The Cooke M25 Series Microscopes

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The M25 series of microscopes was introduced Cooke, Troughton and Simms in 1954 and lasted into the mid-1960's (1).

The name of the company was often abbreviated to Cooke, or CTS, as in the company logo. During production of this series, the name was dropped in favor of Vickers Instruments, since Vickers, who already owned CTS, had just bought the C. Baker microscope company.

There were at least 5 members of this series: M25, M26 (inverted biological), M29 (inverted metallograph), M35 (incident light), M75 (polarizing), and the interferometer microscope (after Dyson).

It was contemporaneous with the M1000, M2000, M3000, M4000 and M7000 series, and was phased out, together with that series, in favor of the M15 series, and others.

Having got all that out of the way, some explanation of naming by CTS/Vickers is in order. Unfortunately, they generally used numbers rather than more easily memorable names.

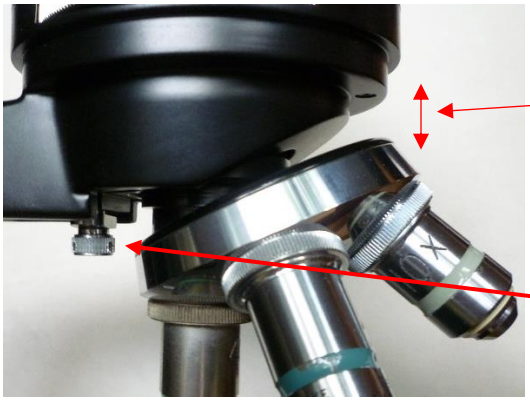
Moreover, they sometimes reused a number years later for a new model. To cap it off, in catalogues, these microscopes have 4-digit numbers, such as M2510, M2520, to distinguish different configurations. For some reason, numbers beginning with 7 were usually favored for petrological models.

I have good examples of the M25 and M75 to show, but for the other models have to use illustrations from contemporary brochures. Luckily, my two examples illustrate many of the salient features of the series.

Clearly, this is not intended as a detailed survey, for which I do not have sufficient knowledge. If anyone notices mistakes, or has comments or additions, I would be pleased to hear from them, hopefully with the view to a revised edition.

Focusing System

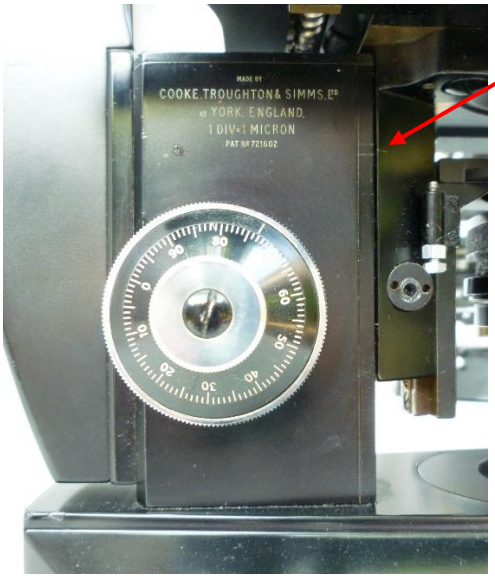
The instruments used a 160 mm tube length and 34 mm length objectives. To protect the objectives, there was a patented mechanism which allowed the nosepiece to tilt up under pressure. This consisted of a rocking plate in the top of the limb which carries the changer. It is partially weight-relieved.



Nosepiece nods upwards if objective comes in contact with slide.

Locking screw for use when transporting microscope.

The focus was coaxial. Coarse focus was on one side of the focusing block to a dovetail, and the fine focus, through a clockwork gear train, drove a single involute tooth to a ball-bearing slide on the other side of the block (1). Interestingly, on the M25, the coarse focus moved the limb and the fine focus moved the stage, but the M35 and M75 had the reverse layout. So, effectively, the focus block is rotated 180 deg.

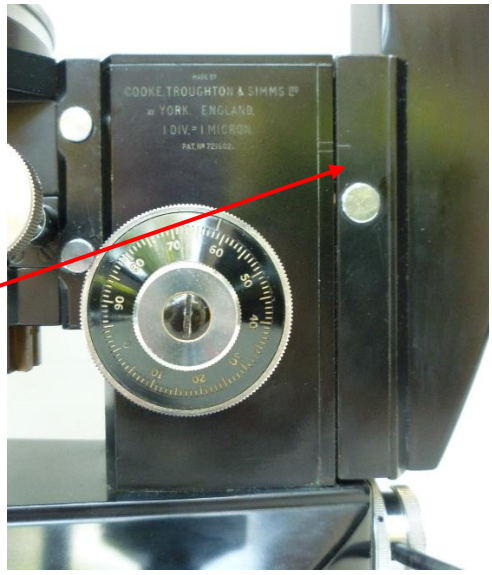


M25

Stage moved by fine focus

M75

Limb moved by fine focus



Base

M75 (left)

Base showing rear mounted pre-centered bulb, and illuminator unit

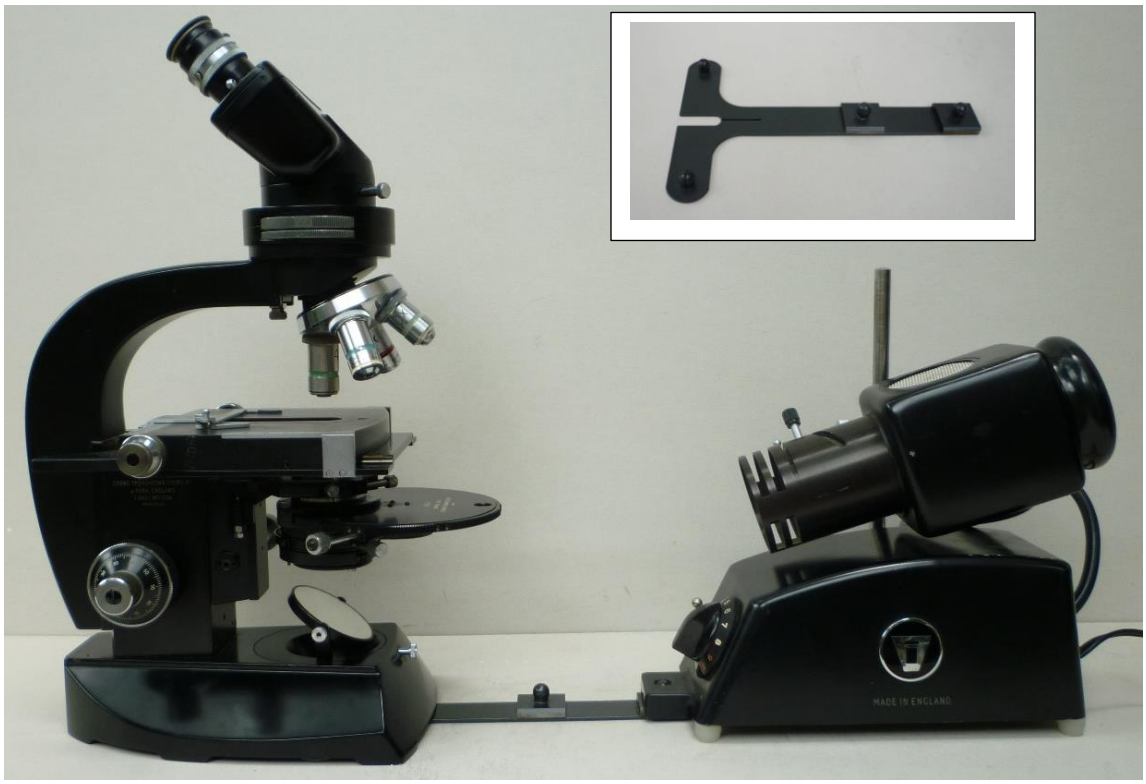
M25 (right)

Base with mirror unit removed.

Base illuminator unit with flip-out diffuser, condenser, mirror, and iris with centering screws (left)

Mirror unit for external illuminator (right)

M25



Mine is a binocular version equipped with a (Zernike) phase-contrast condenser, and its catalogue number is **M2510.**

There is a (built-in) magnification changer with 3 powers marked 1x, 1.5x, 2.25x, and a phase telescope to examine the back focal planes of the objectives for aligning the phase rings in the condenser.

Illumination is by mirror and external light source. (The version equipped with internal illumination is designated M2520.)

It is shown above with the 6 v, 48 w, Vickers high-intensity lamp with field iris, collector lens, and rheostat.

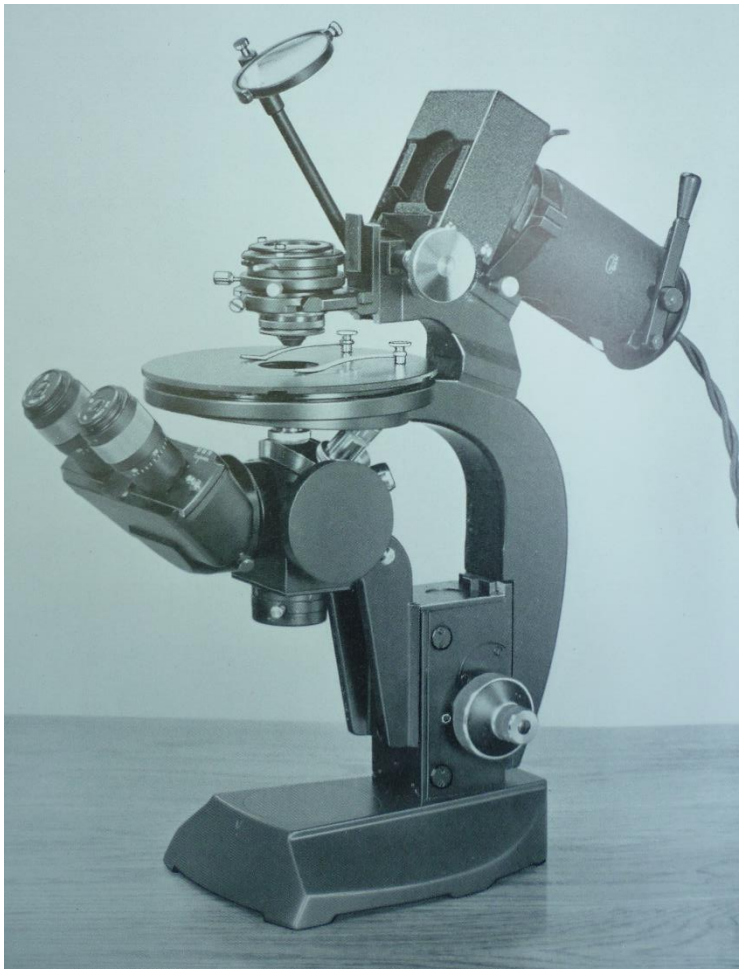
The microscope and illuminator could be tethered together using a T-shaped spacer (inset).

Clearly, there were monocular and trinocular heads also available, and other condensers.

The body is finished in semi-bright black enamel and chromium plate, as are all instruments in the series.

CTS call the M25 range a general-purpose instrument, and also cite the convenience of concentric controls at sub-stage level. Also noted are the fine-focus on ball bearings which gives a 'very free and yet dead-beat movement', and the patented nosepiece mechanism for avoiding damage to specimens.

M26



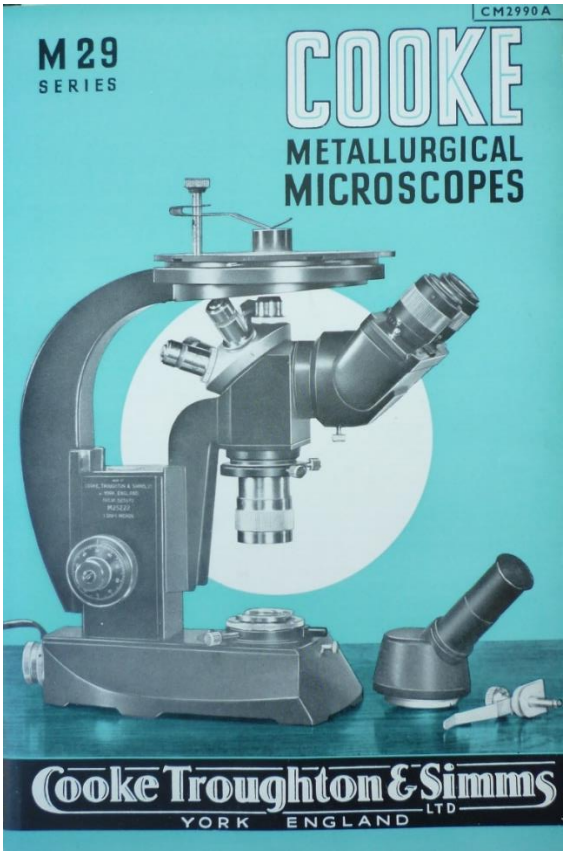
M2650

This is an inverted biological microscope. According to the brochure, it was considered particularly adapted to the examination of hanging drop cultures, and micromanipulation. This microscope has the same focus block orientation as the M25 but, since stage and objective changer are interchanged, coarse focus moves the limb with the stage.

The 6 v, 48 w solid source lamp can be removed if desired and an external source used. I do not know why CTS chose to use an angled source which therefore necessitated a mirror to divert light to the condenser. The more familiar setup is to mount the illuminator vertically above the condenser. But that does also result in a very tall, relatively unstable instrument.

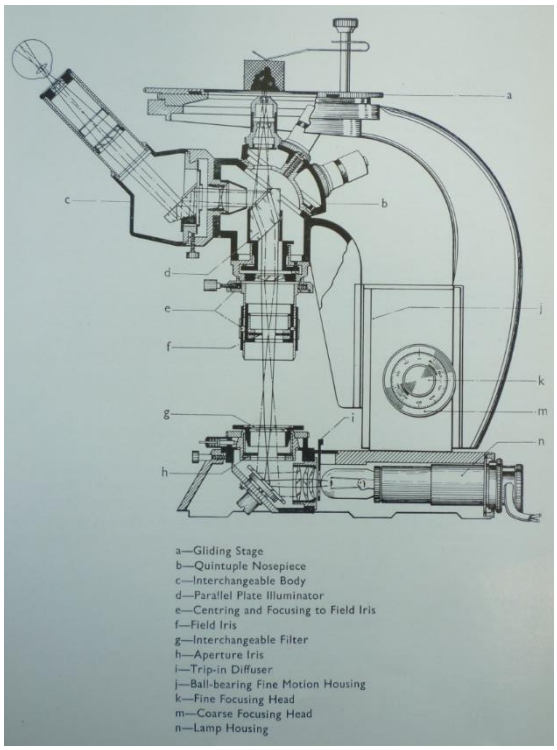
There was provision to mount a camera on the side of the body tube. A reflector can be tripped to divert the image beam to eyepiece or film.

M29



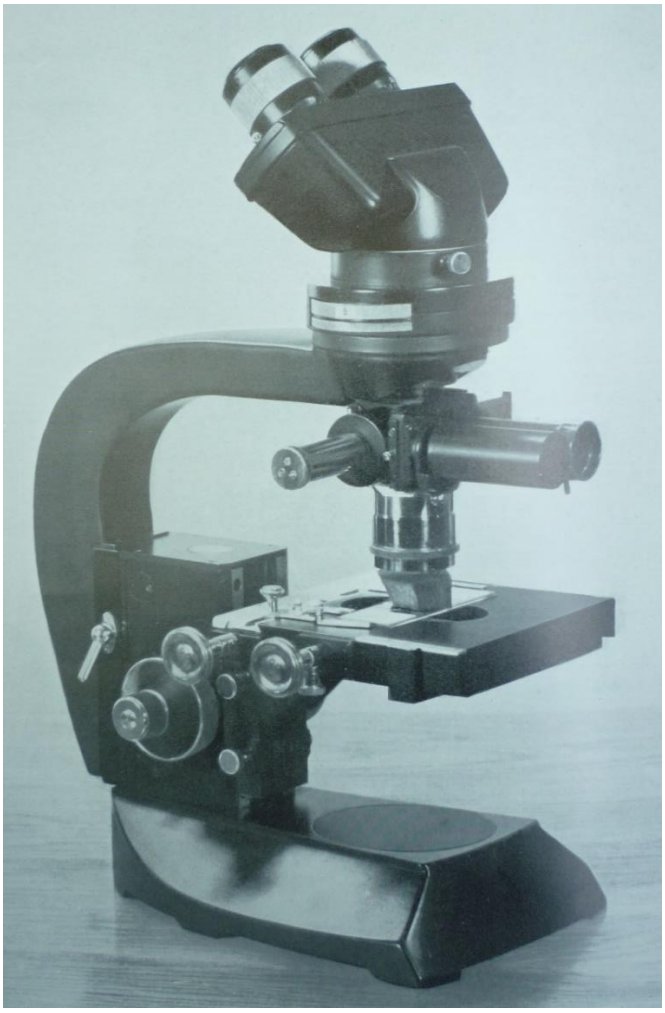
M2990

This is another inverted microscope, but for general metallurgical applications. So, it uses the base with inbuilt illumination. It has the same focus block orientation as the M25, with the coarse focus moving the limb and stage. A film of grease allows easy and accurate manual movement of the gliding stage.
Both binocular and monocular heads were available, and the latter allowed a simple camera attachment.



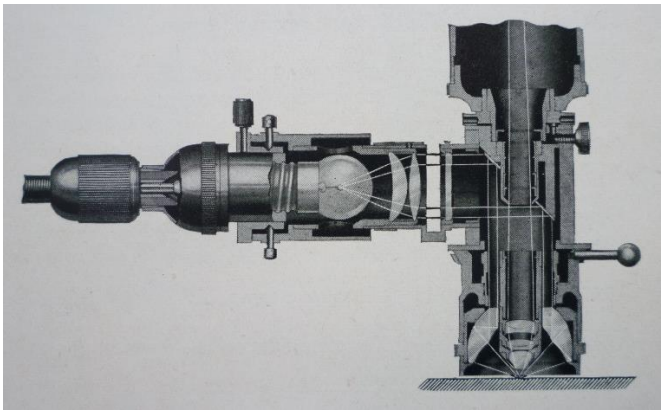
From the same M29 series brochure is a nice illustration of the **ray-paths** through the microscope.

M35



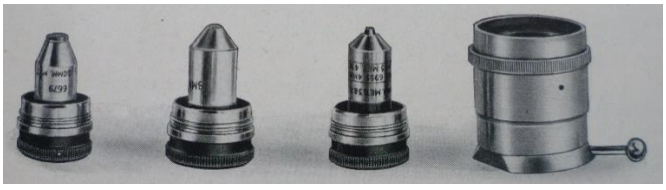
M3508

Brochures state that this range was designed to be more universal than the M25. While predominantly orientated to incident light microscopy (epi-illumination), substage illumination could also be included.
The focus block is rotated with respect to the M25, and so the coarse focus moves the stage, giving the advantage that when using an external source for the epi-illuminator, the alignment of the two is not disturbed by the coarse focus.
Various incident illuminators were available to be used with an external light source, such as the high-intensity unit shown previously, or an attachable light unit, typically 8v, 6w.
However, the most interesting were the Universal Illuminator, shown here, and the Dark Ground Illuminator.

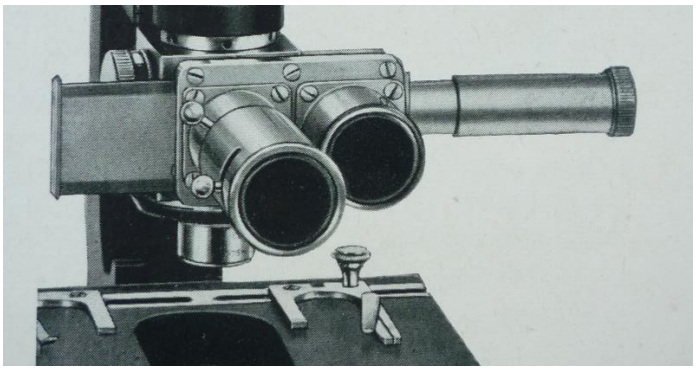


Dark Ground Illuminator

This takes the place of the revolving nosepiece changer.
Special objectives are screwed into the catoptric condenser.
It provides incident darkfield illumination, with separate, coaxial, light paths for the illumination and image rays, and can be compared to the Leitz Ultropak.



Three example Objectives and Catoptric Condenser



Universal Illuminator

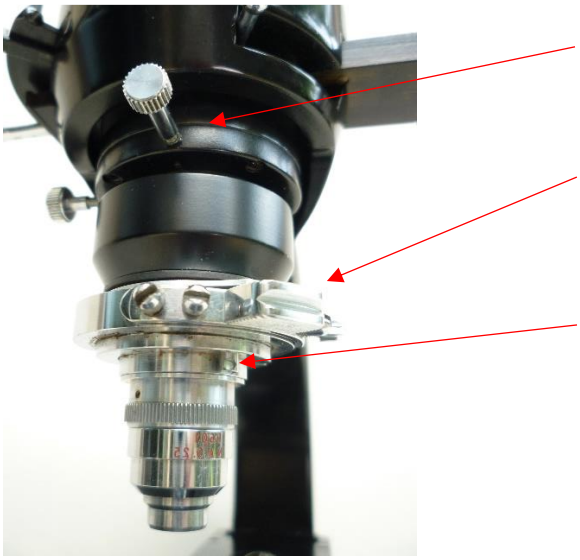
Using the catoptric condenser, this provides 4 different illumination methods: Transmitted light, epi-illumination with metal reflector, epi-illumination with glass reflector, and dark ground illumination. Each type can be selected by moving the plunger, which has three positions, and shifting the metal tubes to right or left.
It can be compared to the Leitz Panopak.

M3520

As noted, the M35 could be set-up as a **transmitted light microscope**. This catalogue example looks just like my M25 shown earlier (but with inbuilt illumination) until you notice the focus block orientation, which is rotated 180 deg with respect to the M25, and thus has the coarse focus moving the stage.

M75

This range consisted of the polarizing microscopes. My example has the catalogue number **M7520**.
The coarse focus moves the stage and the fine focus moves the limb and head.
A monocular head with Bertrand lens and a binocular head are present.
The base contains the built-in illuminator system.
The polarizer and analyzer both use Polaroid.
The analyzer is on a sliding mount and is also provided with 90 deg of movement.
There is a slot for compensator plates immediately below the analyzer.
A fair number of accessories were available, such as a 3-axis universal stage, and various heads set up for photography.
Interestingly, there was a small range of objectives prepared with a slot in the mount for the insertion of wave plates.



The **nosepiece** has centering screws.

The **objectives** are held in a changer also equipped with centering screws, and they can also be rotated independently into the best extinction position and held with a **locking screw**.

Interestingly, none of the objectives in my example are marked as polarizing, so I assume they were individually chosen to be strain-free out of standard batches.

Filter holder
Polarizer

Filter holder
Subsidiary low-power condenser

Sub-stage Condenser

Aplanatic condenser

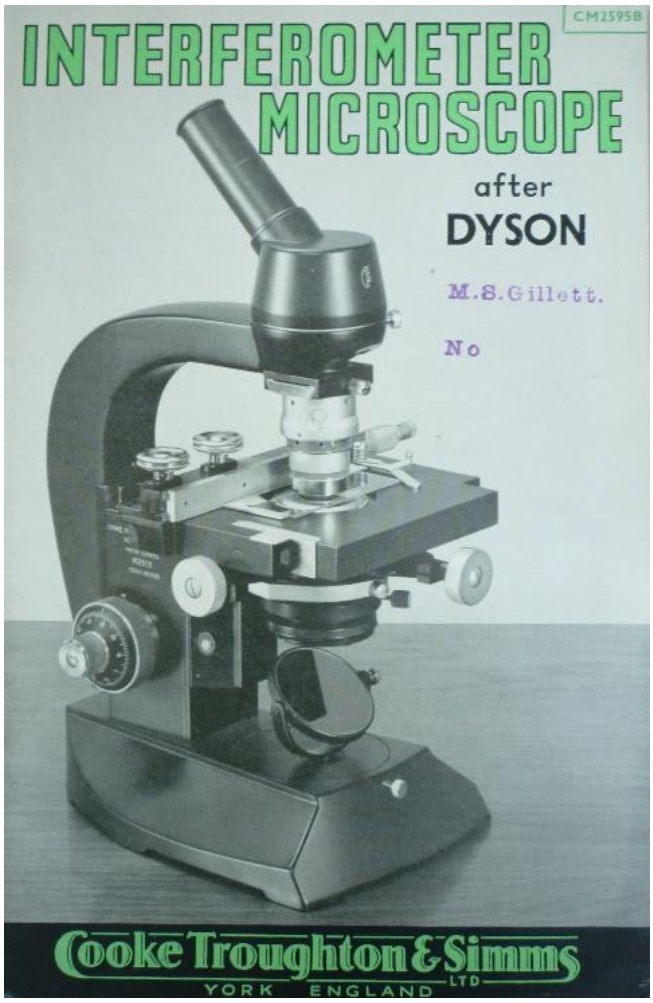
Condenser centering screws

Iris

It can be set up for **epi-illumination** also. In this case there are various options for accommodating large specimens: the limb and microscope body can be raised 40mm by loosening a clamp on the side of the body.
For further room, the substage can be removed from its slide and the stage mounted instead, giving a further 30mm.

It came in a beautiful dovetailed **wooden box** with a fairly extensive set of **auxiliaries**, most still there.

Interference Microscope after Dyson



M2595

This instrument provided an alternative to phase contrast, which has two drawbacks: the difficulty of making quantitative measurements, and the 'halo' effect, which is an image distortion caused by the phase plate and the differing ray-paths of the direct and diffracted light.

It uses the M25 stand and came in monocular and binocular versions. Two illuminators were available: a 6v filament lamp with transformer and a mains voltage Mercury vapor lamp.

The special objectives with centering mounts were 40X and 95X. Compensating eyepieces were used.

The methodology uses a glass plate above the condenser with levelling and transverse motion screws.

An identical plate is the front element of the special objective, and this is cemented to a plano-convex glass block. Above this is a normal objective. The whole is free to rotate and so align with the bottom plate.

Partially aluminized surfaces, fully silvered surfaces and clear surfaces direct the rays in a complex dance, and together with the transverse adjustment of the bottom plate, produce the interference.

Homogeneous immersion is used on both surfaces of the slide.

CONCLUSIONS

Munro (1) states that the short life of this series was due to high cost of manufacture and, in the case of the M75, lack of rigidity. The first point is quite obvious. There is a complexity and, from a modern perspective, lack of modularity. But I don't quite understand the later point. Certainly, if you grab the instrument by its limb, there is a nasty clunk as the weight of the instrument is taken up by the fine-focus mechanism.

This series in general appears orientated to higher end, research grade. But potential clients would also be looking at the competition with larger, heavier, more stable instruments, like the Leitz Ortholux and the Reichert Zetopan (with better illumination systems also).

However, it seems to me that this series was the inspiration for the Vickers M15 series, which became the most successful in the company's history, selling over 50,000 (1). This series had very similar styling, a simple robust coaxial focusing system operating the head only, and extensive modularity. Parts from the M25 series, like the heads, carried through with only minor changes, as did the rather elegant base, which was offered as an alternative to the more characteristic, but ugly horseshoe-type base of the M15.

REFERENCES

1. A. John Monroe. A History of Vickers Instruments' Microscopes. *Microscopy* (*Journal of the Queckett Microscopical Club*) 34, July-December 1980, January-June, 1981

COOKE TROUGHTON & SIMMS LTD BROCHURES

CM1741D Cooke Phase Contrast Microscope (no date)

CM2500E M25 and M35 Series (no date)

CM2595B Interferometer Microscope after Dyson (no date)

CM2990A Cooke Metallurgical Microscopes (no date)

CM7000G Cooke Polarizing Microscopes (Nov, 1959)

CM1000A Cooke Microscopes (No date, but mine is signed inside July, 1949. This predates the M25 Series but contains details of the epi-illuminators, etc.)

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Published in the June 2018 issue of *Micscape* magazine.
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