#### RESPONSIBILITY FOR DELIVERY

Bausch & Lomb Optical Company guarantees that every instrument is in perfect condition when it leaves the factory. When the transportation company accepts the shipment in good order, our responsibility ceases, and the transportation company becomes the consignee's agent insofar as assurance of safe delivery is concerned.

If shipment shows evidence of rough handling on the outside of the packing case, have the agent make a notation on receipt "Received in Bad Order"; or, if there is no external evidence of rough handling, but "Concealed Damage" is revealed after unpacking, call the representative of the transportation company within 48 hours of the delivery of shipment and have him make out a "Bad Order" report. Unless this procedure is followed, you lose all right to recovery from the carrier.

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Bausch & Lomb Optical Company guarantees the instruments manufactured by it to be made of the best materials by skilled craftsmen, free from defects in material and workmanship under normal use and service.

If an instrument manufactured by Bausch & Lomb Optical Company proves defective in material or workmanship, a satisfactory adjustment will be made. This guarantee does not cover damage in transit, damage caused by carelessness, misuse or neglect, or unsatisfactory performance as a result of conditions beyond the control of the manufacturer. Claims for adjustment must be made to the Company within thirty days from date of delivery.

BAUSCH & LOMB OPTICAL COMPANY Rochester 2, N. Y., U. S. A.

# BINOCULAR OPHTHALMOSCOPE AND HILDRETH MERCURY LAMP



Stereoscopic Study of the Fundus

BAUSCH & LOMB OPTICAL CO., ROCHESTER 2, N. Y., U. S. A.



The Bausch & Lomb Binocular Ophthalmoscope in Use

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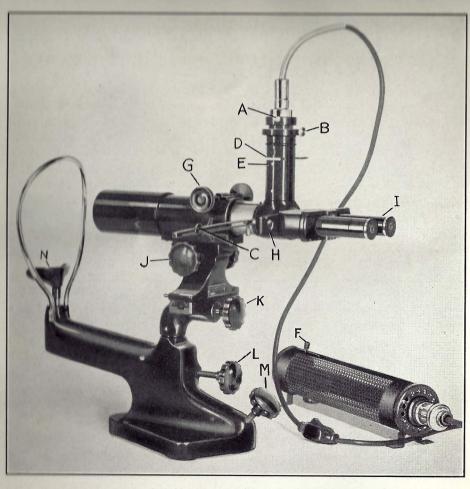


Figure 1

Bausch & Lomb Binocular Ophthalmoscope

A Lamp Socket Set Screw

B Lamp House Adjustment Screw

C Fixation Target

D Filter Slide

E—Iris Diaphragm

F Resistance Slide Adjustment Knob M-Elevating Knob

G Focusing Knobs

H-Auxiliary Lens Slide

I—Binocular Eyepiece

J-Longitudinal Adjustment Knob

K-Lateral Adjustment Knob

L-Chin Rest Adjustment

N-Chin Rest

# Stereoscopic Study of the Fundus

A comprehensive examination of the eye requires a complete study of the retina. For such fundus conditions as papillitis, choked disc, and retinal tears; for studying the physiologic and pathologic cuppings of the disc, an instrument is necessary that makes it possible to obtain a magnified, stereoscopic view of the fundus showing in the finest detail the exact surface topography.

The Bausch & Lomb Binocular Ophthalmoscope was designed for the purpose of obtaining the best possible view of the eye ground. The instrument was designed primarily to give stereoscopic perception of depth and high magnification with brilliant illumination.

While the design of the instrument is centered on the stereoscopic perception of depth, many other features were taken into consideration so that the final instrument gives the greatest possible aid to fundus examination with the least possible amount of manipulation and adjustments.

#### LARGE STEREOSCOPIC VIEW

The field of view of the instrument is extremely large, permitting the viewing of the nerve head and fovea simultaneously. This field is approximately four times as large as can be seen with the hand ophthalmoscope, yet as in the hand ophthalmoscope the image is erect and magnified about fifteen diameters.

While a large field of view is invaluable for rapid observation of the fundus and localization of particular portions for detail study, it is sometimes advantageous to be able to reduce the size of the illuminated field to the area that it is desired to study in detail. For this purpose an iris diaphragm has been incorporated in the optical system of the instrument whereby the size of the field can be controlled.

#### INTENSE ILLUMINATION

Fundus examinations are of extreme importance in all cases, especially where the media of the eye is somewhat cloudy. It is for such cases that the Binocular Ophthalmoscope has been equipped with an illumination system that produces intense illumination. The illumination is uniform as well as intense, and means are provided whereby the intensity can be controlled to suit every case. Gross reduction in illumination is obtained by the use of a central filter, while finer gradation of intensity is accomplished by an adjustable resistance.

#### RED-FREE FILTER

There are many advocates of the use of red-free light for the investigation of blood vessels and hemorrhages that are invisible in ordinary illumination. To provide for examination of the eye ground in red-free light, a filter has been incorporated in the illuminating system that absorbs the red rays. The resulting light is red-free, but the intensity is sufficient to permit a detailed examination of the fundus.

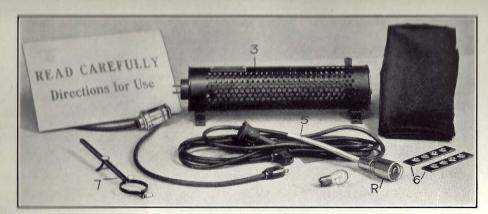


Figure 2

Accessory apparatus that is included with the instrument

# FOR ALL REFRACTIVE ERRORS

In many cases the refractive error of the patient is great enough to cause difficulty in the ophthalmoscopic examination. In the Binocular Ophthalmoscope two auxiliary slides are used to correct the refractive errors over a range of plus twenty to minus twenty diopters. Fine adjustment of focus is always available so that accurate focus is possible over all ranges.

# SIMPLICITY OF MANIPULATION

Simplicity and ease of operation are salient features in the new ophthalmoscope. The instrument is complete and can be easily used on any adjustable table. The base has been made so that it can be fastened to

the arm of the Hydraulic Instrument Stand, and an examination of the fundus can be made without the necessity of the patient moving from one part of the refracting room to another.

All the controls on the instrument are conveniently placed and may be speedily and easily adjusted. The operation of the instrument is practically as simple as the operation of the hand instrument but the magnificent stereoscopic view resulting increases the value of ophthalmoscopy beyond measure.

The Binocular Ophthalmoscope, to conclude, is an ideal instrument for careful study of the eye ground. It is designed for this purpose, just as the Universal Slit Lamp is calculated for diagnosis of the anterior portions of the eye.

#### CHAPTER II

# Specifications

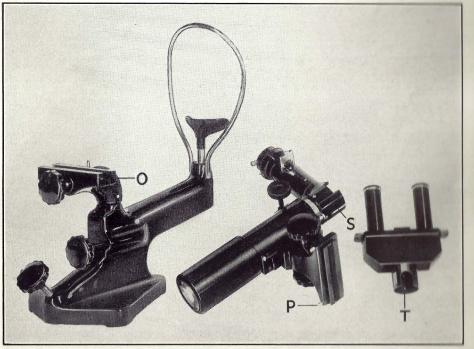
The complete Bausch & Lomb Binocular Ophthalmoscope, Cat. No. 71-63-40-21, consists of various component parts. The equipment is as follows:

- 1—Ophthalmoscope with base (including two auxiliary lens slides, one filter slide, and one head and chin rest).

  1—Fixation Device
  1—Binocular Eyepiece
  2—10× Eyepieces
  71-63-25
  2—Lamps, 6-8 volts, 15 c.p. 31-31-32
  1—Cloth Cover
  71-91-20
- 1—Adjustable Resistance, with cord and lamp socket.
- 1—Directions for use.

The Binocular Ophthalmoscope may be used with either alternating or direct current.

The bulb, listed with the above equipment, is a Mazda bulb, of 6-8 V. and 15 c. p., No. 88, and has a double contact bayonet base. It is an ordinary automobile headlight lamp.



Base

Ophthalmoscope
Figure 3
Ophthalmoscope dismantled for shipment

Eyepiece

The instrument is normally supplied with 10× eyepieces. These, combined with the optical system of the instrument itself, produce a magnification of fifteen times. Should greater magnification be desired it is possible to substitute any of the regular Huygenian eyepieces, to which series the standard 10× eyepieces belong. These eyepieces are as follows:

Paired Huygenian Eyepieces, for Binocular Ophthalmoscope, 15×

Paired Huygenian Eyepieces, for Binocular Ophthalmoscope, 20×

With the  $15 \times$  eyepieces a magnification of 22.5 times is obtained, while a magnification of 30 times is obtained with the  $20 \times$  eyepieces.

#### CHAPTER III

# Unpacking and Assembling

#### TO UNPACK

In order to safeguard the Binocular Ophthalmoscope during shipment, it has been dismantled into several parts, and packed in this form. The three main parts, as illustrated in Figure 3, are:

The Base

The Ophthalmoscope

The Eyepiece.

The equipment is thoroughly surrounded with packing material to prevent abuse of any nature during shipment. It would be well to make sure that no part of this material adheres to the instrument. Once clean it is possible to proceed with the assembling.

#### TO REASSEMBLE

For ease and correctness of procedure in assembly it is necessary to bear certain features in mind. These are illustrated in Figures 2 and 3, and are as follows:

O-Slide for Rack

P-Stop Pin

R—Lamp Socket

S-Slot for Pin "T" on Eyepiece Tube

T—Pin on Eyepiece Tube

To reassemble, the first step is to unscrew the pin, P. There is a pin at either end of this assembly, one of which will be loose. This is the pin to unscrew. The rack will now fit into the slide, O. When the rack is

squarely in place, replace the pin, P, and tighten it securely.

The eyepiece is now placed in the end of the observation tube so that the pin, T, on the eyepiece tube engages in the slot, S, of the observation tube. The eyepiece does not have a fastening screw. It is held in the observation tube by the slight outward spring of the eyepiece tube.

The final operation in the assembly is to slide the lamp socket, R, into the upper end of the lamp housing and tighten screw A. This operation is illustrated in Figure 5. The cord of the Adjustable Re-

sistance is now connected to a 110-120 volt lighting circuit.

#### TO SECURE FIXATION DEVICE

To attach the fixation device to the Binocular Ophthalmoscope, remove the two knurled knob screws. Spread the arms apart and place it on the ophthalmoscope barrel, as shown in Figure 4. When the device is in position, replace the screws and tighten. The screws should only be tightened sufficiently to hold the device securely. It should be free to be easily rotated around the ophthalmoscope tube.

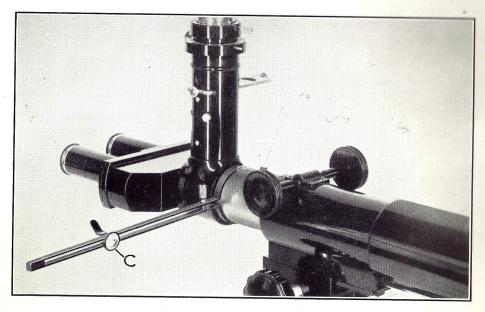


Figure 4
Fixation Device in Position
C—Fixation Target

# Adjustment of the Instrument

#### Adjustment of Lamp

The Binocular Ophthalmoscope should be used in a semi-dark room.

The adjustment of the illumination is all that is necessary preliminary to the use of this instrument.

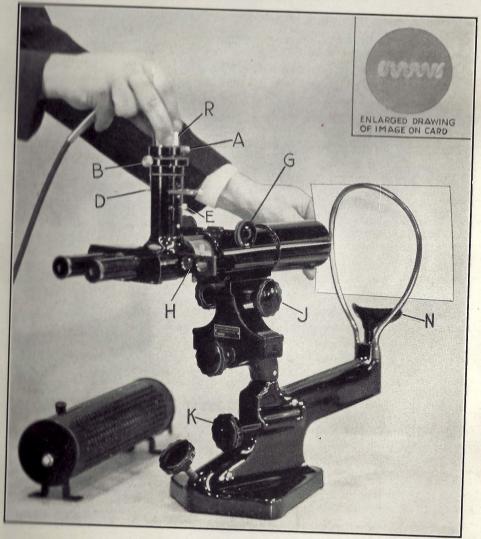


Figure 5
Adjustment of Ophthalmoscope

Loosen the set screw A, and push down the lamp socket R carefully as far as it will go. Hold a piece of paper about six inches in front of the instrument and on this will be seen an image of the filament in a faintly illuminated circular spot of light. This image will take the form of a bright band in the faint circle of light.

The iris diaphragm should be completely open, in position nearest patient, and the filter slide D should be removed. Turn the lamp housing R until the filament image is horizontal. By the adjustment of the screw B, center the filament image in the circular spot.

Should it be impossible to get the filament image centered and horizontal, the trouble is probably due to a decentration of the filament in the Mazda lamp. In this case it is only necessary to turn the lamp socket through one hundred eighty degrees and then complete the adjustment.

The lamp socket is then raised without rotation until the circular spot is evenly filled with light, and then screw A is tightened. Should one edge of the circle be slightly dark, adjust Screw B slightly to eliminate the shadow.

For a critical adjustment of the lamp, close the iris diaphragm (E). Hold the card at the focal point of the instrument near the head rest, in a plane in which the patients' eyes will be. A sharp faint circle of light about 4 mm in diameter will

be seen. A bright horizontal image of the filament will be seen in this circle. The horizontal image of the filament should be in the center of the circle or slightly above the center. Adjust by means of set screw B.

### **Accessory Adjustments**

#### 1. Intensity of Illumination.

The intensity of the illumination can be varied by changing the position of the slide F, Fig. 1, on the adjustable resistance. When the patient's pupil is undilated, best results can be obtained with low illumination.

Filter Slide D should be placed in position with notches in front of the slide. It contains a neutral and a red-free filter. The neutral filter reduces the illumination and the green colored filter is supplied for "Red-Free Ophthalmoscopy."

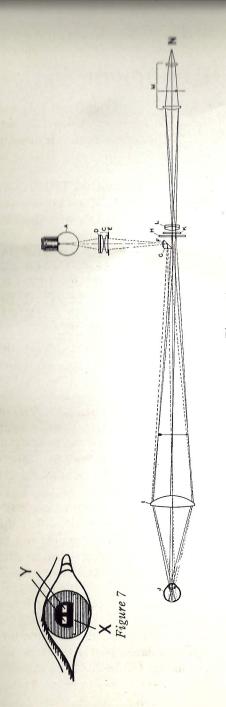
#### 2. Size of Field.

The size of the field can be changed by means of the iris diaphragm, E, from a field which includes both the disc and the macular region to a field about the size of the disc.

#### 3. Auxiliary Lens Slides.

Two auxiliary lens slides are supplied with the instrument. The slide should be placed in the instrument with notches on top and the numbers toward the operator, such that the open aperture is in position. The table showing with what refractive errors each lens should be used is on page 14.





# Optical System for the B & L Binocular Ophthalmoscope

# Use of the Instrument

#### The Examination

For an examination with the Ophthalmoscope the patient must be seated comfortably with the chin in the rest N, and the head held firmly against the head rest. The Chin Rest Adjustment Knob L, Fig. 1, raises or lowers the chin rest to position for different patients. The patient should be requested to look at the fixation target, C, (Fig. 4) with both eyes.

To observe the optic disc of the right eye of the patient, place the fixation device on the opposite side of the instrument. The fixation target (C) should be about one-third the way out on the arm.

With the patient seated comfortably and the binocular eyepieces set for the interpupillary distance of the observer, the light is then turned on.

THE PRELIMINARY ADJUST-MENTS SHOULD BE MADE WHILE LOOKING DIRECTLY AT THE EYE TO BE EXAMINED AND NOT THROUGH THE OPHTHALMOSCOPE. These adjustments should be made with the slit image directed on the iris of the patient's eye, as follows:

- 1. Direct the slit image of light on the iris by the Elevating Knob (M), and the Lateral Adjustment Knob (K), Fig. 1.
- 2. Rack the Ophthalmoscope backward or forward by the Longitudinal Adjustment Knob (J) until the slit image of light is sharply focused on the iris.

- 3. With Elevating Knob (M) and Lateral Adjustment Knob (K), adjust this slit image until it is directly below and centered with respect to the pupil.
- 4. NOW LOOKING THROUGH THE OPHTHALMOSCOPE, raise the instrument slightly with the Elevating Knob (M) until the fundus comes into view. IN ORDER TO OBTAIN THE BEST IMAGE OF THE FUNDUS, THE SLIT IMAGE OF THE LIGHT MUST BE FORMED ON THE LOWER EDGE OF THE PUPIL.
- 5. Focus with Knob G for fine detail of the fundus picture. (Use knob on opposite side from fixation device).

For errors larger than +5.00D or -5.00D, an auxiliary lens is used. Refer to table under the heading of "Auxiliary Lens Slides" on page 14 for correct auxiliary lens used for a given refractive error.

When focusing, the fundus picture may become blurred with a flare appearing in the field so that it will be necessary to again slightly adjust with the Longitudinal Adjustment Knob (J). This is especially true with undilated pupils. With dilated pupils this adjustment is not so critical. It is recommended for critical observation with undilated pupils that the iris diaphragm (E) be closed to approximately two-thirds of the full field.

By moving the fixation target (Fig. 1) along the arm of the device, and by revolving the arm, the pa-

With the target about one-third of the way out on the arm, the optic disc is centered in the field. If the target is moved close to the body of the ophthalmoscope, the macular region becomes centered in the field.

#### **Auxiliary Lens Slides**

If proper focus cannot be obtained with the total movement of the instrument in cases of considerable refractive error, one of the supplementary lenses must be used. These are mounted in two slides, one marked "A" the other marked "B". The following table shows the range of refractive errors for which each auxiliary lens is used:

Auxiliary Lenses Refractive Error Slide "A"

0.00	-5.00  to + 5.00
-2.00 D	-14.00 to $-16.00$
-2.25 D	-16.00 to $-20.00$
+2.50 D	+12.00 to $+20.00$
Slide "B"	
0.00	-5.00  to + 5.00
-075 D	5 00 to 10 00

0.00	-5.00  to + 5.00
-0.75 D	-5.00 to $-10.00$
-1.50 D	-10.00 to $-14.00$
+1.25 D	+ 5.00 to $+$ 12.00

#### Possible Difficulties

a. Complete field not seen with both eyes.

Interpupillary separation between the eyepieces may not be correct. Instrument may not be centered with respect to the patient's eye. The examiner should close each eye alternately and center the instrument with the Lateral Adjustment Knob K. If the patient's pupil is extremely small, it may be impossible to get a binocular picture and it will be necessary to observe the image through one eyepiece. A pupil 3mm in diameter is about the minimum with which a binocular image is possible.

b. Flares of light in the field.

This is due to reflections from the cornea and can be eliminated by proper adjustment of the filament image, controlled by Longitudinal Adjustment Knob J, and Elevating Knob M.

c. Illumination too intense.

The intensity of the illumination can be controlled by the moderating filter in the slide, D, and by adjusting the Rheostat with Knob F.

d. Field too small.

Caused by the iris diaphragm, E, being closed.

e. Image in focus for one eye and not for the other eye of the observer.

The observer should wear his own correction when using the instrument. The design of the instrument makes this possible. In case the condition still exists, an adjustment is necessary.

With the patient away from the front of the instrument, focus on an object some distance away with one eye. Pull the eyepiece before the other eye out slightly until the object is in sharp focus for that eye. Leave the eyepiece in this adjustment for using the ophthalmoscope.

Figure 7 (Page 12), indicates the relative position of the slit of light X and the portions of the pupil, Y, through which the light passes when observing the fundus.

# Hildreth Mercury Lamp

The complete Hildreth Mercury Lamp, catalog No. 71-63-44-66, is composed of the No. 71-63-44 lamp attachment with transformer and the No. 71-71-66 mercury vapor lamp of 400 volts and 85 watts.

The recent development of a small, compact Mercury Lamp with a light source of high intrinsic brilliance has made it possible to use a mercury light in the Binocular Ophthalmoscope. Several advantages attach to this type of light. By far the major portion of the light consists of three pure colors, vellow, green, and blue. Since these colors are pure, that is, consist of a very narrow wave length and are well separated in wave length from one another, it is possible to use filters to obtain high intensity light of a single pure color.

The fundus details become greatly sharpened when viewed under mercury illumination. Mercury illumination has a distinct advantage over ordinary illumination for careful study of fundus structure and in distinguishing certain conditions. In the diagnosis of toxic amblyopia, for example, there may be a question of partial optic nerve atrophy. From visual field studies and ordinary ophthalmoscopy it is impossible to determine the condition of the nerve fibers in the retina. When the retina is examined with the mercury illumination, the normal nerve fibres are visible, but in atrophy they are invisible and diagnosis can thus be accurately made.

Other conditions, also, may be more readily distinguished by this special illumination. Capillary invasion can be seen with this light that cannot be seen with white light, which may aid in the early diagnosis of carcoma of the choroid.

The macula lutea truly becomes the yellow spot. Senile macular degeneration, hole in the macula, and all macular changes stand out vividly in monochromatic yellow light. Probably mercury illumination's greatest usefulness lies in the study of the macula. This most important spot becomes a distinctive three dimensional structure newly appreciated when viewed through the Binocular Ophthalmoscope with Mercury Illumination.

#### Adjustment of the Lamp

Referring to figure 5, screw "A" is loosened and the regular lamp socket "R" is removed from the instrument. The mercury attachment is put in place of the regular assembly.

The lamp socket is removed by loosening screw "C" and the Mercury Vapor Lamp is installed by screwing into the socket. (Be sure to screw in firmly.) The lamp and the socket are now held beside the housing in the same position that they will occupy when in the housing (See Figure 9). The small, inner bulb of the lamp is centered approximately over the supporting tube. Note on bushing "V" how far it must be pushed into the housing to insure

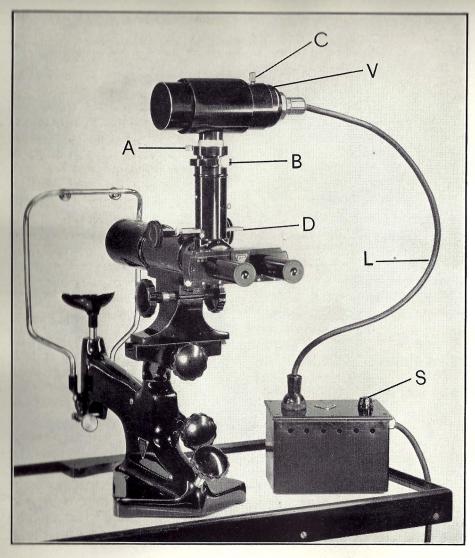


Figure 8
Binocular Ophthalmoscope with Hildreth Mercury Lamp

A—Lamp Socket Set Screw

D—Filter Slide

B—Lamp House Adjustment Screw

L—Cord

C-Screw

L—Cora

V—Lamp Socket

S—Transformer

the same position for the lamp. If the lengthwise support wire for the small, inner bulb comes directly beneath the lamp, the socket is rotafed 90° so that the other hole in bushing "V" takes screw "C." Otherwise, the support wire would throw a shadow in the illuminated area.

The Mercury Vapor Lamp is adjusted in the same manner as the regular bulb. Follow the directions contained in Chapter IV.

Due to the high voltage at which this Mercury Vapor Lamp operates, it will take approximately one minute for the lamp to reach maximum illumination.

After the lamp has been turned off it must cool for approximately five minutes before it can be relighted.

#### **FILTERS**

Two special filters are furnished in a regular filter slide "D." One of these filters out the longer wave lengths resulting in red-free illumination and the other, pure green light. Since it is necessary to use dyed gelatine filters cemented between glass plates, this slide should be handled with reasonable care. Dropping especially should be avoided. The filters should not be washed with any liquid. It is sufficient to clean

them with lens tissue, similar to test lenses.

#### THE TRANSFORMER

The transformer is specifically designed to go with the mercury type lamp. The switch has three positions, marked 110, 115 and 120. It should be placed in the position corresponding to the voltage furnished in your locality. USE ALTERNATING CURRENT ONLY. Where only DIRECT CURRENT is available, it will be necessary to purchase a convertor unit to change the direct current to alternating, the convertor unit being installed between the wall plug and the transformer.

#### **PRECAUTIONS**

Keep lead "L" segregated from everything. A slight shock, surprising but not dangerous, may be given the operator or patient if this lead is allowed to touch the instrument during use.

Do not touch the metal parts between bushing "V" and cord "L" while the lamp is burning. This may give a slight shock. Do not burn the lamp when it is out of the housing. These lamps burn at high pressure and would scatter glass particles if one happened to burst.

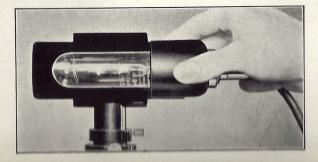


Figure 9

Trial Positioning of Lamp

# Care of the Instrument

The Binocular Ophthalmoscope, in common with all Bausch & Lomb instruments, is made with the greatest degree of precision possible. More than satisfactory service may be obtained from the instrument by exercising the following few precautions in caring for it.

Dust, dirt, finger prints, any foreign substance, in the wrong places, will detract from the operating efficiency of the Binocular Ophthalmoscope. Following are the parts which may be cleaned:

- 1. The end of the bulb, A.
- 2. The neutral and red-free filters.
- 3. The upper surface of the condenser system, C. This may be reached by removing the lamp socket and the filter slide.
- 4. The apertures, K, which may be reached by removing the eyepiece.
- 5. The Huygenian Eyepieces, M.
- 6. The front surface of the aspheric lens, I.
- 7. The auxiliary lens slides, H.

We caution you, emphatically, not to attempt to clean any parts except those listed above. Any further cleaning would necessarily involve the disassembling of the instrument. Any tampering with the optical system, especially with the prism, is liable to throw the entire system out of focus. Nor should the aspheric lens be removed from the ophthalmoscope tube. It is centered at the correct point necessary to focus the rays of light and a fraction of movement might be enough to throw it out. Finally, do not try to remove the perpendicular housing, extending up from the rear of the ophthalmoscope tube.

The gears and bearings used in the various positioning actions are fitted perfectly and will operate smoothly and accurately for a long time. If their movement should ever become somewhat stiff, it is only necessary to apply a few drops of a very light lubricating oil to free them completely.

Dust and dirt are the main enemies of a clear optical system. Overnight, or when the instrument is not in use, it should be completely covered. It is for the purpose of keeping dust out of the instrument that a cloth cover is furnished.

Bausch & Lomb reserves the right to make changes in instrument design according to scientific progress.