Nikon

1168.0

INVERTED MICROSCOPE

MODEL MS

INSTRUCTIONS

NIPPON KOGAKU K.K.

INVERTED MICROSCOPE
MODEL MS

The Microscope Model MS is a standard type inverted microscope developed as a sister instrument of the Model M which has gained much favor among the users. With its compact stand, excellent optical system, etc., the Microscope Model MS* will be advantageously used especially for histological cultivation in the field of medicine, and for examining metallurgical specimens. It is suitable also for studying translucent substance such as minerals, synthetic resins, etc., its wide application field in science and industry being confidently expected.

GENERAL CAUTIONS

- The microscope is to be used in a place free from dust, moisture and vibration.
- Before and after use, do not forget to clean the instrument. For dusting, use a soft brush.
- Be careful not to touch the lens. Remove grease or finger marks, using clean cotton cloth soaked with a little amount of xylol. Cotton cloth washed out several times is most suitable. For cleaning the objective, never use alcohol or ether, etc.
- The microscope stand is to be handled also with proper care. If any undue function is found, check the part relating to the trouble.
- The coarse and fine focusing mechanism adopts a ball race system to avoid the damage of the ball race. Never carry the instrument holding only its arm, but the stand and at the same time the mirror housing.

*Model MSD: Diascopic (biological) use
Model MSE: Episcopic (metallurgical) use

CONTENTS

I. NOMENCLATURE

With circular rotating stage

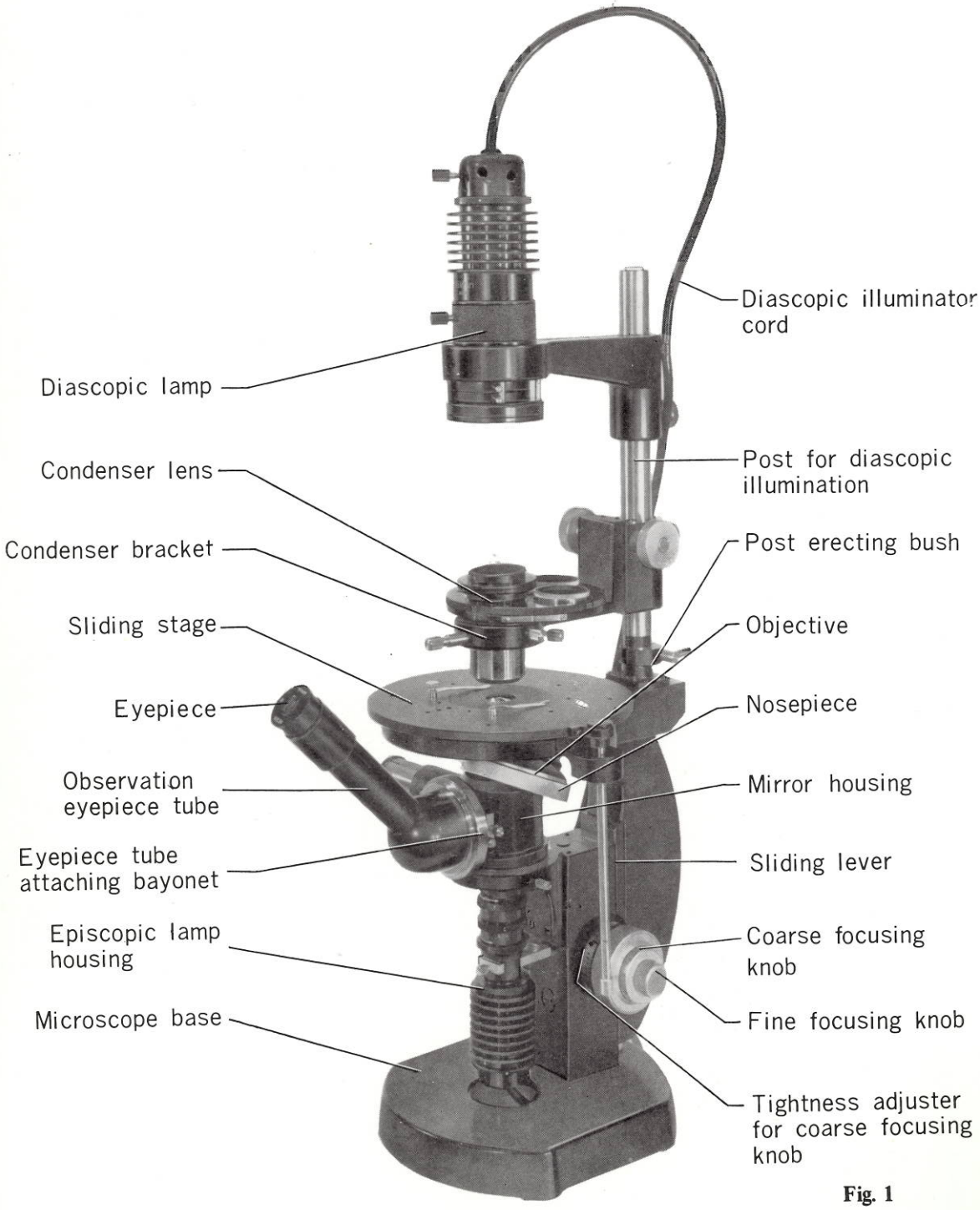

Fig. 1

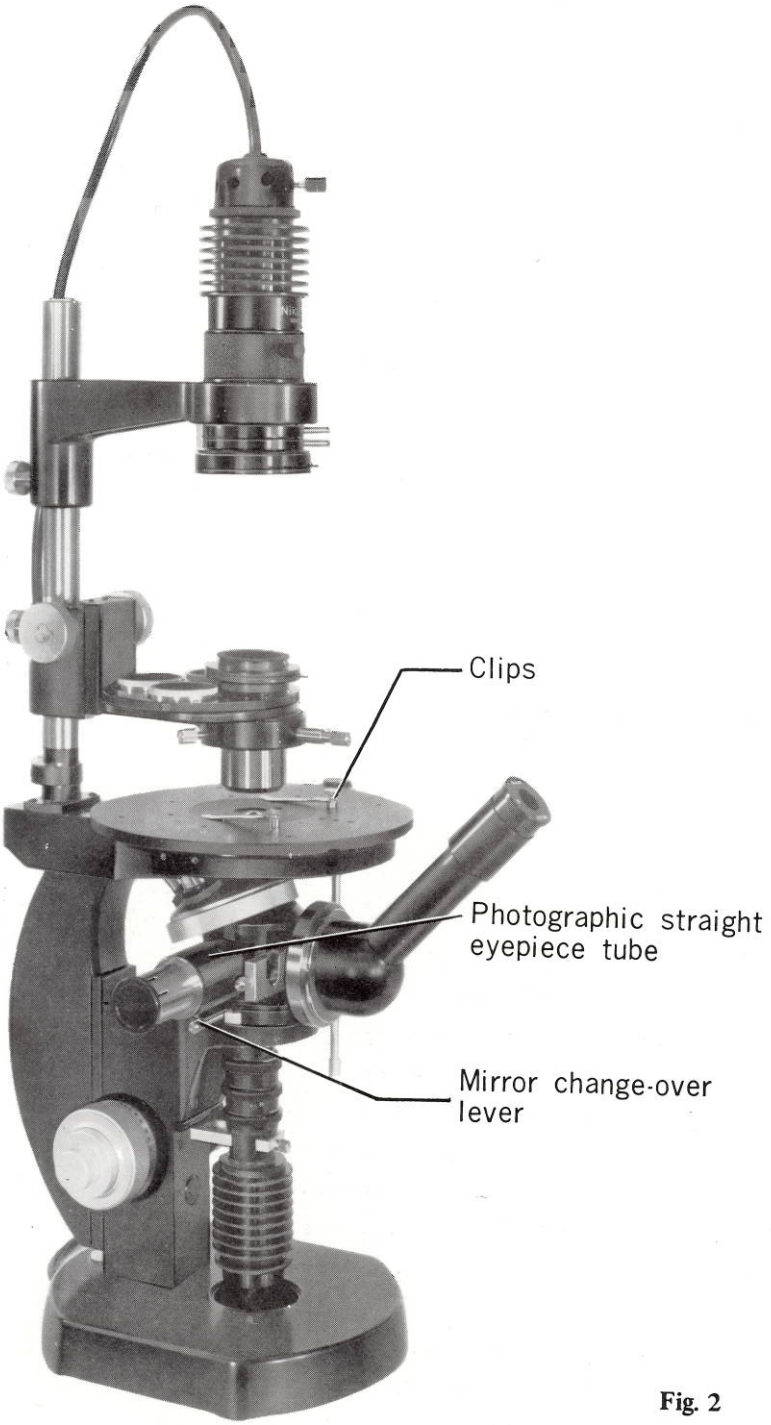
Clips
Photographic straight eyepiece tube
Mirror change-over lever

Fig. 2

With rectangular mechanical stage

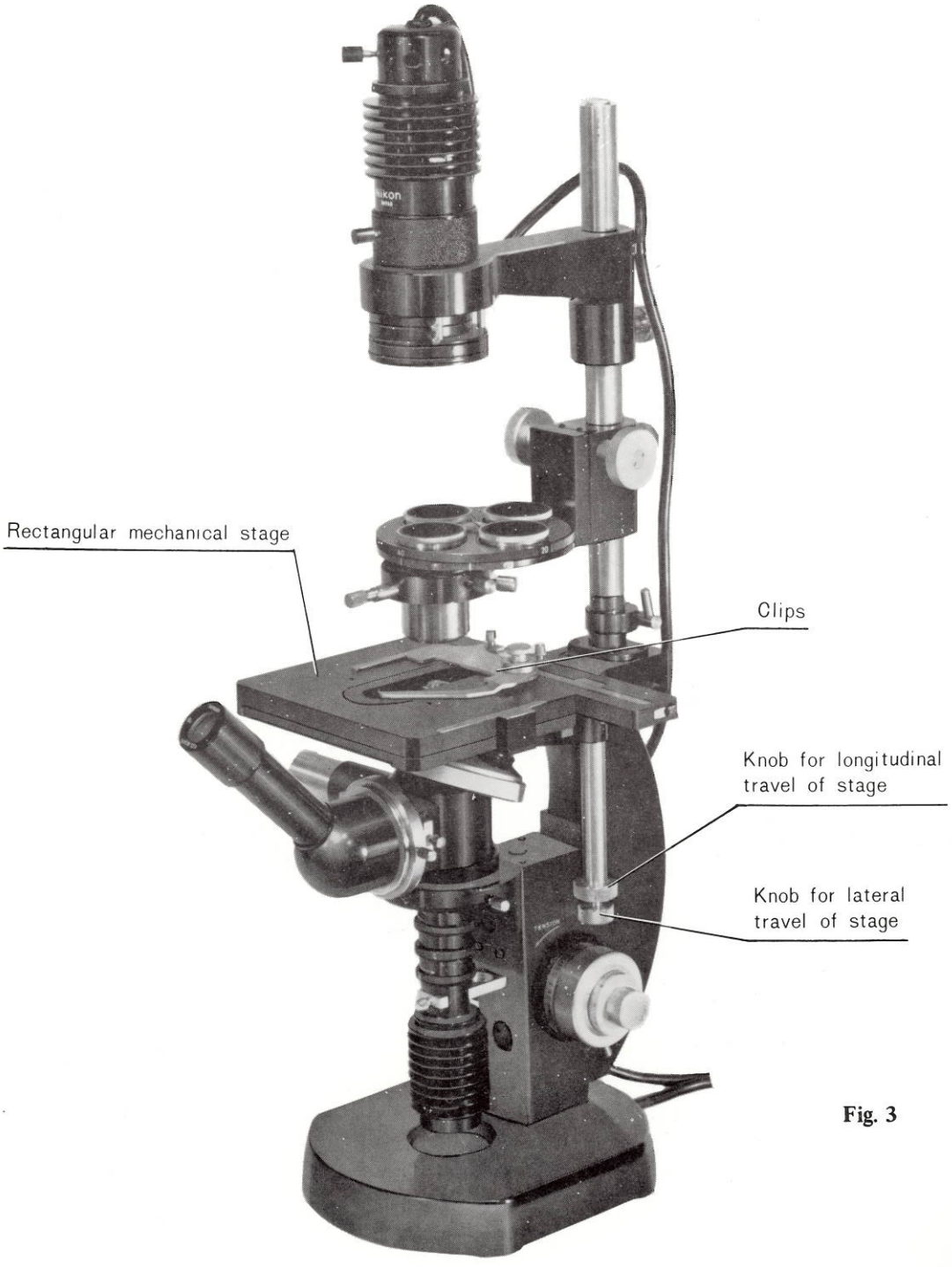

Fig. 3

Available in two types – with the circular rotating stage and with the rectangular mechanical stage. The stages can't be exchanged with each other. This instruction manual uses the picture of the microscope with the circular rotating stage for explanation.

II. ASSEMBLING

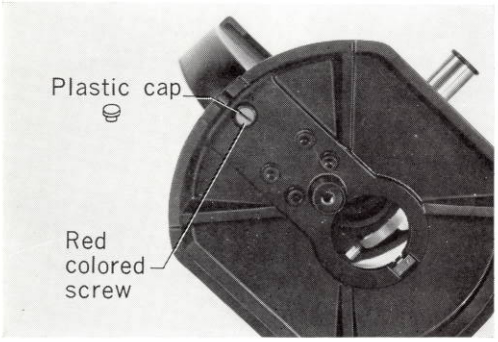

Fig. 4

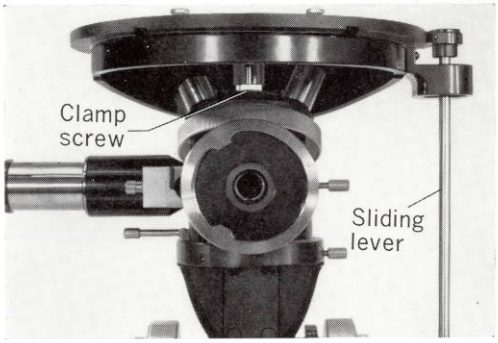

Fig. 5

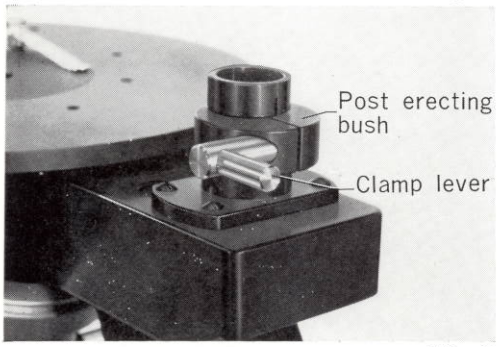

Fig. 6

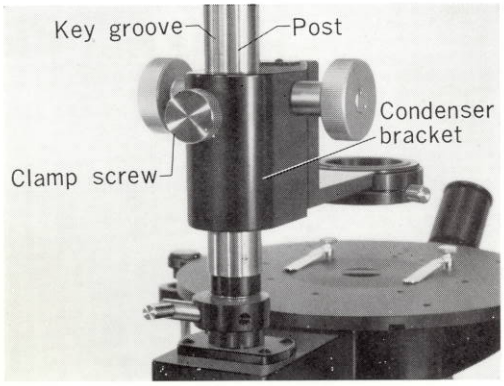

Fig. 7

1) Microscope base (in MSD and MSE)

First, remove the red colored screw from the bottom of the microscope base. Then, insert from above the plastic cap into the screw hole. This cap serves as a stopper for the lowest position of the microscope stage carrier. **(Fig. 4)**

2) Attaching the stage (in MSD and MSE)

Fitting the pins on the arm of the microscope body into the pin holes of the stage, fix the stage with the four screws.

3) Attaching the objectives (in MSD and MSE)

Release the tightness adjuster for the coarse focusing knob. Raise the stage by manipulating the coarse focusing knob. The objectives are then attached onto the nosepiece in such positions that the magnification increases as the nosepiece is turned counterclockwise, viewed from above.

4) Microscope stage (in MSD and MSE)

Beforehand, release the clamp screw on the bottom side of the stage for free movement of the sliding surface of the stage. Using the screw driver supplied with the instrument, attach the sliding lever to the side of the stage. **(Fig. 5)**

5) Setting up the diascopic illuminator (in MSD)

Erect the post on the top of the stage carrier with its bottom end inserted into the bush. Fasten the post with the clamp screw securely in position. **(Fig. 6)** Attach the condenser bracket (when the condenser is used) to the post in such a position that the end of the clamp screw is fitted to the key groove on the post. Adjust the height of the bracket along the post properly. **(Fig. 7)**

Attach the diascopic lamp to the post the same way as the condenser bracket. The post is then refastened in the bushing in such a position that the condenser and the lamp are aligned to the objective.

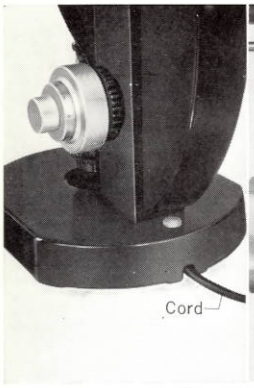

Fig. 8

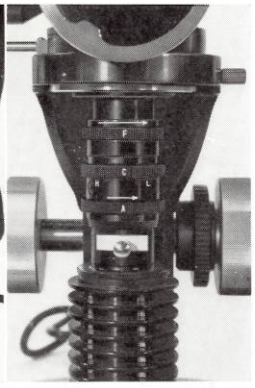

Fig. 9

6) Attaching the episcopic illuminator (in MSE)

Detach the cover from the bottom of the mirror housing after releasing the clamp screw. The illuminator cord is passed under the microscope base beforehand. **(Fig. 8)** Insert the illuminator into the bottom of the mirror housing with its side engraved with figures F,C,A, etc. faced toward the user. **(Fig. 9)** Fasten the illuminator in position with the clamp screw.

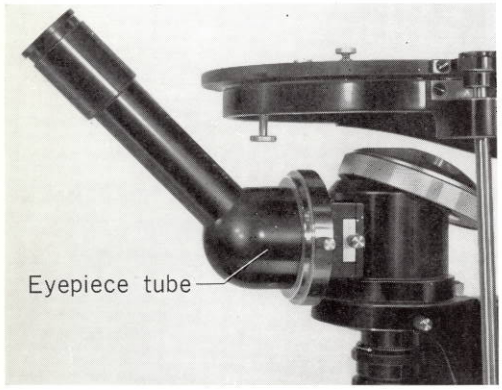

Fig. 10

7) Attaching the eyepiece tube (in MSD and MSE)

The monocular, binocular, trinocular or straight observing eyepiece tube is attached in bayonet fashion to the mirror housing underneath the objective nosepiece. **(Fig. 10)**

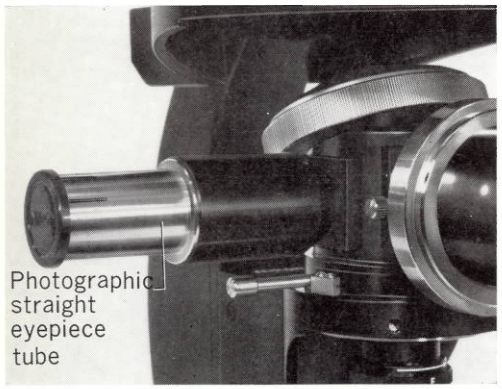

Fig. 11

8) Photographic straight eyepiece tube (in MSD and MSE)

This eyepiece tube is attached by screwing, after the cap on the left side of the mirror housing is removed. **(Fig. 11)**

Fig. 12

9) Attaching the episcopic (metallurgical) stage (in MSE)

This stage is held by the post erecting bush and clamped in position. **(Fig. 12)**

Ⅲ. ILLUMINATION

The microscope permits dia- and episcopic illumination. When two transformers are used, both types of illumination can be made simultaneously, and when two filters of different colors are used additionally, polychromatic illumination is possible.

A. Diascopic Illumination (in MSD)

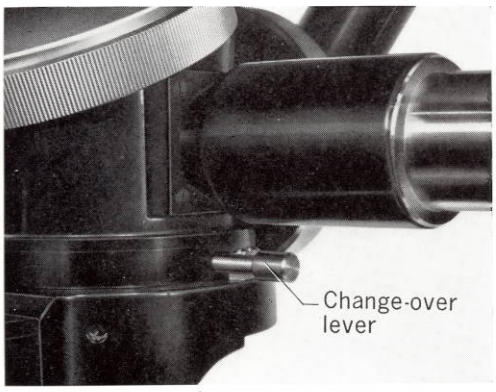

Fig. 13

1) Changing over the mirror

Push in the change-over lever positioned at the left of the mirror housing, thereby the total-reflecting mirror for diascopic illumination being brought into the light passage. **(Fig. 13)**

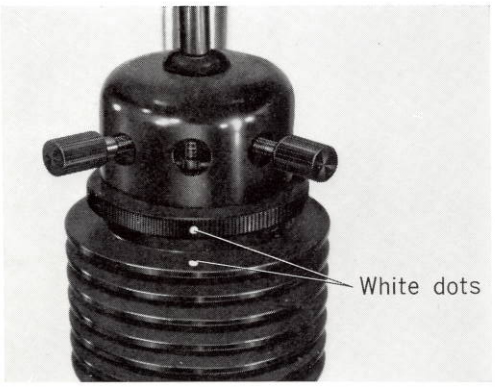

Fig. 14

2) Attaching the lamp socket

As shown in Fig. 14, lining up the white dot on the retaining ring to that on the lamp housing, insert the lamp socket into the housing. Then, rotate the retaining ring to lock the socket in position. **(Fig. 14)**

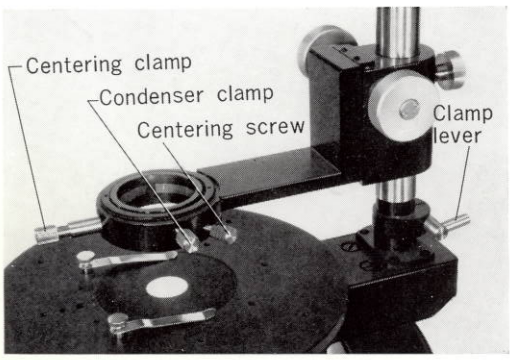

Fig. 15

3) Koehler's illumination

- For this type illumination, attach the condenser to be used to the condenser bracket. Fasten the post in such a position that the condenser is aligned with the objective. **(Fig. 15)**

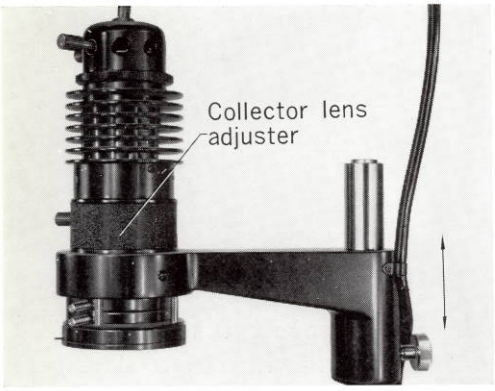

Fig. 16

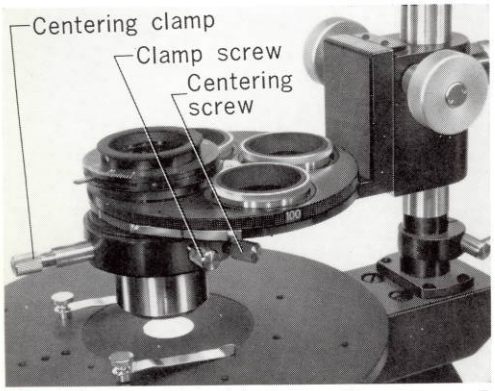

Fig. 17

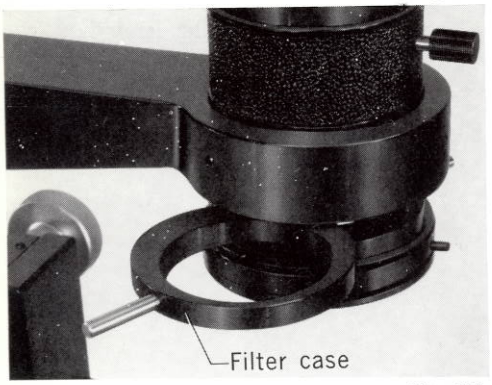

Fig. 18

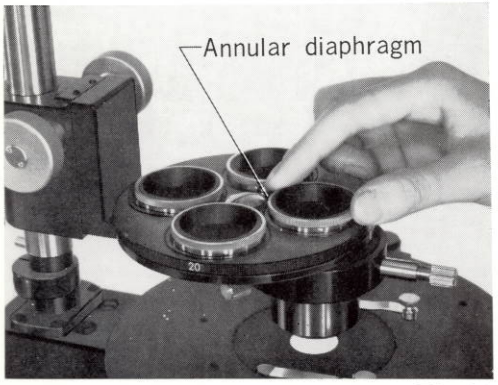

Fig. 19

- Releasing the clamp screw on the lamp housing bracket, move the bracket along the post. The height of the lamp housing depends upon the magnification of the objective, that is, the lower the magnification, the closer the position of the lamp to the condenser, and vice versa. **(Fig. 16)**

- When using the ordinary condenser, utilize the built-in aperture diaphragm. When using the long-focus condenser, attach the condenser (aperture) diaphragm onto any hole in the turret.
  Close the condenser diaphragm. Move in or out the collector lens in the lamp housing, until the image of the lamp filament on the closed condenser diaphragm is brought into focus, the size of this image being made slightly larger than a required opening of the diaphragm. **(Fig. 16)**

- Then, open the condenser diaphragm, and observe the microscope image of a specimen placed on the stage. Close the collector diaphragm (illumination viewfield diaphragm), and release the centering screws of the condenser.
  Using two of the centering screws, bring the center of the collector diaphragm image to that of the viewfield. Fasten the centering clamp in this centered position. **(Fig. 17)**

- Move the condenser vertically, so that the image of the collector diaphragm together with that of the specimen comes into sharp focus. Then, fully open the collector diaphragm, but close the condenser diaphragm to a proper diameter.

- When using the objective of 4X or lower magnification, or observing the specimen in a large culture bottle or dish, remove the condenser lens. Instead, place on the filter case in the illuminator a mat glass filter supplied with the instrument in order to gain a uniform illumination over a wide viewfield.
  (Fig. 18)

4) Phase-contrast illumination

a) Attaching the phase-contrast annular diaphragm

- Four phase-contrast annular diaphragms 10×, 20×, 40× and 100× are available individually or with a turret.
  Replace the ordinary condenser with the long-focus condenser. Then, attach one of the annular diaphragms onto the long-focus condenser.
- When using the phase-contrast turret, attach the annular diaphragms following the magnification figures engraved on the milled edge of the turret. **(Fig. 19)**

b) Attaching the objectives

- The magnification of objective corresponds to that marked on the annular diaphragm. When using the phase-contrast turret, the phase-contrast objectives are attached to the nosepiece, in the same order as that of the magnification figures on the phase-contrast turret.
- Turn the turret until the magnification marked on the annular diaphragm comes to that of the objective being used.

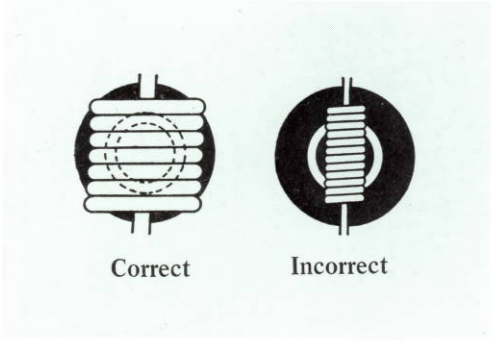

Fig. 20

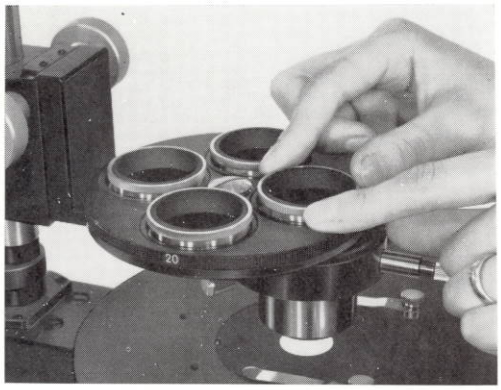

Fig. 21

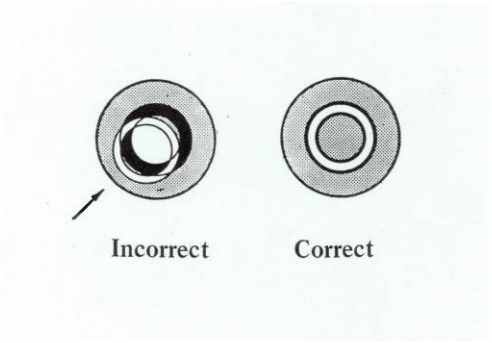

Fig. 22

c) Illumination

- As in the phase-contrast illumination the light volume is reduced not only by the annular diaphragm to a great extent, but also by the absorption through the phase shifting plate, thus producing much darker image than in the ordinary bright illumination, the most suitable illumination will be Koehler's.
- Even though a heat absorption filter is built in the illuminator, it is necessary to use an additional heat absorption filter when observing a living specimen. The filament of the illuminating lamp in this case should be adjusted so that its sharp image fully covers the phase-contrast annular aperture diaphragm to give a sufficient brightness, especially for photomicrography. **(Fig. 20)**

d) Centering

- The centering in this case means to overlap the image of the annular diaphragm, produced by direct light, exactly on the ring in the phase shifting plate. This coincidence is indispensable for phase-contrast microscopy. If it is not perfectly performed, no sufficient contrast will be obtained, thus losing the effect of the phase-contrast. For centering, set the corresponding annular diaphragm to the objective being used.
- Then, bring the specimen into approximate focus. Replace the eyepiece with the centering telescope. Turning the head of the telescope, bring the image of the annulus in the phase shifting plate into focus. If the bright image of the annular diaphragm is not coincident with the phase shifting plate, push the diaphragm with the finger, until the coincidence is attained. **(Fig. 21, 22)**
- The image of the annular diaphragm may sometimes be not clear when a specimen is placed on the stage. In this case, change the position of the specimen or remove the specimen which may not be suitable for phase-contrast observation. Water drops on the surface of the condenser lens or slide also may cause such dimness; try cleaning.
- After the centering has been finished, replace the telescope with the eyepiece and proceed to observation.

e) Filters

- To prevent deterioration or dying out of living specimens by the heat of illuminating light, use the heat absorption filter. Such a filter is indispensable for phase-contrast microscopy where the observation of living specimens prevails.
- For observation using a monochromatic light or for photomicrography, the use of a green filter is required.

Either of the above mentioned filters is placed on the filter case in the diascopic illuminator.

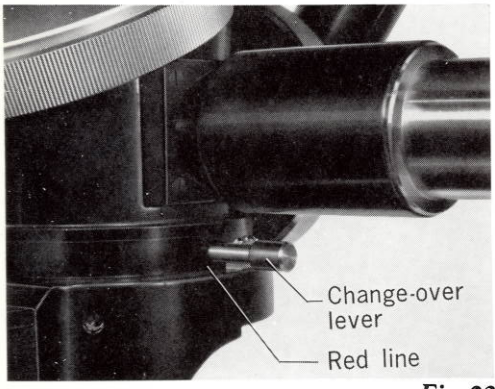

Fig. 23

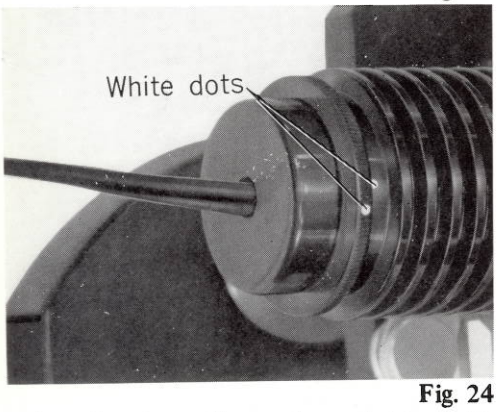

Fig. 24

B. Episcopic Illumination (in MSE)

1) Objectives

Attach the objectives for metallurgical use.

2) Changing over the mirror

Pull out the change-over lever positioned at the left of the mirror housing, until the red line appears. **(Fig. 23)**

3) Exchanging the lamp bulb

a) Release the clamp screw on the side to remove the episcopic illuminator.

b) Turn the milled ring on the lamp housing so that the two white dots are lined up to each other. Take out the socket. **(Fig. 24)**

c) Take out the lamp bulb from the socket by pushing and turning the lamp bulb counterclockwise.

d) Lining up the ~~V-groove~~ Index of the flange of the lamp bulb to that of the socket, insert the lamp bulb into the socket. Fasten the lamp bulb by turning the direction of the arrow of the socket.

e) Lining up the white dots, insert the socket into the lamp housing. Fasten the socket in position by turning the milled ring.

The socket can be fixed in a position where it is not fully pushed in, so that the brightness of illumination is made as uniform as possible.

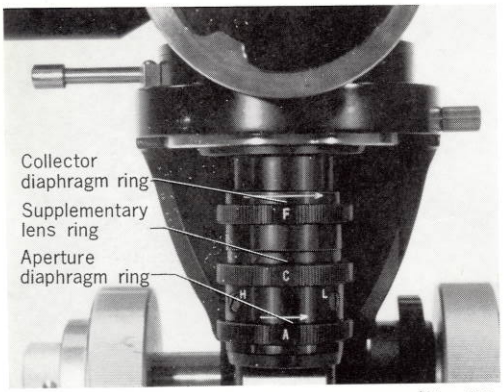

Fig. 25

4) Episcopic illumination

- Connect the power source cord to the transformer. Switch on the lamp. The appropriate voltage will be 3.5 - 4 V usually.
- After the lamp lights, conduct an approximate focusing of the microscope.
- If no uniform brightness is obtained, turn the supplementary lens ring (C). When a high power objective is used, turn the ring toward H and when a low power lens is used, turn it toward L.
- Then, turn the collector diaphragm (illumination viewfield diaphragm) ring (F) to fully open the diaphragm, thus the entire viewfield being illuminated.
- Turn the aperture diaphragm ring (A) to stop down the aperture until a clear image with no flare is attained. **(Fig. 25)**

5) **Filters**

Three filters supplied with the episcopic illuminator are green, yellow and daylight.
The green filter is used for monochromatic observation or photomicrography. The other two are for increasing the image contrast, depending on the degree of etching of the specimen.

C. Simultaneous Dia- and Episcopic Illumination (in MSD and MSE)

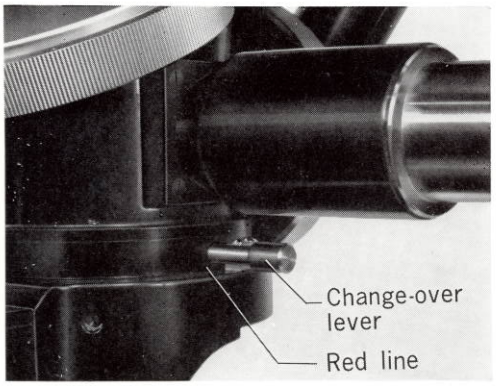

Fig. 26

1) **Lighting the lamps**

For simultaneous use of the dia- and episcopic illuminator, prepare two transformers, each for either illuminator.
Lighting of each lamp is performed as mentioned previously.

2) **Changing over the mirror**

Pull out the mirror change-over lever positioned at the left of the mirror housing, until the red line appears. **(Fig. 26)**

3) **Objectives**

When observating a transparent specimen, use the ordinary objective.

4) **Polychromatic illumination**

Two filters of different colors, one placed on the filter case in the diascopic illuminator or in the condenser, the other on the filter case in the episcopic illuminator, will give a polychromatic illumination.

Ⅳ. MICROSCOPY (in MSD and MSE)

Focusing procedure requires great skill. Even after the skill has been acquired, it requires utmost care.

Fig. 27

1) **Eyepiece adjustment**

When using a binocular or trinocular eyepiece for observation, it is necessary to adjust the eyesight (diopter) and the interpupillary distance to the eyes of the user. When the interpupillary distance is set to 64 mm indicated by a red line, the standard mechanical length (160 mm) of microscope is obtained. **(Fig. 27)**
The H.K. Eyepiece permits the user to use his eyeglasses. For those who do not use eyeglasses, the eyecup can be drawn out from the eyepiece head up to convenient height.

2) **Coarse focusing**

- Turning the coarse focusing knob on either side of the microscope moves the stage vertically. When the white dots, one on the microscope stand and

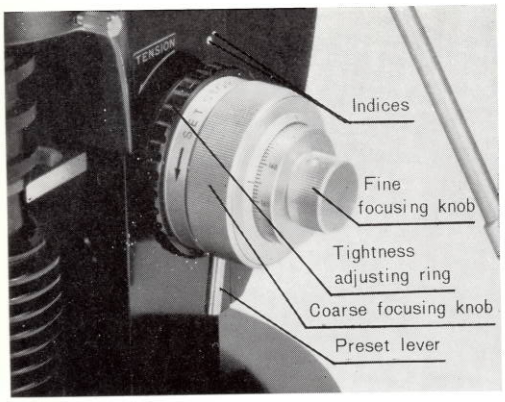

Fig. 28

the other at the right side of the stage carrier, come opposite to each other, sharp focusing is obtained for the normal eye. (**Fig. 28**)

- If the specimen comes into contact with the front end of the objective, it will be pushed upward to avoid damaging the specimen and the objective. All the objectives being parfocal, it will be convenient for focusing first to use a low power and then to proceed to a high power objective.

3) Tightness adjustment of the coarse focusing knobs

- The tightness of the coarse focusing knobs can be adjusted by turning the black tightness adjusting ring (**Fig. 28**). This is also utilized for locking the knobs for long use or photomicrography.
- If the adjusting ring is released too far, the righthand coarse focusing knob with graduation will be subjected to rotation together with the fine focusing knobs, causing no functioning of the fine focusing knobs. Therefore, tighten the adjusting ring so far that the lefthand coarse focusing knob slightly rotates at the same time as the fine focusing knob is rotated. Then, the fine focusing knob will correctly work.

4) Fine focusing

The fine focusing knobs on the Microscope MS are provided coaxially to the coarse focusing knobs, with a specially designed differential gear mechanism, whereby one rotation of the knob moves the stage 0.2 mm vertically, permitting direct reading down to 0.002 mm on the scale engraved on the circumference of the knob.

The fine focusing range covers the stroke of the coarse focusing knob. Turning of the fine focusing knob toward the user raises the stage and that in the opposite direction lowers the stage.

5) Preset device

The preset lever on the coarse focusing knob on the right side which, when turned, does not allow the stage to be lowered beyond the preset position, gives a great convenience in getting the focused position once obtained, after the stage has been raised out of focusing for exchanging the objective, for application of oil immersion, etc. (**Fig. 28**)

6) Oil immersion

The oil immersion objective, providing an extremely shallow depth of focus and a working distance as small as 0.10 mm, requires careful manipulation.

Change over to the 100× objective after raising the stage by means of the coarse focusing knobs. Apply a drop of cedar oil to the front top of the objective and proceed to focusing.

The oil-immersion objective may sometimes cause poor image.

- One of the causes is attributed to air bubbles which have made their way into the cedar oil. The bubbles will be observed inside of the microscope tube after the eyepiece is taken out. Move the specimen to and fro or apply more oil.
- The second cause of poor image may be the use of cedar oil of incorrect refractive index (normal: Nd=1.515).
- The third cause comes from the remaining cedar oil on the front top of the objective. Therefore, it is necessary to thoroughly clean it, using cloth soaked with a little amount of xylol, every time the immersion objective has been used.

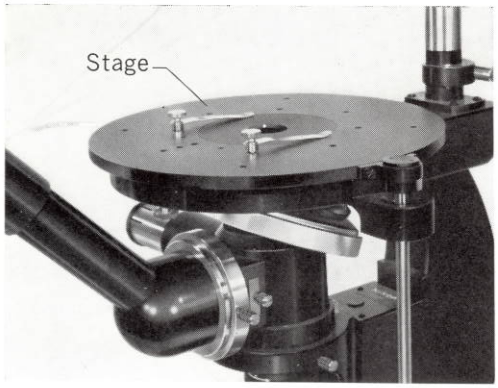

Fig. 29

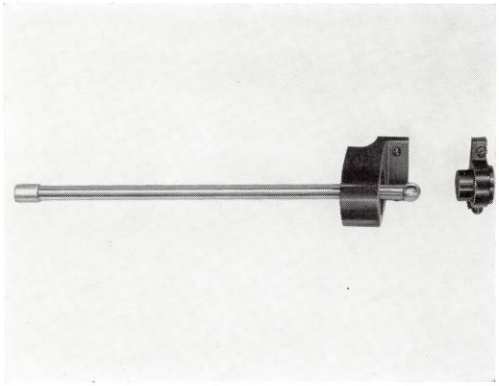

Fig. 30

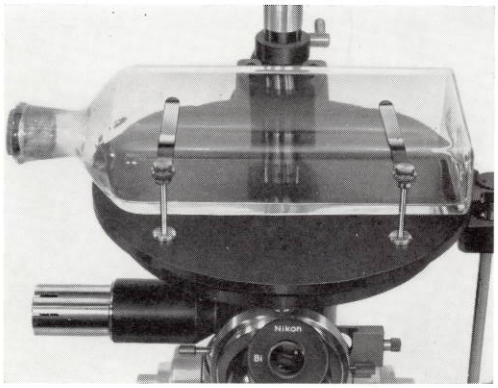

Fig. 31

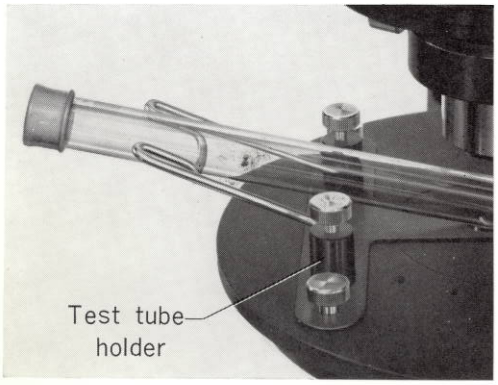

Fig. 32

7) Sliding stage

- The stage (**Fig. 29**) floats on an oil layer, with its sliding range covering 20 mm in diameter. It moves smoothly in the direction in which the finger pushes.

- By means of the sliding lever (**Fig. 30**) the stage is easily moved in the *X* and *Y* directions of the stage with the hand positioned low near the coarse and fine focusing knob. The lever provides great convenience, because the direction in which the specimen moves is the same in which the lever is pushed. Furthermore, the lever which moves the entire top surface of the stage, permits mounting not only of a regular slide, but also of a large metallurgical specimen, a specimen in a culture bottle, etc. (**Fig. 31**) When a small metallurgical specimen is to be examined, use the coaxial stage rings of 5-20 mm in diameter placed in the center hole of the stage.

- When observing a specimen in a test tube, it is convenient to attach the test tube holder to the stage (**Fig. 32**), which is available at extra cost.
  To lock the stage in position, use the clamp screw found on the bottom of the stage.

V. PHOTOMICROGRAPHY (in MSD and MSE)

Fig. 33

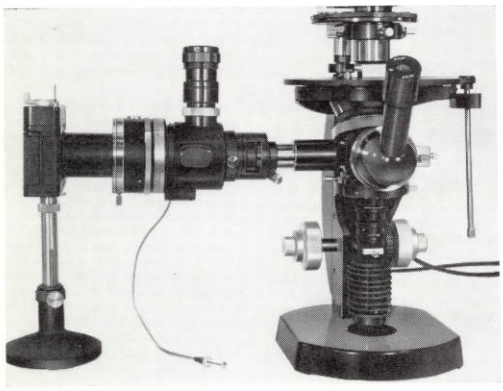

Fig. 34

- Even though photomicrography can be carried out by means of the Nikon Microflex Model AFM, EFM or PFM in combination with the straight tube or trinocular eyepiece tube attached to the observation side of the microscope, it is more convenient to attach the Microflex rather to the photographic side of the microscope.
- The eyepiece to be used is then attached to the end of the photographic straight eyepiece tube. Secure the Microflex with camera by means of the supporting stand. **(Fig. 33, 34)**
- Thereafter, turn backward the mirror change-over lever and push it in for diascopic illumination or pull it out for episcopic illumination until the red line appears.
- For details on photomicrographic procedures, refer to the Instructions for the Nikon Microflex.

VI. OBSERVATION IN POLARIZING LIGHT

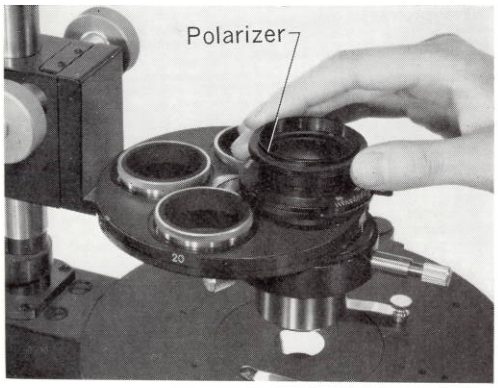

Fig. 35

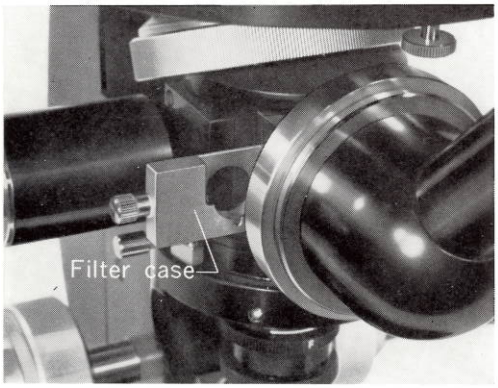

Fig. 36

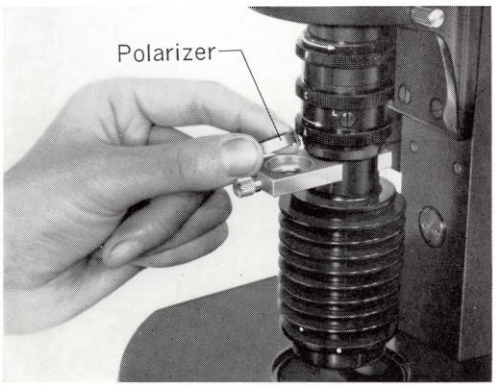

Fig. 37

1. Diascopic illumination (in MSD)

In this case, place the polarizer onto the filter case in the condenser, and the analyzer into the filter case on the mirror housing, with the pin on the polarizing plate inserted into the notch. **(Fig. 35, 36)**

2. Episcopic illumination (in MSE)

For episcopic illumination, put the polarizer into the filter case on the episcopic illuminator, with the pin inserted into the notch.

The analyzer is placed in the filter case on the mirror housing in the same way as for diascopic illumination. **(Fig. 37)**

Nikon

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