**



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May 1, 1939

E. LEITZ, Inc.
730 Fifth Ave.
New York City

Price List for Catalog No. 7737
PANPHOT - Combination of
Polarising or Ore Microscope
and Reflex Camera

Code Word	Price $
Page 12	
iraki	200.00
iqeti	150.00
pciib)	
pdsii)	40.00
beeul)	
peiiz	98.00
Page 13	
pfiiy	164.00
piisd	126.00
Kogip	4.75
Komer	4.00
piitz	36.00
piiue	45.00
pnlii	20.00
Petta	9.00
Petri	11.50
iazyi	20.75
piivs	7.50
piiwf	7.50
qiikn	10.00
iqali) See note	107.00
piiah) on pg. 3	77.00
qiila	1138.00
Pirux	57.50
qiicw	34.00
qiiop	40.00
Page 14	
ickri	5.20
iclti	5.20
icmvi	5.20

Code Word	Price $
Page 14	
qiigy	10.00
qiihm	20.00
ipami	42.00
ipboi	2.50
ipcqi	28.00
ipdsi	72.50
ipeui	108.00
ipsvi	45.00
ipboi	2.50
ipcqi	28.00
ipkei	183.50
iudni	120.00
qyiik	245.00
pdsii	8.00
Page 15	
beeul	4.00
iwaei	59.00
peiiz	98.00
pfiiy	164.00
qcpii	106.00
iqpoi	27.00
piiyg	37.00
iponi	11.00
piiue	45.00
pnlii	20.00
puzii	34.00
iicvo	9.00
iicwq	15.00
iiczw	40.00
iidax	52.00
iprti	13.50

Code Word	Price $
Page 16	
piivs	7.50
piiwf	7.50
qiikn	10.00
Perot	8.25
iqali	)See note-107.00
piiah	)on pg.3 - 77.00
Mepux	13.00
iwmbi	6.50
iseri	1324.75
piiob	7.00
piiqc	72.00
pqrii	38.00
priin	35.00
prtii	34.00
psiim	34.00
psvii	34.00
plgii	38.50
agnee	13.50
Page 17	
qkiiw	17.00
iqhzi	5.00
isbli	400.00
Ringa	2.00
isdpi	17.50
Redyx	18.00D
rakee	Discontinued
Rekur	44.00
Regam	52.00
Redig	11.50
Reduk	17.00
atiih	3.50*
bpcii	17.50
bqeii	24.50
bqiin	17.50
brgii	24.50
bsiil	12.00
btiik	12.00
aniio	25.00
Lisey	.75*
wiiuv	3.00

Code Word	Price $
Page 17	
qiiav	12.00
bvpii	2.00
Page 18	
Pekru	7.50
Petta	9.00
iaywi	9.00
Petme	9.00
Petri	11.50
Petku	17.50
Petoy	17.50
Petex	20.75
iazyi	20.75
Petis	24.50
ibazi	36.50
ibhoi	42.00
Pewat	57.00
ibcdi	30.00
ibdfi	40.00
Pelim	45.00
Pefam	52.00
Pefox	72.50
Pefun	78.00
ibehi	95.00
iicvo	9.00
iicwq	15.00
iicxs	40.00
iicyu	30.00
iiczw	40.00
iidax	52.00
iidbz	72.50
iidcb	78.00
iidef	Discontinued
Pizut	5.50
Page 19	
ibksi	3.50
iblui	3.50
ibmwi	3.50
ibnyi	3.50

Code Word	Price $	Code Word	Price $
Page 19		Page 19	
ibpci	3.50	Perot	8.25
Periv	8.25	Pezen	11.50
Perfu	8.25	Pefil	4.00
Perse	8.25		

NOTE:

Pages 13 and 16 - The Camera and Reflex Camera Attachment regularly furnished with the PANPHOT are arranged for a plate size of 3¼ x 4¼". If desired, we can furnish a camera and reflex camera attachment arranged for a plate size 5 x 7" as follows:

Vertical Photographic Camera as described under code word "iqali", but for plate size 5 x 7". $153.00

Reflex Camera Attachment as described under code word "piiah", but for plate size 5 x 7". $126.00

Prices Are Subject to Change Without Notice.

M-608