Back

MICROSCOPE-ANTIQUES.COM © 2013-16.

PETROGRAPHIC MICROSCOPE
MODEL: 'NEW PETROLOGICAL' or 'DICK PETROLOGICAL'
MAKER: JAMES SWIFT & SON

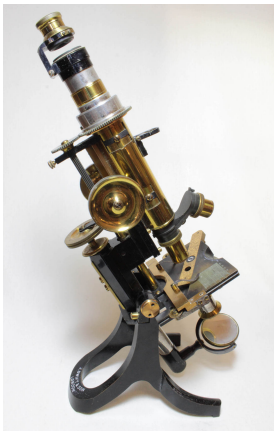
c. 1900

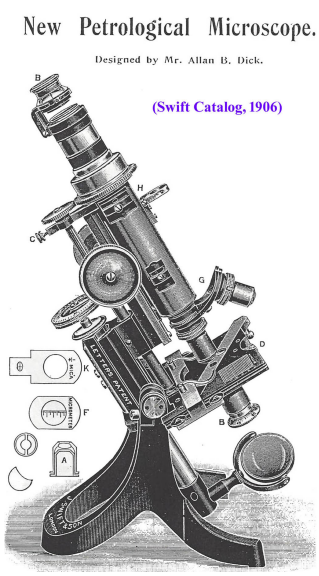
SERIAL NUMBER: 10829

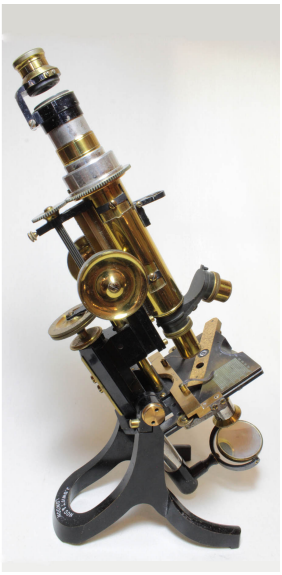
First year Listed in Swift Catalog: 1891

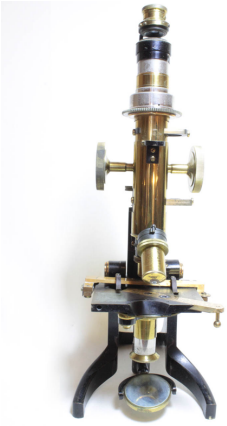
DESCRIPTION HISTORY

Please Click On Any Picture for a Larger Version



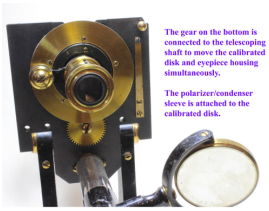


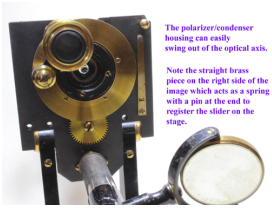




DESCRIPTION:

This microscope arises from a 'Crouch' type English foot. The height of the foot is about 5 1/8 inches. On the underside of the foot is a serial number of 10829. The case serial number however is 17669, (which might suggest this microscope was part of school, where similar microscopes might get put away in different cases). Also engraved on the bottom of the foot is '*Lacy*' in neat script. The continental-style limb is supported by trunnions on each side. A straight nickel-plated tailpiece supports a gimbaled plano-concave mirror which rides on a sliding sleeve around the tailpiece.



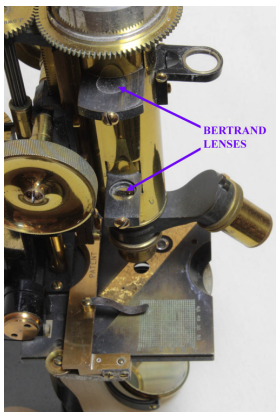


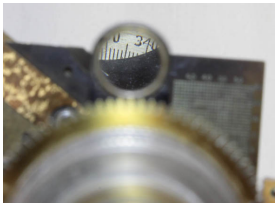
The square stage is about 3 5/8 inches wide, and has a substage sleeve that rides on a large geared calibrated disk with a silvered scale visible from the top of the stage, the bottom side being lacquered brass. The sleeve can hold the polarizer or the achromatic condenser (both present). The condenser and sleeve can be thrown out of the optical axis on a hinge.

The nickel-plated polarizer housing has a pin to register it on the sleeve. It has a calibrated knurled lacquered brass knob with a stop for zero and an arrow in the barrel points at the degree scale.

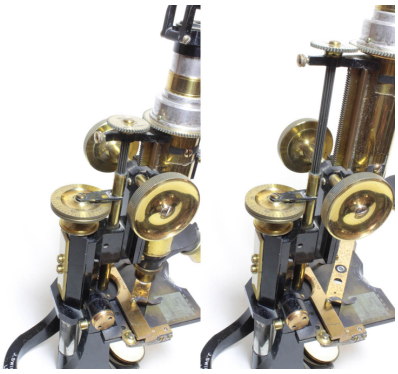
A slide holder attaches to the sides of the stage by rollers, two stationary on the left side and a spring-loaded one on the right. The rollers ride in slots machined into the sides of the stage for this purpose. Two spring-steel stage clips ride on this roller device. There are also two separate stage clips which fit into holes on the stage for stationary use without the roller device. A dovetailed slider fits in at a 45 degree angle from the left front corner. It has two 'empty' openings, one smaller than the other, which are fixed apertures, and a third oriface houses a convergent lens for use when viewing conoscopic images. The slider has three tiny holes that register its position against a pin sprung from the bottom of the stage.

Coarse focus is by diagonal rack and spiral pinion and fine focus by micrometer screw acting on the pillar.

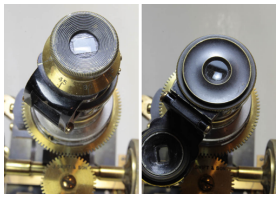


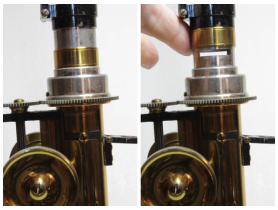


The optical tube has two Bertrand lenses, one on the lower end of the tube and another at the upper end. Both can be thrown in or out of the optical axis and both can be focused up and down within the tube. A double nosepiece is present. On the front of the optical tube is a fold out lens, housed in hard rubber, allowing the operator to read the silvered scale on the large disk at the stage from the top of the microscope; this is not possible when the double nosepiece is installed as pictured, but is possible with the double nosepiece angled instead of aligned front to back; this angled position was the usual way it was installed on a petrographic microscope.



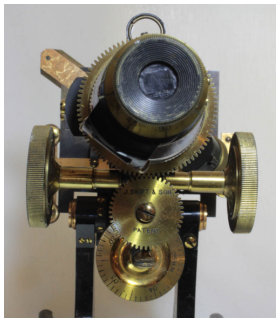
A telescoping rod passes from the level of the bottom of the eyepiece through the arm of the microscope and through the stage. A gear at its top meshes with a gear that rotates the eyepiece housing, and a gear attached to its bottom meshes with the the large disk under the stage which attaches to the condenser sleeve. In this way, rotation of both the eyepiece housing (with analyzer) and the polarizer, rotate simultaneously.





The analyzer sits over the eyepiece and is in a flip over attachement, making it easy to move out of the optical path. It can also rotate independently via a knurled calibrated scale, with stops. There is a slot in the upper tube to admit sliders such as a waveplate into a slotted eyepiece when it is present. The slot is covered by a dust cover which slides up and down.

Accessories currently with the instrument include two separate stage clips, the rolling slide holder, a double nosepiece, three Swift objectives, one eyepiece, achromatic condenser, dark field stop and a stop for oblique illumination. The objectives are a J. Swift & Son 1 inch, a J. Swift & Son $^1/_4$ inch with n.a. 0.88^6, and a $^1/_{12}$ inch J. Swift & Son oil immersion with n.a. of 1.30. The objectives each come in their own can, each labeled 1 IN, $^1/_4$ IN, and $^1/_{12}$ IN respectively. The achromatic condenser has an iris diaphragm controlled by a knurled ring at its bottom end. An insert fits inside the bottom of this condenser and has a tiny ridge inside of its top to hold the dark field stop or oblique illumination stop which are also present. The top element of this condenser can be unscrewed to remove it and reveal the lower element.



The microscope is about 13 inches high with a 1 inch objective focused on a slide, without the analyzer in place. The gear at the top of the telescoping rod is signed 'J. SWIFT & SON, PATENT'. The rolling slide holder is signed 'PATENT.' The fine focus knob has a diameter of about 41 mm (1 /58 inches), and is calibrated in 0.001 mm increments, labeled every 0.01 mm. The substage toothed silvered scale disk is calibrated in single degrees and labeled every ten. The stage has a calibrated grid engraved on its surface at the right side near the front for slide location. It is calibrated in both X and Y directions in mm. The foot is signed 'J. SWIFT & SON, LONDON'. The dovetailed hardwood case has green felt pads inside and a brass carrying handle. It has brass hinges and a brass lock. Lacking from this outfit are the key to the lock, the waveplates, and the slotted crosshair eyepiece.

The original waveplates, no longer with this example, were housed in black hard rubber. Waveplates from another example of this microscope are shown here to the left.

The serial number of the box, as noted above is much higher than that on the microscope.

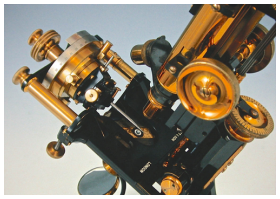
HISTORY OF THE SWIFT DICK PETROGRAPHIC MICROSCOPE:

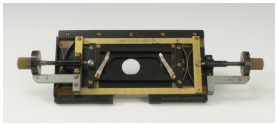
James Powell Swift worked for Andrew Ross before starting his own business in 1854. When his son joined in 1877 the name changed to J. Swift & Son. The name changed in 1912 to James Swift & Son Ltd. Starting in the late 19th century, Swift and Son Specialized to some extent in Petrographic stands. Unfortunately there is no record available to date serial numbers on Swift microscopes, though the serial on this scope is in the lower range of known serials which, according to Bracegirdle run from 10290 to 23983. Swift Dick Models were first offered about 1891[4], and the various iterations continued to be offered through the mid twentieth century. Although made for many years, Dick models were relatively expensive and few still survive. Many of these seem to lack the slotted eyepiece, waveplates or both. Over the years various modifications of the model were offered.

Mineral sections are examined in several different ways with a petrographic microscope. They can be examined with a polarizer alone with plane polarized light from below. They can also be examined with 'crossed polars' where the orientation of the polarizer(below the stage), and analyzer(above the stage), being oriented 90 degrees from each other would result in 'extinction.' In this situation, if no anisotropic specimen is placed between the polarizer and analyzer, the field will appear black. That is to say, that if the specimen does not alter the polarized light entering it, the field will remain black. With anisotropic specimens, not only is what is seen not black, but it changes with rotation of the specimen. This was originally studied by rotating the specimen on the stage with the polarizer and analyzer orientation fixed at 90 degrees from each other. To do this, the stage and objective need to be accurately centered. Because this is a bit tedious, and may need to be redone each time an objective is changed, easier methods were introduced. Perhaps the earliest was to include the facility to rotate the stage and optical tube together, but independently of the analyzer, as seen on microscopes such as the Nachet 'Petit Modele Petrographiage' of 1886. Another way is to rotate the analyzer and polarizer as a unit. The Dick Microscope uses gears to achieve this, mechanically coupling the rotation of the analyzer and polarizer. The specimen then can remain in the same place on the stage, and centration is no longer required, thus facilitating optical analysis of very small mineral grains.

Allen B. Dick was the first to invent this gearing system and it was first reported in 1889[1,2]. James Swift and Son

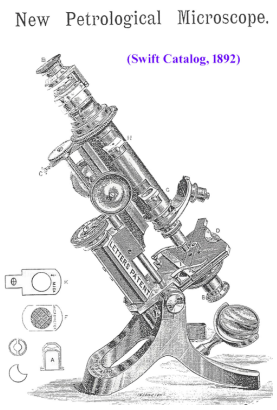
were the first to manufacture microscopes with this feature under patent and it first appeared in their catalog of 1891. Of special interest is that the Swift/Dick was used in a British polar expedition to Antarctica, as evidenced by various photos of the geologist (Frank Debenham) preparing samples with the 'scope in the background.



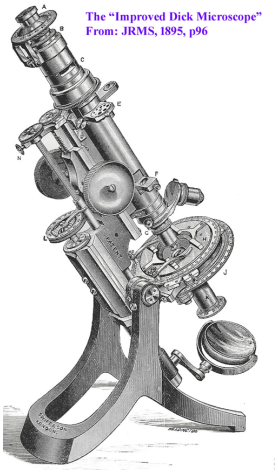


Other accessories were available for the Swift Dick microscope, and two of these are quite rare. One is the Meirs' stage goniometer(left), a complex instrument that allows precise rotation of a mineral grain. Another was a Shand's integrating stage(right), modified at the factory to fit the stage of the Dick model. The author is indebted to Dan Kile for these images from his collection. His superb articles should be consulted for more information about the history of the petrographic microscope[7,8]

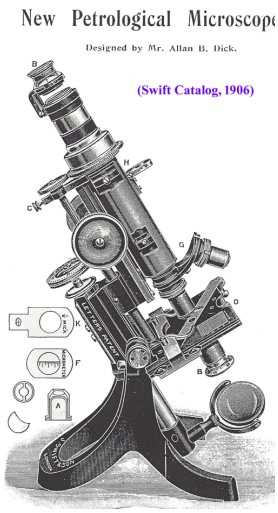
As easier methods to reproducibly center objectives became common, the need to simultaneously rotate the polarizer and analyzer became unimportant, and the rotation of the stage again became the standard. Most modern petrographic microscopes work this way. For examples of objectives with centering mechanisms, see the Leitz Polarizing Microscope, in this collection and the Watson Grand Van Heurk, also in this collection.



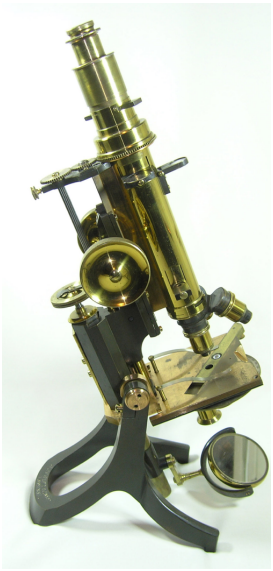
When the Dick model was first offered by Swift(left), it was called the 'New Petrological Microscope.' Other models soon followed and by 1892, the 'New Larger Petrological Microscope' was also offered. Besides being larger than the original form, this microscope featured a finely divided scale for rotation of the eyepiece with magnifier over vernier scale reading to 5' of arc. It also provided finer divisions in the fine focus knob to 1/5000 mm as opposed to 1/1000 mm in the orignal version.

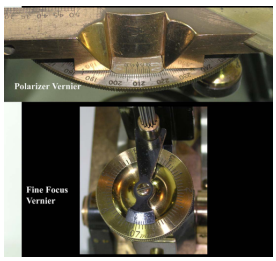


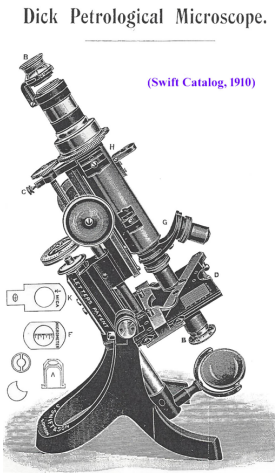
In 1895 an 'Improved Dick Petrological Microscope'(right), was reported in the JRMS[5]. This stand provided a calibrated rotating stage thus offering the user the choice of rotating the stage or the simultaneous rotation of the polarizer & analyzer. Another addition was a an iris diaphragm above the polarizer. The other new feature was a revolving disk of apertures for the upper slider, unlike the single choice in the original model. By 1895 all Dick models were provided with a flip-down magnifying lens attached to the body tube, which allowed reading the angle on the silvered understage polarizer disk without having to move far out of the optical axis nor get closer to the stage.



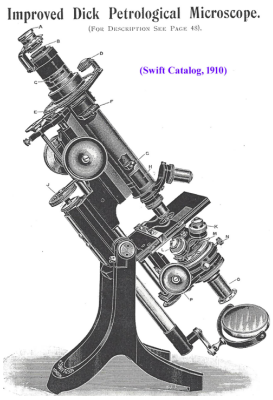
The 1906 catalog entry(left) still called the microscope the 'New Petrological' but a subtitle was added 'Designed by Mr Allan B. Dick.' The 'New Larger Petrological' was still offered, and still without illustration, but an example is pictured to the right, and a comparison to the standard model is shown below. This model is about 20% larger, has verniers for the fine focus and analyzer rotation and a wormscrew focus for the substage. It also has larger stage, and a third gear both above and below. Note that the eyepiece assembly for this example of the 'Larger Petrographic' microscope is most likely an adaptation, not the original.

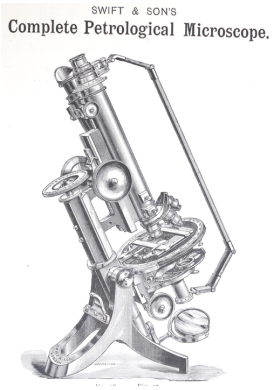






By 1910(left), the catalog called the original the 'Dick Petrological Microscope.' The features did not change. There was also offered the 'Large Model Dick Petrological' again with no illustration. A newer version of the 'Improved Dick Petrological'(right) featured the vernier scale for the eyepiece, but now a rack & pinion focused substage housing a revolving group of three different condensers above the polarizer. An iris diaphragm was interposed between these condensers and the polarizer. Further a swing-out holder in this apparatus accepted stops for dark ground and oblique illumination, as well as selenites and waveplates. This substage also had a centering adjustment. The stage was again square. With the vernier scale below the eyepiece, the understage graduated disk was eliminated.





An interesting fact is that in 1891 Swift also marketed a microscope(left) which also allowed simultaneous rotation of the polarizer and analyzer but instead of the internal gears, this microscope, called the 'Complete Petrographic' microscope, allowed this rotation through a bar coupling that stuck out in front of the microscope. This type of coupling was to become popular in the 1st quarter of the twentieth century and beyond.

The Dick rotation mechanism was used by others such as Fuess in 1895(right), where the 'Model VI' had both stage rotation and gear rotation. The Dick mechanism was also used in their models VIIa and VIII. This image courtesy of, and collection of, Dan Kile.

Another rare microscope using Dick's invention is the rare R & J Beck Dick model(left), which because of its much higher original cost, was never very popular and is therefore considerably rarer than the Swift model. This image courtesy of, and collection of, Dan Kile

REFERENCES AND FOOTNOTES:

1. **Dick, A.B. A New Form of Microscope. Mineralogical Magazine VIII pp 160-163. 1889.**
2. **Dick, A.B. Dick and Swift's Patent Petrological Microscope. JRMS pp 432-436. 1889.**
3. **Bracegirdle, Brian. Notes on Modern Microscope Manufacturers, pp 72-74. Quekett Microscopical Club. 1996.**
4. **Bassett, JH. The History of James Swift & Son Ltd. JQMC X pp 210-221. 1977.**
5. **Anon. Messrs Swift and Son's Improved Dick Petrological Microscope. JRMS pp 96-97. 1895.**
6. **Swift offered 1/4 inch objectives with n.a. of either 0.80 or 0.88.**
7. **For an authoritative and richly illustrated history of the petrographic microscope, please see: Kile, D. (2003) The Petrographic Microscope. Supplement to the Mineralogical Record, Nov-Dec 2003. Tucson.**
8. **Kile, D.E. (2013) The petrographic microscope: Addendum. Mineralogical Record, v. 44, 303-322.**

9. **Dick, Allan B. (1890) NOTES ON A NEW FORM OF POLARIZING MICROSCOPE James Swift & Son. London.**

The author would like to gratefully acknowledge the kind assistance of Dan Kile, James Solliday, and Dr Joe Zeligs for valuable catalog information, and advice about the Swift Dick microscopes. I am particularly indebted to Dan Kile for providing superb images from his own personal collection which have greatly enhanced this page.