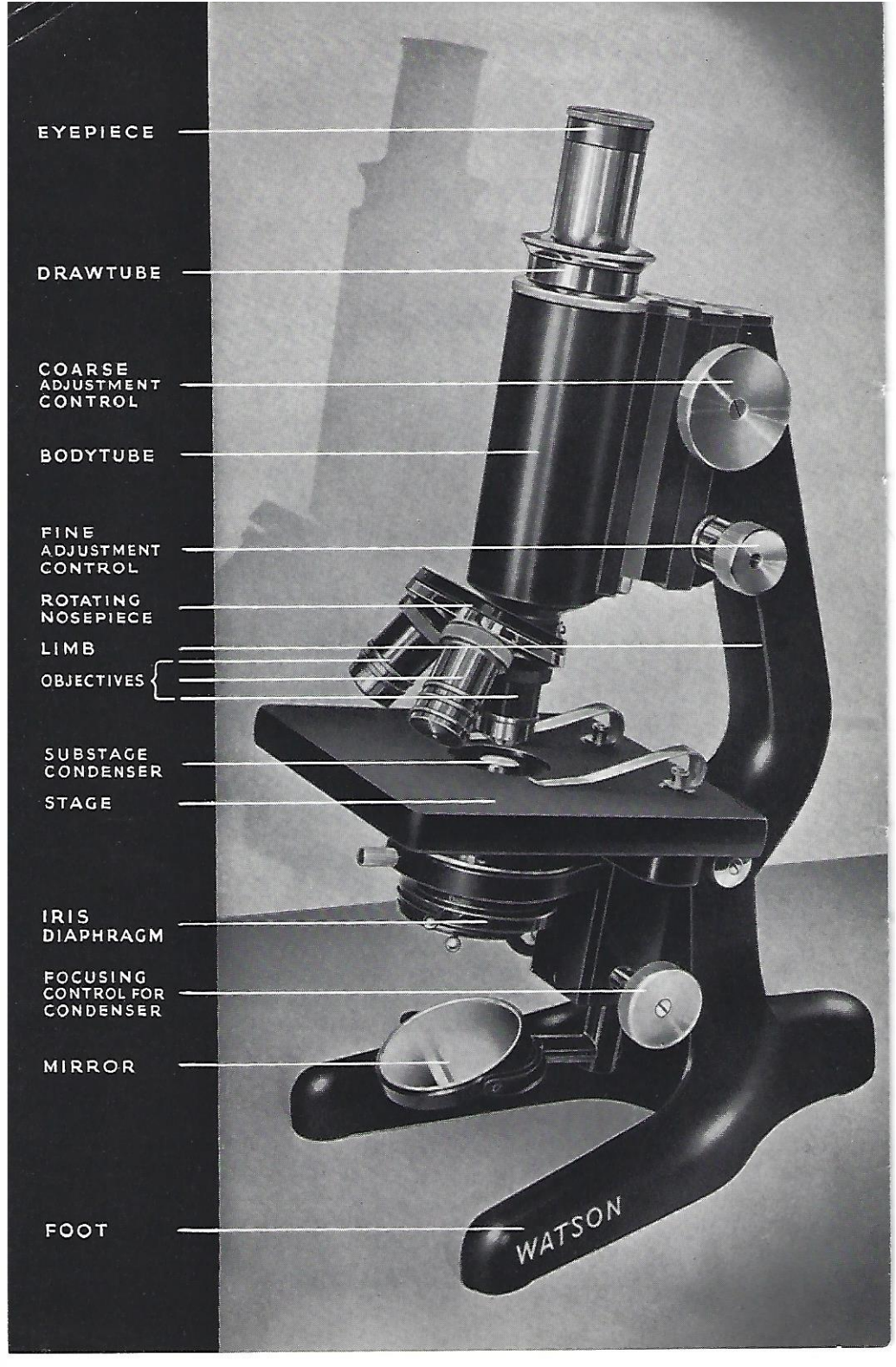
A HANDBOOK FOR THE

SERVICE *Microscope*

W. WATSON & SONS LTD.
BARNET, HERTS,
ENGLAND


EYEPIECE
DRAWTUBE
COARSE ADJUSTMENT CONTROL
BODYTUBE
FINE ADJUSTMENT CONTROL
ROTATING NOSEPIECE
LIMB
OBJECTIVES
SUBSTAGE CONDENSER
STAGE
IRIS DIAPHRAGM
FOCUSING CONTROL FOR CONDENSER
MIRROR
FOOT
WATSON

THE USE AND CARE OF YOUR SERVICE MICROSCOPE

UNPACKING THE MICROSCOPE

For safety in transit the microscope is secured to the floor of its case by a screw which may be removed with the aid of a coin.

The rubber band* which protects the fine adjustment against shock should next be removed. The various items comprising the outfit should be checked to ensure that no damage has occurred in transit.

Remove the objectives from their cases and screw them into the nosepiece. The apertures of the nosepiece will be found to be numbered and each objective has its magnification engraved on the mount. The objective of lowest magnification goes into the aperture numbered 'one', the next lowest into 'two,' and so on. Care should be taken to avoid touching the glass surfaces, since grease from the fingers affects definition. Place an eyepiece in the tube.

The condenser in its mount is pushed up into the substage from below, the keyway acting as a guide for the small screw on the mount. The assembly is then secured by the locking screw.

**This need not subsequently be replaced.*

SETTING UP

Care should be taken to avoid physical discomfort and unless the nature of the preparation demands that the stage be horizontal the instrument should be inclined to a convenient angle. It is worth noting that wet preparations, so long as they are covered with a cover glass, can generally be examined with the instrument inclined.

A suitable source of light will be required. Daylight is not very satisfactory by reason of its variability and low intensity. A 60 watt pearl bulb, enclosed in a suitable housing to shield the observer's eyes from direct light, will be found satisfactory for general and class work.

Place the lamp directly in front of the microscope and about eight inches away from it. In all microscopical work in which a substage condenser is used, the flat mirror is employed. With objectives of very low power (50 mm., 75 mm.), it may be desirable to dispense with the condenser in order to secure a uniformly illuminated field. Under these conditions the concave mirror may be used.

Rotate the nosepiece until the lowest power objective is in line with the body tube, then, looking into the instrument, move the mirror until the field appears brightly illuminated. A little patience may be required when doing this at first, but the adjustment soon becomes easy, particularly when an objective and eyepiece of low power are used. Having illuminated the field, place a slide on the stage, and bring the condenser to the top of its travel by operating the substage focusing control.

FOCUSING

The body tube is provided with two focusing motions, a coarse adjustment and a fine adjustment. Using the objectives of lowest power focusing can be carried out by means of the coarse adjustment alone.

Still using the low power, put the object out of focus by racking the body first a little above and then slightly below the position at which the object is clearly seen. When this is done the object should not appear to move across the field; if such movement is present the indication is that the illumination is not correctly set. Move the mirror slightly with one hand whilst focusing with the other until the object goes in and out of focus without appreciable shift.

If at this stage it is found that the field is no longer fully illuminated, the microscope should be moved in relation to the lamp to obtain the desired results.

THE USE OF THE CONDENSER

With the microscope focused on a slide using the 16 mm. (X10) objective and with the condenser at the top of its travel, look into the instrument and hold a pencil or a mounted needle against the surface

of the lamp bulb; move the needle or pencil until its shadow is seen in the field of view. Next, slowly lower the condenser until the tip of the pencil is clearly seen, superimposed on the object. The condenser is now focused, i.e. it is forming an image of the light source in the plane of the specimen.

When using a pearl bulb its roughened surface may become visible, so that those portions of the field not occupied by the object have the appearance of ground glass. A further slight movement of the condenser serves to lose this grinding, but the movement should be no more than is necessary to do so.

THE USE OF THE SUBSTAGE IRIS DIAPHRAGM

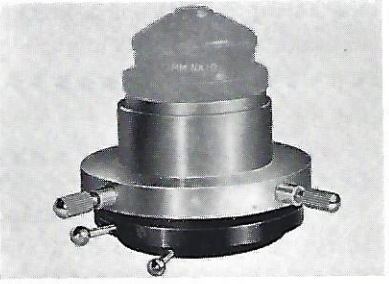
Take out the eyepiece and look at the back lens of the objective, the eye being six inches or so from the top of the microscope tube. Close and open the substage iris, noting that this regulates the proportion of the back lens which is filled with light. Adjust the iris until about three quarters of the back lens is illuminated. Now replace the eyepiece and note the appearance of the object. Again open and close the diaphragm, watching the change which this produces in the image. When too far open, the image will be flooded with light; when too far closed the outlines and fine details of the object become thickened or doubled; this is an artificial appearance and should be recognised as such.

For a given objective the precise setting of the substage iris depends upon the nature of the object. A setting which fills three quarters of the back lens will be found suitable for many objects but the user will quickly learn to adjust the iris by the appearance of the image.

From what has been said, it will be appreciated that the iris must not be used to regulate the *intensity* of the light. It may sometimes be found that the field is uncomfortably bright, in which case a neutral or coloured filter may be placed in the filter carrier immediately below the condenser iris. Normally the filter carrier takes the disc of blue glass which is supplied with the instrument. Its purpose is simply to whiten the rather yellowish light of the bulb.

The top lens of the condenser is made to unscrew and it is desirable to remove it when any considerable amount of work is done with the 40 mm. objective since the Abbe cannot otherwise fill the field of this low power. When the objective is being used temporarily or as a finder preparatory to the use of the higher powers, the removal of the top lens may not be considered worth while.

Plain mount supplied for use with Abbe condenser.



Centring mount recommended for use with all condensers other than the Abbe.

CENTRING THE CONDENSER

In the case of a condenser provided with a centring mount, the centration should be checked and if necessary, adjusted. This is normally done at the beginning of the setting-up procedure.

With the condenser at the top of its travel focus the microscope on a slide using the 16 mm. objective. Close the substage iris to a pinhole and rack the condenser down until the small aperture of the iris diaphragm is seen. It should appear at the centre of the field of view and if necessary it is brought there by means of the substage centring screws.

The Abbe condenser in plain mount is accurately centred during manufacture. With the more highly corrected types of condenser the greater accuracy of centration afforded by a centring mount is a necessity. The thin colour fringe visible at the edge of the iris image must be symmetrical and uniform. A slight adjustment to the mirror will ensure this.

THE USE OF THE HIGHER POWERS

To observe with a higher power than the 16 mm. the object is first set up under the low power and the nosepiece is then rotated to bring the new objective into use. A slight movement of the fine adjustment is all that is necessary to bring the object into sharp focus. In rotating the nosepiece, care should be taken that the front of the high power objective does not foul the stage clips.

If the condenser has been previously focused for the low power, it should not now require re-focusing, but the setting of the substage iris may require adjustment to obtain optimum results.

To use an immersion objective, rack up the body by means of the coarse adjustment and place one small drop of immersion oil over the part of the preparation which it is desired to examine; the small spot of light from the condenser will indicate the place. Observing the objective from the side, rack down until the front lens just makes contact with the oil. Now look into the instrument and continue the downward motion, using the coarse adjustment with the utmost care. Immediately the object is seen, transfer to the fine adjustment.

Immersion objectives focus very close to the preparation and great care is called for in their use. As the substage iris required adjustment in passing from the 16 mm. objective to the 4 mm., so it will normally need to be re-set on transferring to the oil immersion 2 mm.

After use, the immersion oil should be cleaned from the objective, and from the preparation with a piece of lens tissue or soft linen. Under no circumstances must xylol, alcohol or solutions of alcohol be used to clean an objective.

Oil immersion objectives should never be used "dry", i.e., without immersion contact. In the same way, other objectives must not be used immersed. If, after an immersion objective has been used, it is desired to revert to a dry objective the slide must be cleaned. The layer of oil will suffice to upset the performance. The total magnification of the microscope, provided that the tube length is kept at 160 mm. is the product of the magnification engraved on the objective and the eyepiece.

THE MECHANICAL STAGE

A mechanical stage enables the preparation to be moved with greater accuracy than can be done by the fingers alone. Its use is indicated where much work is done with the higher powers, or where slides must be systematically searched. Two forms of mechanical stage are available for use with the Service microscope, the Student model and the Service. Both are of the attachable form and may be added to the instrument at any time by the user. No adaptation of the microscope is required. The simpler Student model is available either with or without scales. The Service stage is more robust and possesses most of the advantages of a mechanical stage which is built into the instrument. Scales are always fitted to this stage.

In both cases, attachment of the mechanical stage is by means of two pins which pass through the holes normally occupied by the stage clips. The ends of the pins are threaded to take milled nuts which secure the stage in position.

THE CARE OF THE MICROSCOPE

Microscopes do not require frequent lubrication. The greases which are used during manufacture last for many years. The user is particularly warned against applying oil to the bearings of the shafts which carry the milled heads.

When not in use the instrument should be kept in its case as a protection against dust. It should not be stored in a chemical laboratory or in any place where it is liable to come into contact with corrosive fumes.

Optical surfaces may be cleaned with lens tissue or with a soft linen cloth but cleaning should normally be confined to the exposed and readily accessible surfaces, and should not be carried out unnecessarily. Under no circumstances should an objective be taken to pieces.

Objectives may be left on the nosepiece when not in use, but when this is done an eyepiece should always be left in the tube to prevent dust collecting on the back lenses of the objectives. If for any reason it becomes necessary to clean the back lens of an objective use a dry camel hair brush.

Service Microscope with Service attachable mechanical stage

The performance of the instrument will not be affected by small traces of dust on the objective and condensers, or on the mirror. If specks are seen in the field it is probable that they are on the eyepiece, and this can be confirmed by rotating the eyepiece. The eyepieces are easily cleaned and if careful dusting of the exposed surfaces fails to remove the offending particles, the lenses may be unscrewed from each end of the eyepiece and their internal surfaces wiped. The lenses should be unscrewed, cleaned and replaced one at a time in order to ensure that they are returned to the correct ends of the eyepiece tube.

ACCESSORIES

BINAC ATTACHMENT. Prolonged observation using a monocular microscope frequently results in a degree of ocular fatigue, and a consequent reduction in the reliability of results obtained. Using both eyes eliminates the cause of the fatigue. The Binac, which is available with vertical or inclined eyepiece tubes, does not diminish resolving power or affect image quality. All prisms and lenses are coated to increase light transmission. The right eyepiece tube has provision for independent focusing. The mechanism controlling interocular separation is enclosed and dust proof. The Binac has a magnification factor of 1.5 and is corrected for 160 mm. tube length.

THE SERVICE ATTACHABLE MECHANICAL STAGE

THE STUDENT ATTACHABLE MECHANICAL STAGE WITH DIVISIONS

THE STUDENT ATTACHABLE MECHANICAL STAGE WITHOUT DIVISIONS

REGULITE LAMP with a 6v. 30w. bulb and control unit.

SUBSTAGE LAMP with 6v. 18w. bulb and control unit.

SUBSTAGE LAMP, mains operated, with 15w. bulb.

BENCH LAMP with 60w. pearl bulb.

LITERATURE AVAILABLE

BACTIL-60
BACTIL
SERVICE
ACCESSORIES
PHASE CONTRAST
METALLURGICAL MICROSCOPES
STEREOSCOPIC MICROSCOPES
MICROPROJECTOR
KONIMETER
GRATICULES
ZOOM LENS
PHOTOGRAPHIC LENSES
PHOTOMICROGRAPHIC EQUIPMENT

The design of Watson Instruments is under constant review and improvements are frequently introduced, consequently illustrations and descriptions in this list may not be correct in every detail.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