SPECTROSCOPES

Prices Revised

1961

BECK

SPECTROSCOPES

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BUSINESS TERMS

1. All prices are strictly nett for cash.

2. Payment should be made by cash with order where no account has been opened in our ledgers. When it is desired that a ledger account be opened, London reference should accompany order to prevent delay.

3. All goods and experimental models made to order must be paid for half in advance and half on delivery. We take no resposibility as to the performance of experimental models.

4. Prices are subject to alteration on account of fluctuation in cost of labour and materials.

5. A charge is made for packing cases, which when returned empty, carriage paid and in good condition, will be credited at invoiced price.

6. Delivery is free in London district. Elsewhere in the United Kingdom, goods are sent carriage paid and the cost of carriage charged on the invoice, except in cases where delivery is included in the contract price.

7. We do not hold ourselves in any way responsible for damage to goods in transit, although every care is expended in the packing. Our risk terminates on the goods leaving our London warehouse. We can insure goods at customer's expense if instructed to do so.

8. We cannot consider complaints as to the execution of any order unless lodged within seven days of the receipt of the goods.

9. Code. In cabling or telegraphing orders it is only necessary to quote catalogue number.

This catalogue cancels previous lists.

Foreword

The following pages describe a range of instruments designed to suit the requirements in various classes of spectroscopic work. There are two types. The diffraction spectroscopes employ a replica of a master grating 14500 lines to the inch as described on page 17. The prism spectroscopes contain a train of five prisms. The advantage of the diffraction type is that the entire spectrum is in exact correspondence with the wavelength, whereas in those utilizing the train of prisms, the red end is closed up, and the dispersion is relatively small at this end compared with the blue. Where this is of no consequence and when a very bright spectrum is of advantage, the prism spectroscopes are of great use, as they pass more light than the diffraction types.

The reversion spectroscope has gained great popularity owing to the ease and accuracy with which readings may be taken by the method employed in them. Two models are described. One is the No. 2780 Hartridge reversion spectroscope, chiefly used for the determination of CO in blood and provided with a special stand for the accommodation of the specimens and their comparison and illumination. The other model, No. 3505, also on the reversion principle, is designed for use where very accurate wavelength readings are required.

A portable instrument for the examination of the ultra violet spectrum is also described. A brief description of the Dobson ozone spectrophotometer is included, also particulars of a newly designed micro-spectroscope.

Spectroscopy covers a very large field and details of the purposes to which the instruments may be put and the method of their use for these many and various classes of work are beyond the scope of a catalogue. Consequently we suggest that anyone interested in spectroscopy as a subject or requiring further information on the use of the instruments for general or specific purposes, should refer to the following books :—

" Spectroscopy, in Science and Industry "
by S. Judd Lewis.
Published by Blackie & Son Ltd., London.

" Practical Spectroscopy "
by T. A. Cutting.
Published by William Heineman Ltd.

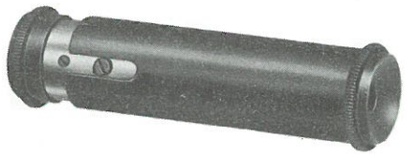
In addition to this catalogue, the following publications connected with Beck products are available to anyone interested and will be sent on request :—

Microscopes (General catalogue).
Stereoscopic binocular microscopes.
No. 50 Universal microscope.
Magnifiers.
Projectograph (opaque projector).
Optical Units and Benches.

A small selection of optical units particularly applicable to spectroscopy is listed on page 20.

See Revised Price List

Diffraction Spectroscopes



No. 2444.

No. 2444 spectroscope is a small and simple instrument for use in the hand. The illustration shows it full size. It is direct vision and gives a brilliant spectrum with a dispersion of 11 degrees. The slit is of a fixed width and is protected by a glass cover plate to exclude dust. As will be seen from the illustration, the eyepiece end of the spectroscope is adjustable in relation to the slit, so that a sharply defined spectrum can be obtained. This spectroscope has been widely adopted for students use and also for medical purposes for the examination of blood specimens and for many other general purposes. It is supplied in a pull-off leatherette covered case and is of convenient size for carrying in the pocket.

No. 2444. Spectroscope, in case 4-0-0

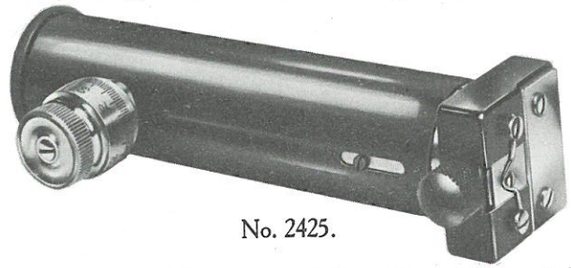


No. 2447.

No. 2447 is constructed on similar principles to the No. 2444 but it is provided with an adjustable slit the width of which can be varied by means of a milled head. The effect of this variation of the slit is to alter the width of lines in the spectrum when viewed through the instrument and is of special value for distinguishing lines which are very close together. The dispersion is 11 degrees. The focussing of the instrument, in order to obtain sharply defined lines in the spectrum, is accomplished by sliding the inner tube, to which the slit is attached, in the outer tube until the correct position is reached. On one side of the slit is a large tapped hole so that the spectroscope may be attached to the stand No. 2437 as listed on page 16. On the other side of the slit are two small tapped holes for the attachment of the cylindrical lens No. 2496 or the test tube holder No. 2697, also described on page 16. This spectroscope is suitable for general simple work and readily shows the Frauenhofer lines or rainbands. The illustration shows the instrument full size. No. 2449 has in addition a comparison prism as described on page 16. A fitted leatherette covered case is provided.

No. 2447. Spectroscope, in case 11-4-0 ... ...
No 2449. Spectroscope, in case 13-8-0 ... ...
No. 2437. Stand ... ... 3-6-0 ... ...

Reading Diffraction Spectroscopes



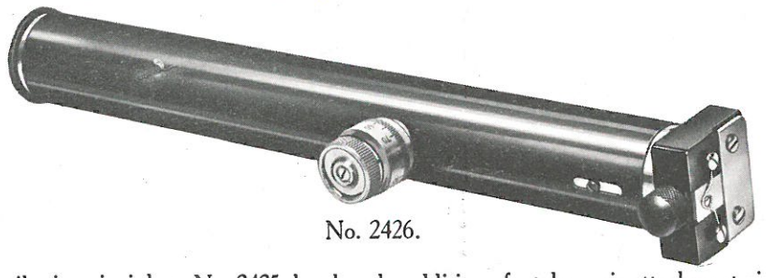
No. 2425.

No. 2425 is a larger instrument and is constructed for taking readings of the wavelengths of the light emitted by the substance under examination. The instrument is direct vision and has a dispersion of 17 degrees. It is fitted with an adjustable slit actuated by a milled head at the side. An adjustment for focussing is also provided as described in connection with No. 2447. The readings are taken on a drum having 100 divisions, which are arbitrary but which can be calibrated in wavelengths by the user. When the instrument has been trained upon the specimen and the slit adjusted to a suitable width, an illuminated indicator will be seen, impinging upon the spectrum. The rotation of the graduated drum, will travel the spectrum across the field. The lines can be set against the indicator and their position read by reference to the divisions on the drum.

The instrument may be used in the hand but it is generally advisable to employ a stand. For this purpose a tapped hole is provided in the side of the slit by which the spectroscope can be attached to stand No. 2437 which is described on page 16.

Cylindrical lens No. 2496 or test tube holder No. 2697 may be employed. The illustration shows the instrument approximately three-quarter size. No. 2428 has a comparison prism as described on page 16.

No. 2425. Reading spectroscope, in case ... 24-10-0 ... ...
No. 2428. Reading spectroscope, in case ... 27-0-0 ... ...
No. 2437. Stand ... ... 3-6-0 ... ...



No. 2426.

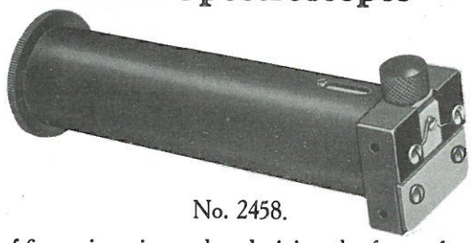
No. 2426 is similar in principle to No. 2425, but has the addition of a telescopic attachment giving increased magnifying power, therefore showing the spectrum on a larger scale and increasing the dispersion to 34 degrees. Cylindrical lens No. 2496 or test tube holder No. 2697 may be employed.

The illustration is approximately half size.

No 2429 has in addition a comparison prism as described on page 16.

No. 2426. Reading spectroscope, in case ... 35-4-0 ... ...
No. 2429. Reading spectroscope, in case ... 37-8-0 ... ...
No. 2437. Stand ... ... 3-6-0 ... ...

Prism Spectroscopes

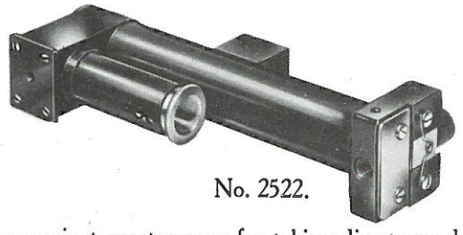


No. 2458.

In the No. 2458, a train of five prisms is employed giving the form of spectrum as described in the foreword. It gives a dispersion of 10 degs. The slit is adjustable and a focussing motion is provided as described in connection with No. 2447. Provision is made for the attachment of the cylindrical lens No. 2496 or test tube holder No. 2697 described on page 16. The instrument may be used in the hand or attached to stand No. 2437, a tapped hole being provided for this purpose. The illustration is five-eighths size. No. 2459 has a comparison prism as described on page 16.

No. 2458. Prism spectroscope, in case ... 14-10-0 ... ...
No. 2459. Prism spectroscope, in case ... 16-4-0 ... ...
No. 2437. Stand ... ... 3-6-0 ... ...

Wavelength Prism Spectroscopes



No. 2522.

No. 2522 is a simple and convenient spectroscope for taking direct wavelength readings. A train of five prisms is employed and the instrument gives a dispersion of 10 degs. The slit is adjustable and a focussing adjustment is provided. When the spectroscope is in operation an illuminated scale is seen in the field of view. The divisions on this scale represent 100 A and are numbered. The illumination of the scale is provided from an outside source by means of the tube at the side of the instrument. It is important not to obscure the window of this attachment during use. The position of the scale in relation to the spectrum is adjustable so that periodic checks and re-adjustments may be made. This is done by means of the screw at the side of illuminating tube. This screw has a locking ring which must first be released. It will be seen when looking through the spectroscope, that a marker line is visible in the field. By means of the screw, this line should be placed against the sodium line (5895 A) in the spectrum and the locking ring then clamped securely. This adjustment should not then be touched until a check and a possible re-adjustment are thought necessary. Cylindrical lens No. 2496 or test tube holder No. 2697 may be employed.

The illustration is half-size.

The instrument should be used on a stand to facilitate its correct alignment with the specimen and to render it stable for making the necessary adjustments. A tapped hole is therefore provided for its attachment to stand No. 2437. No. 2523 has in addition the comparison prism described on page 16.

No. 2522. Prism spectroscope, in case ... 32-14-0 ... ...
No. 2523. Prism spectroscope, in case ... 34-18-0 ... ...
No. 2437. Stand ... ... 3-6-0 ... ...

Wavelength Diffraction Spectroscope



No. 3500 on stand No. 2437.

No. 3500 is a larger and more elaborate instrument than those previously described. It is very substantially constructed and direct readings, to a great degree of accuracy, can be made with it. The instrument has a collimator carrying an adjustable slit, which is fixed to the centre portion containing the grating. On the other side of this is hinged the observing telescope, the relative angle of which to the collimator is varied by means of a micrometer screw with a drum. The screw moves the telescope on a sine motion and the positions of the spectrum lines, as they travel across the field, can therefore be read direct in wavelengths against the crossline fitted in the eyepiece, by reference to the divisions on the graduated drum. The drum has 20 divisions, each representing 10A and an index gives the number of complete revolutions of the screw. Readings to half a division (5A) can readily be taken. The dispersion is 34 degs. The spectrum can be focussed by means of a sliding adjustment of the slit in the collimator tube. The eyepiece has an adjustment for focussing the crossline. An eyepiece ×8 is normally fitted but a high power eyepiece No. 3502, ×15, can be supplied if desired. This latter increases the dispersion to 68 degs.

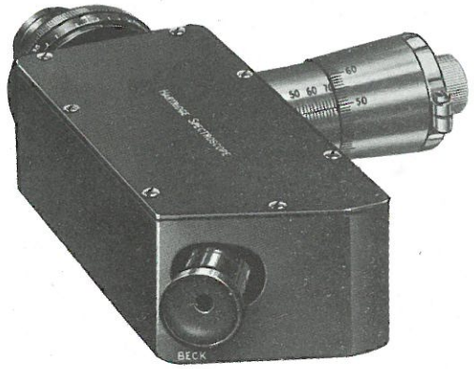
Cylindrical lens No 2496 or test tube holder No. 2697 may be used with this spectroscope.

The instrument should be used on a stand and provision is made for fitting it to stand No. 2437 on which the instrument is illustrated. This enables the height to be adjusted and also the angle at which the spectroscope is placed. The positions can be clamped to ensure rigidity. The clamp by which the spectroscope is attached to the upright of the stand is made, as standard, to attach it in the manner shown in the illustration, but it can be supplied on request so that the instrument is held on its side, *i.e.*, with the slit vertical.

The illustration shows the spectroscope just over quarter-size. A hardwood case is provided in which it is desirable to keep the instrument, when not in use.

No. 3500. Wavelength spectroscope, in case ... 61-16-0 ... ...
No. 3502. High power eyepiece ... ... 3-6-0 ... ...
No. 2437. Stand ... ... 3-6-0 ... ...

Hartridge Reversion Spectroscope



No. 2780.

The reversion spectroscope was originated by Prof. H. Hartridge, F.R.S., its special feature being the ease and accuracy with which the position of any particular line or band can be ascertained. Two spectra are formed, one above the other, but the direction of their colours is reversed. The spectra are moved across the field by means of a graduated drum, but they travel in an opposite direction. The reading is obtained by setting the line or band in one spectrum against the same line or band in the other, which can be done with great accuracy. In the case of absorption bands where the outer edges are indefinite, this method is found very satisfactory. It also obviates the difficulty found in setting a line against a crosswire which is not plainly visible, especially in the darker region of the spectrum. The dispersion given by the spectroscope is $9\frac{1}{2}$ degs.

The general design of the spectroscope may be seen from the illustration which shows the instrument approximately two-thirds size.

The readings are taken on a graduated drum which has 100 divisions each representing 1A and figured at every ten divisions. This is read against a line. An index scale is provided with divisions, each representing a complete revolution of the drum. The arrangement of these scales can be observed in the illustration and it will be seen that readings can be taken easily and rapidly. The range covered is 3000 A to 7000 A. The scale is accurate for readings over small parts of the spectrum, but not over the whole range. For this reason the drum is fitted with an adjustment by means of which it can be set for varying regions of the spectrum. This setting is made by means of the indicator lamp (No. 2788) supplied with stand No. 2781 (page 9). The slit is symmetrical *i.e.* both jaws are moved for the variation of its width. The width is controlled by the rotation of a ring which is graduated in thousandths of an inch. The divisions are figured so that it may be set at any pre-determined or known width. A cylindrical condensing lens is fitted in front of the slit, which concentrates the light in such a manner that the whole aperture of the slit is filled.

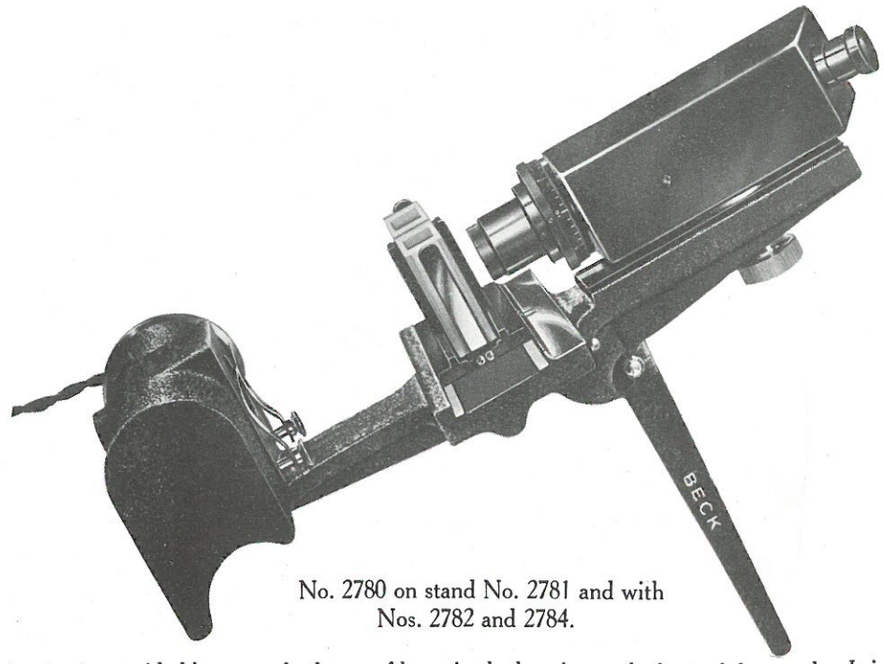


Symmetrical slit unit,
approximately full size.

One of the chief uses of the Hartridge reversion spectroscope is for the examination of blood, especially for the detection of carbon monoxide. The absorption band seen in specimens of blood containing carbon monoxide occupies a different position in the spectrum from that in normal blood, the amount of the shift being proportionate to the degree of carbon saturation. The use of the instrument for this purpose is fully described in :—

"Chemical Methods in Clinical Medicine"
by Dr. G. A. Harrison.
Publishers : J. & A. Churchill, Ltd., London.

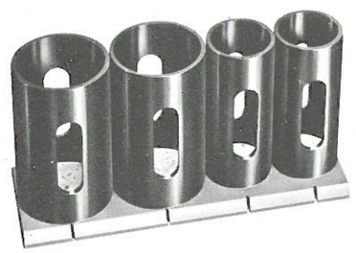
Stand No. 2781 is for use in conjunction with the Hartridge reversion spectroscope when examining solutions of haemoglobin etc. The use of this stand gives a quick and convenient method of comparison. A hinged leg supports the stand at a suitable angle. When not in use it folds flat to the main base, rendering the stand portable for travelling purposes. The general arrangement of the stand is shown in the illustration. The spectroscope is carried on the upper portion which is slotted. It is attached by means of a bolt and can be moved backward and forward until sharp focus is obtained, when it can be secured in position by means of a clamping screw.



No. 2780 on stand No. 2781 and with
Nos. 2782 and 2784.

The illumination is provided by a standard type of lamp in the housing at the base of the stand. It is run direct from the mains. Holders are used to carry the troughs or test tubes which contain the fluids for examination. The holders are made to slide in a dovetailed fitting, so that the solutions may be examined in turn. A clicking device secures the holder when each trough or test tube is in its correct position in relation to the light source. The troughs are held in the holder by spring clips and are readily interchangeable.

The holders are interchangeable in the dovetailed slide and are made in three forms. No. 2782 which is shown in the illustration above, accommodates two troughs of either 5 mm. or 10 mm. thickness. No. 2785 carries two test tubes and two boiling tubes, while No. 2786 carries two tubes for fluids, one behind the other, enabling them to be examined simultaneously. This is shown in the illustration on page 10.



No. 2785.

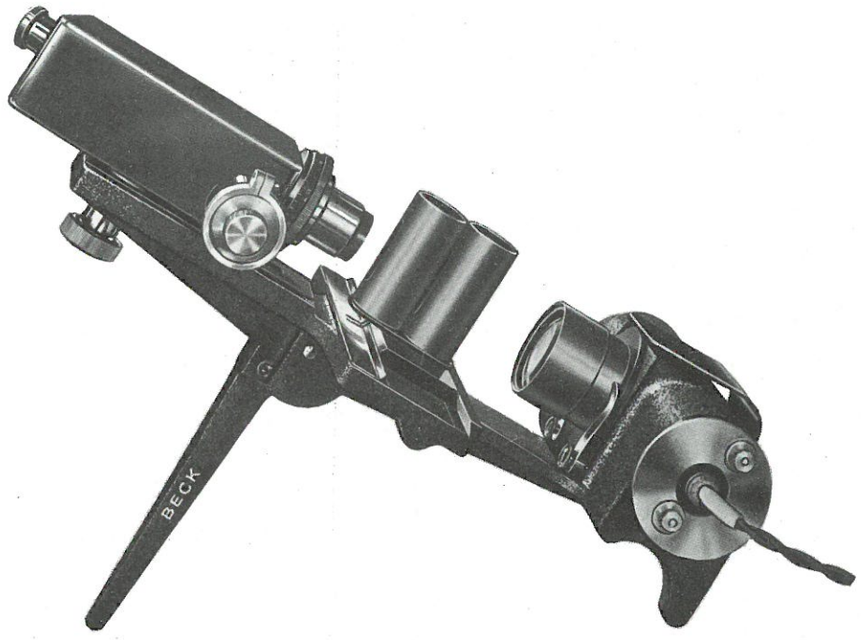
In the construction of the troughs for use with holder No. 2782, the glass is fused together so that they are impervious to acids and other liquids.

Although the housing containing the lamp is well shielded, a baffle plate is made which ensures that all extraneous light is excluded. The baffle fits on to the stand in front of the fluid holders by means of two screws. The holes to take these are already drilled and tapped, so that if ordered subsequently there is no necessity to return the stand for fitting purposes.

A further useful accessory is the No. 2788 indicator lamp. The main lighting source is completely detached and the indicator lamp in its tubular housing inserted. These lamps cover a wide spectral range and the characteristics depend on the mains voltage for which they are designed. Prominent lines of neon and mercury vapour at 4358.3 A, 5460.7 A, 5852.5 A and 6402.2 A are usually observable and provide a means of setting the calibration of the instrument in the various regions of the spectrum. The adjustment to set the reading of the instrument is readily made by releasing the screw of the clamp band and setting the divided drum for the known line being observed.

The neon lamp has a second use, as it can be employed for illuminating the divisions on the drum, when using the spectroscope in a darkened room. For this reason the lamp is wired separately from the illuminating lamp and may be plugged into a separate wiring point.

The illustrations on pages 9 and 10, showing the spectroscope on stand assembled for use, are approximately one third size.



No. 2780 on stand No. 2781 with attachments Nos. 2790 and 2786.

The illuminant fitted to the No. 2781 stand is sufficiently powerful for most uses but it has been found necessary in certain work to utilize a more intense light source. In the examination of absorption spectra of heavy bacterial suspensions and in the spectroscopic examinations of all types of partially opaque preparations, both bacteriological and chemical, a greater brilliancy of illumination is of great advantage. Consequently the No. 2790 high power lighting atttachment has been designed. It uses a 6 volt, 30 watt lamp in conjunction with a corrected condenser which is attached to the illuminating portion of the stand. By this means a very concentrated beam is passed through the material contained in the troughs or test tubes and into the slit of the spectroscope. A transformer is supplied for use on alternating current.

As before stated the stand No. 2781 is constructed so as to be readily portable and for those who desire to use the instrument in different places, a carrying case with handle is made which contains the spectroscope, stand and accessories. The case measures 14in. × 9½in. × 4½in. As the illuminating lamp and indicator lamp run off mains there is no difficulty in operating provided the voltage is correct.



Outfit, Nos. 2780-89.

No. 2780.	**Hartridge reversion spectroscope**	5 1 - 6 - 0
No. 2781.	**Stand,** including illuminating lamp, wiring, pin or plug adaptor	1 6 - 10 - 0
No. 2782.	**Holder** for glass troughs	3 - 6 - 0
No. 2783.	**Fused glass troughs** for No. 2782, 5 mm. thick ... ... per pair	1 - 18 - 0
No. 2784.	**Fused glass troughs** for No. 2782, 10 mm. thick ... ... per pair	2 - 14 - 0
No. 2785.	**Holder** for test tubes and boiling tubes	4 - 0 - 0
No. 2786.	**Holder** for two test tubes	4 - 0 - 0
No. 2787.	**Baffle plate**	1 - 18 - 0
No. 2788.	**Indicator lamp** in tubular housing, complete with wiring, pin or plug adaptor	
No. 2789.	**Mahogany case,** to contain above	7 - 16 - 0
Nos. 2780-2789.	**Complete outfit for examination of blood** for carbon monoxide	
No. 2790.	**High power lighting attachment** for stand No. 2781, with transformer	
No. 2792.	Spare lamp for No. 2781 ... ... each	— 6 - 6
No. 2793.	Spare lamp for No. 2788 ... ... each	— 7 - 6
No. 2794.	Spare lamp for No. 2790 ... ... each	— 10 - 0

When ordering, please specify voltage of electric supply and whether pin or plug adaptors are required.

Wavelength Reversion Spectroscope



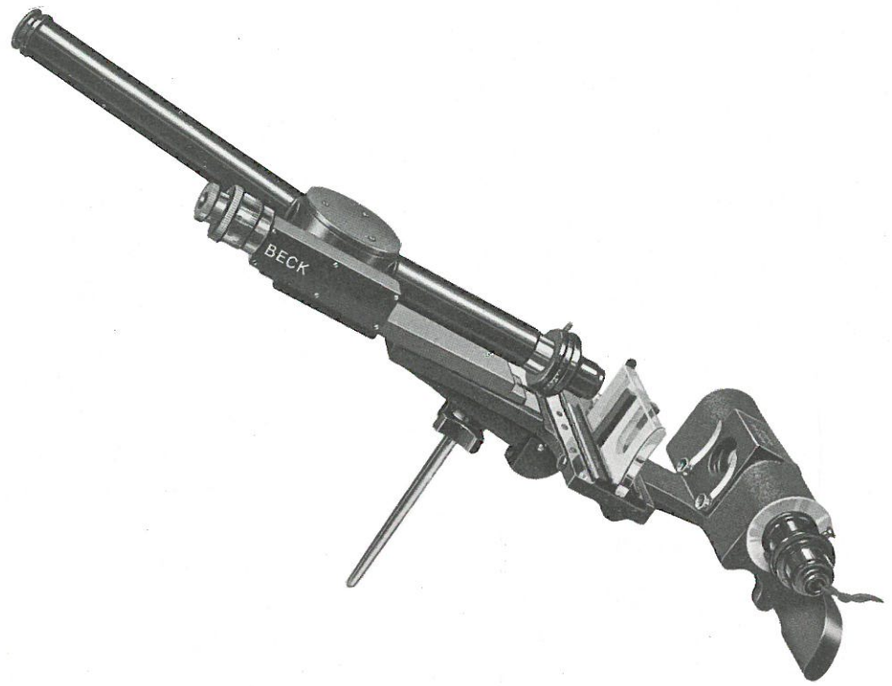
No. 3505 on stand No. 2437.

The No. 3505 spectroscope utilises the reversion principle already described on page 8. The dispersion of the instrument is 43 deg. and at this magnification great accuracy of reading can be achieved. As in the No. 3500 spectroscope, the viewing telescope is mounted on a drum, which rotates about the diffraction grating actuated by a tangent screw. This screw has an associated micrometer head, the drum of which is engraved with 100 divisions each representing 2A, thus providing an accuracy of 1A on clearly defined specimens. The action of the tangent screw is modified by a special device to produce an exact sine relationship and the calibrated scale is therefore linear and once set on any known calibration line, readings throughout the visible spectrum are accurate. Should it at any time become necessary to check the calibration of the instrument, any known spectrum line, such as the sodium D, can be utilised. For convenience, an indicator lamp, having a prominent yellow line at 5852.5 A, is offered for direct connection to the electrical supply.

The slit unit of the spectroscope is similar to that fitted to the Hartridge instrument and described on page 8, but has, in addition an adjustment enabling the slit length to be modified. This feature, by means of which the two spectra can be made to overlap, will be found most useful when readings are required on poorly defined spectra. A test tube holder, No. 2698, can be attached to this spectroscope if desired and a fitted hardwood case is provided for the instrument, in which it should be kept when not in use.

The instrument should be used on a stand and No. 2437 as described on page 16 is suitable, giving raising and lowering and also angular adjustment, with clamp for securing its position. The clamp by which the spectroscope is attached to the upright of the stand is made, as standard, to attach it in the manner shown in the illustration, but it can be supplied on request so that the instrument is held on its side, i.e. with the slit vertical. The illustration is just over quarter-size.

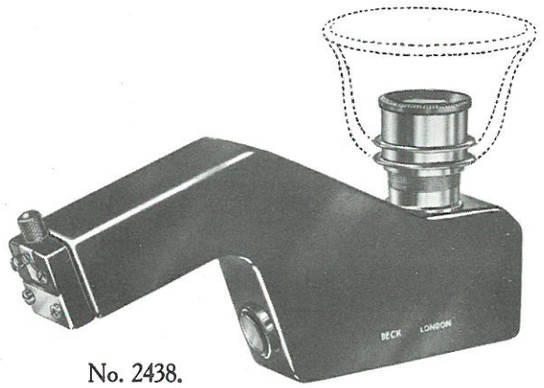
The greater accuracy of the No. 3505 spectroscope makes it particularly suitable for applications similar to those for which the Hartridge instrument is intended, and for this purpose a stand and accessories equivalent to those described on pages 9 and 10 are manufactured. A complete set in mahogany cabinet measuring 20in.×12in.×6in. is supplied.



No. 3505 on stand No. 2795 with attachments Nos. 2782 and 2784.

No. 3505.	**Wavelength reversion spectroscope,** in case		84-12-0
No. 2437.	**Stand**		3-6-0
No. 2795.	**Stand,** including illuminating lamp, wiring, pin or plug adaptor		30-12-0
No. 2782.	**Holder** for glass troughs		3-6-0
No. 2783.	**Fused glass troughs** for No. 2782, 5 mm. thick	per pair	1-18-0
No. 2784.	**Fused glass troughs** for No. 2782, 10 mm. thick	per pair	2-14-0
No. 2785.	**Holder** for test tubes and boiling tubes		4-0-0
No. 2786.	**Holder** for two test tubes		4-0-0
No. 2787.	**Baffle plate**		1-18-0
No. 2788.	**Indicator lamp** in tubular housing, complete with wiring, pin or plug adaptor		
No. 2796.	**Mahogany case,** to contain No. 3505, No. 2795 and attachments		11-0-0
No. 2790.	**High power lighting attachment** for stand No. 2795, with transformer		36-12-0
No. 2792.	Spare lamp for No. 2795	each	— 6-6
No. 2793.	Spare lamp for No. 2788	each	— 7-6
No. 2794.	Spare lamp for No. 2790	each	— 10-0

Ultra Violet Spectroscope



No. 2438.

The No. 2438 is a compact spectroscope for the visual examination of the ultra violet spectrum. The spectrum is rendered visible by the introduction of a fluorescent screen. The light passes through an accurately made slit, of adjustable width. The adjustment of the jaws of the slit is operated by a milled head. Passing through a quartz prism the light forms a spectrum upon a fluorescent screen and is examined by an eyepiece giving a magnified image. The eyepiece has a focussing motion and is fitted with an eyecup to exclude extraneous light.

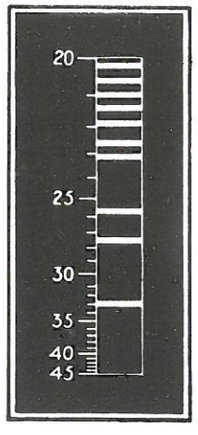
Beside the spectrum in the field of view is an illuminated scale, divided in Angstrom units, so that the wavelength of any portion of the spectrum under observation can be determined. The scale appears with illuminated lines and figures upon a black background, the illumination being obtained through a window in the instrument by means of the visible light in the light source under examination, so that no additional source of light for illuminating the scale is necessary.

The spectrum included in the field of view is from 2,000 A. to 4,500 A., which includes a small portion of the visible light.

The instrument can be conveniently used in the hand. A table stand can be supplied if required (page 16).

This spectroscope has been designed for rapid determinations in electromedical and similar establishments and for industrial workshop use, when a more complicated apparatus is inconvenient.

When a small source of light is being examined, the brilliancy of the spectrum can be increased by using the cylindrical lens attachment No. 2436 (see page 16), thus making it unnecessary to hold the spectroscope close to the source of light. The illustration of the spectroscope is just under half size.



Spark spectrum of zinc and cadmium as seen in eyepiece of spectroscope.

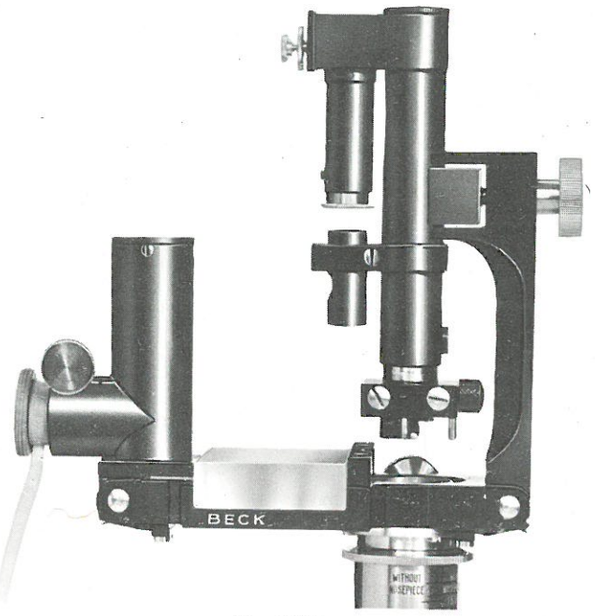
No. 2438. Ultra violet spectroscope, in case discontinued. ... ...

No. 2437. Stand ... ...

Hartree Microspectroscope

The No. 3000 has been developed in collaboration with Dr. E. F. Hartree, of the Molteno Institute, Cambridge, and is used for the identification and assessment of chemical substances from their characteristic spectral absorption bands. Dr. Hartree has fully described his methods in a chapter on "Haematin Compounds" in Vol. IV of 'Modern Methods of Plant Analysis,' published by Springer-Verlag, of Berlin, and edited by K. Paech and M. V. Tracey (1955).

In principle, the microspectroscope consists of a bracket which fits over the eyepiece tube of a microscope and carries a reading prism spectroscope and the necessary facilities for comparing the test material with substances of known constituents.



No. 3000

The basic component is the No. 2523 spectroscope described on page 6. When the spectroscope is in use, an illuminated scale is seen in the field of view having numbered divisions at intervals of 100A. The illumination of the scale is provided by a lamphouse employing a 4-volt bulb. The spectroscope unit and the lamphouse are both hinged to the main bracket to swing clear of the observer when the microscope is to be used in the conventional manner with standard optics.

For spectroscopy the eyepiece is removed and the objective only employed. A collector lens with objective thread is included in the set. This is of longer focus than the objectives normally available and its use improves results in certain conditions. The spectral characteristics of the specimen are observed by swinging the spectroscope unit into the microscope axis.

Facilities are provided for the introduction of a comparison spectrum utilising the light source which illuminates the wavelength scale. A comparison prism is attached to the slit unit which can be instantly swung into a position where it covers half the length of the slit, thus providing contiguous spectra.

A bracket between the light source and the comparison prism is designed to hold perspex platforms on which troughs can be accommodated. A short platform holds simple troughs into which solutions with known constituents can be placed to modify the comparison spectrum as desired. An interchangeable platform, 35 cm. long, and calibrated in millimetres, is used in conjunction with a double wedge trough. This is designed to contain known solutions of relative densities in the two compartments, the alteration in the position of the trough providing qualitative information on the concentration of the unknown material under test.

The instrument is designed to fit the standard RMS drawtube external size of 1.05 in. and a split sleeve is provided to enable it to be fitted to a microscope having drawtube diameter of either 1.0 in. or 25 mm.

The set includes a transformer to operate the illuminant from the main supply, the voltage of which should be specified. This is contained in a cabinet which also has compartments for the microspectroscope, the collector lens, perspex platforms and double wedge trough.

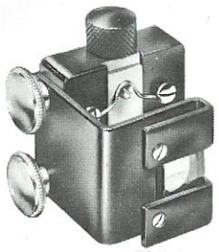
No. 3000. Microspectroscope, with transformer, perspex platforms and collector lens, in case... 89-18-0
No. 3002. Wedge trough 6-12-0

Table Stand

Stand No. 2437 which is shown in the illustrations of Nos. 3500 and 3505 on pages 7 and 12 is of robust construction with a large base to give stability for the manipulation of the instrument. The spectroscope is attached to the upright by means of a clamp. This allows of an adjustment for height and for the angle at which the spectroscope is used, each adjustment being separately clamped. In the case of the spectroscopes Nos. 3500 and 3505 this clamp may be supplied to attach the instrument as shown in the illustration or with the slit vertical so that the spectrum appears in the horizontal direction.

No. 2437. Stand ... 3-6-0 ... ...

Cylindrical Lens Attachments



No. 2496.

In examining small sources of light it is often found that only a portion of the slit is filled with light. The attachment of a cylindrical lens in front of the slit has the effect of converting a small spot of light into a line, more approximately the shape of the slit, and hence giving more light to the spectrum. This is especially useful with small, weak sources. The attachment is made to fix on in front of the slit by means of screws with milled heads which engage in tapped holes provided in the side of the slit unit. No. 2496 contains a cylindrical lens in glass for use with visible light sources. No. 2436 is made in quartz for use with the ultra violet spectroscope.

No. 2496. Cylindrical lens attachment ... ... 3-6-0 ... ...

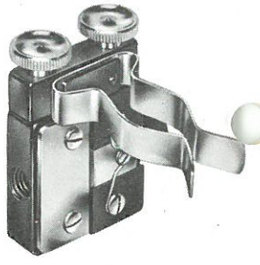
No. 2436. Quartz cylindrical lens attachment ... discontinued ... ...

Test Tube Holders

These holders provide a means of attaching a test tube containing a liquid specimen in front of the slit. They have a spring clip for holding the tube, a number of which can be readily interchanged. No. 2697 is suitable for attachment to spectroscopes Nos. 2447, 2425, 2426, 2458, 2522 and 3500. No. 2698 is utilised on No. 3505.

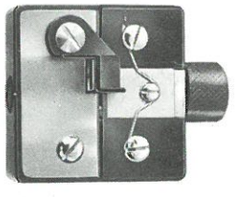
No. 2697. Test tube holder ... 1-10-0 ... ...

No. 2698. Test tube holder ... 1-10-0 ... ...



No. 2697.

Comparison Prism



This consists of a right-angled prism which, when swung into position, covers half the length of the slit. Light from a second source can be deflected by this means into the slit, so that two spectra from different sources are seen adjacent to each other and can be readily compared. This attachment canno be supplied separately but is incorporated in instruments where specified.

Diffraction Gratings



No. 2452A.



No. 2466.

The diffraction gratings are replicas from an original of 14,500 lines per inch ruled on metal and blazed to give maximum efficiency in the first order of diffraction. The area is 25 mm. and the gratings are supplied mounted on glass plates 2in. by 1½in. Alternative qualities are available, the selected plate being suitable for demonstration purposes.

The No. 2466 stand is available to support the grating plate in a vertical position on a spectrometer table.

No. 2452A. Diffraction grating 25 mm. × 25 mm. on selected plate glass, in case ... discontinued

No. 2451A. Diffraction grating 25 mm. × 25 mm. on optically worked glass, in case ... 4-0-0

No. 2466. Stand 2-0-0

Spectroscopes for Gemmology

In the examination of gem stones a rapid means of testing is provided by means of a spectroscope. To accomplish this it is necessary to use a strong source of light passing through the gem and a means of ensuring that such light fills the slit. The use of a microscope enables these conditions to be complied with, the method being to place the stone upon a glass slide on the stage and a beam of light from a powerful source concentrated and passed through it by means of the substage condenser. A low power (32 mm.) object glass is used and gives a small magnification when the microscope is brought into focus. The focussing should then be altered so that the field of view is filled with a glare of light. The eyepiece should then be replaced by the spectroscope when the characteristics of the stone can be examined. The Nos. 2447, 2458 and 2522 spectroscopes are suitable for this work and to enable the method to be carried out with ease and efficiency we make adapters to enable these spectroscopes to be securely affixed to the microscope in place of the eyepiece. A tubular fitting made to the standard eyepiece diameter (.917in.) slides into the drawtube and secures the spectroscope in position.

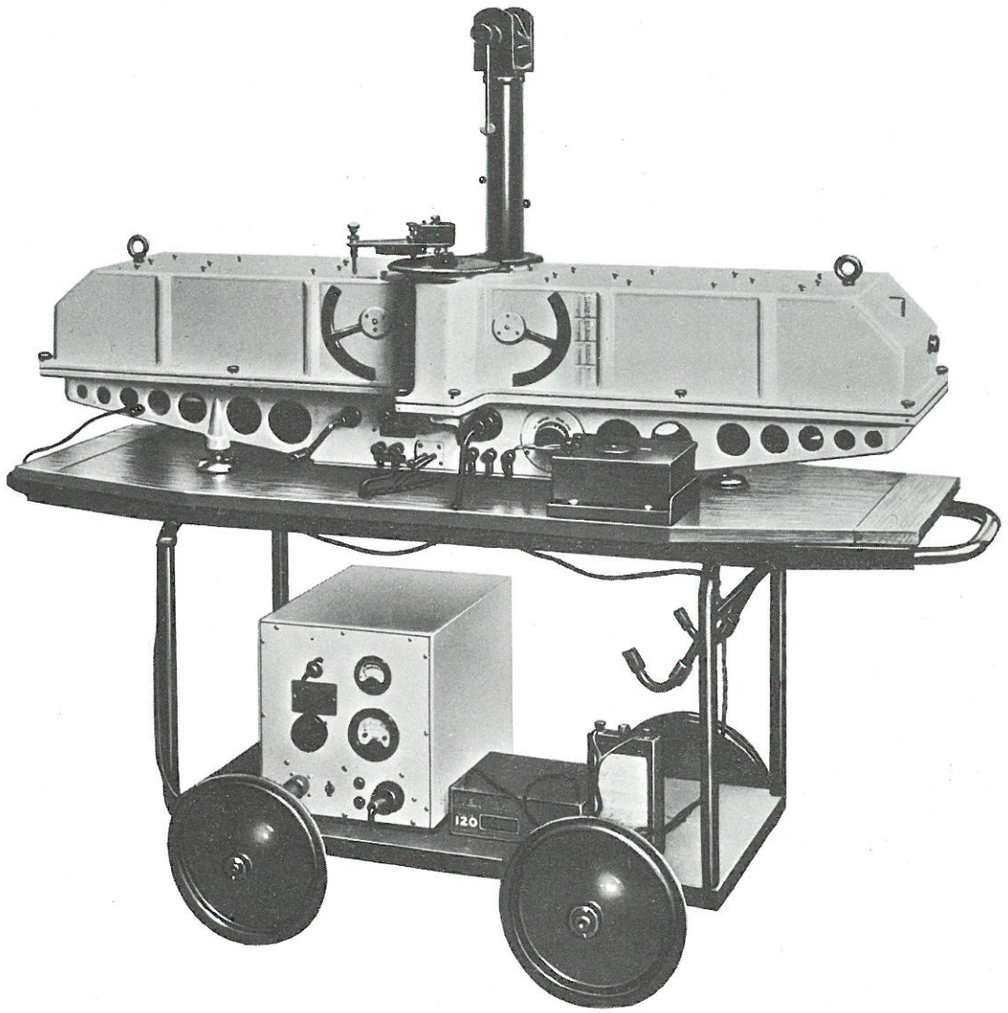
For those interested in this subject we recommend—

" Gem Testing for Jewellers "
by B. W. Anderson, B.Sc., F.G.A.
Published by Heywood & Company Ltd., London.

No. 2534. Adapter, for No. 2447 or 2458 spectroscope ... ...

No. 2535. Adapter, for No. 2522 spectroscope ... ...

Dobson Ozone Spectrophotometer



Dobson ozone spectrophotometer on trolley.

Dobson Ozone Spectrophotometer.

A separate publication (No. 124) is available for this equipment, giving full particulars of the spectrophotometer and accessory apparatus, together with the price list. A copy will be forwarded on application.

This instrument has been developed for meteorological use where it is desired to measure the amount of ozone present in the upper atmosphere. The instrument makes use of the absorption, by free ozone, of certain characteristic wavebands in the solar spectrum. The absorption, which is proportional to the amount of ozone present, is measured by comparing it with a reference waveband and the spectrophotometer is designed to give results with ease and accuracy.

The general appearance of the equipment can be seen in the illustration on page 18 and shows the spectrophotometer on the trolley which also carries the necessary electrical equipment. The apparatus is designed to be mobile and to withstand exposure in extremes of climatic conditions, a quilted cover being available to prevent large temperature changes.

In use, light enters the instrument via the periscopic device in the centre of the main body unit and is reflected on to the entrance slit. The spectrograph consists of a quartz lens which renders light from the entrance slit parallel, a 60° prism and a mirror from which the light returns through the prism and the lens to form a spectrum in the focal plane of the instrument. The required wavelengths are isolated by means of further slits in the focal plane, each having a special achromatising lens.

Measurements are taken with the instrument by evaluating the ratio of the intensity of radiation through the two slits, one corresponding to the absorption band of ozone and the other passing a reference band.

A second spectrograph, exactly similar to the first, is arranged on the opposite side of the central focal plane and images light from both slits on to a further slit, behind which is placed the photo-multiplier. A rotating sector allows light from the two central slits to fall alternately on the photo-multiplier. The variations in current are fed through a two stage A.C. amplifier and rectified by a commutator carried on the same shaft as the sector unit. Thus the galvanometer will show a steady deflection dependent on the difference in intensities of the two wavelengths. The brighter reference beam passes through a carefully calibrated optical wedge which is adjusted to the position of ' no deflection '. The position of the wedge is then read from a scale and the value recorded.

Quartz compensating wedges, actuated by levers on the front face of the spectrograph, are provided to allow minor adjustments of wavelength to be achieved. This enables minor temperature variations to be compensated, a thermometer reading the internal temperature of the instrument being provided.

The instrument requires very careful calibration in order to ensure that the results obtained are valid and certified calibration charts are supplied. A ' standard lamp ' is also available which fits over the entrance aperture and enables the calibration to be checked.

To allow the instrument to be used in extremes of observation conditions, alternative comparison wavelengths can be employed, the appropriate slit in the central focal plane being selected by means of masking shutters actuated by external levers on the front of the instrument. The gain provided by the amplifier circuit can also be varied so that the final signal strength is of an amperage appropriate for the galvanometer.

The instrument is 5 ft. long (150 cm.) by 1 ft. 6 in. (45 cm.) by 1 ft. 2 in. (35 cm.).

Optical Units

Prisms 60°, for spectroscopic work, in heavy flint glass, with two polished surfaces, of good optical quality.

No. 4618. Square face 0.75 in. ... ...
No. 4320. „ „ 1.0 „ ... ...
No. 4619. „ „ 1.25 „ ... ...
No. 4321. „ „ 1.50 „ ... ...

Hollow prisms 60°, made in plate glass, acid proof, with ground-in stoppers.

No. 4914. Height 35 mm., side 25 mm. ... 1-18-0 ... ...
No. 4915. „ 45 „ „ 45 „ ... 2-10-0 ... ...
No. 4916. „ 90 „ „ 60 „ ... 4-7-8-0 ... ...

Prisms 90°. These prisms are of a good quality with accurate angles and surfaces. They are suitable for ordinary experimental purposes.

No. 4304. Size of base surface .25 in. square ... ...
No. 4306. „ „ „ „ .40 „ „ ... ...
No. 4307. „ „ „ „ 1.0 „ „ ... ...
No. 4309. „ „ „ „ 1.25 „ „ ... ...
No. 4310. „ „ „ „ 1.50 „ „ ... ...

Ramsden eyepieces. (mounted to fit R.M.S. standard gauge .917 in.)

No. 3503. × 10 ... ... 3-6-0 ... ...
No. 3502. × 15 ... ... 3-6-0 ... ...

Achromatic object glasses. These are good quality object glasses, unmounted. The focus is approximately seven or eight times the diameter.

No. 4000. Diameter 0.75 in. ... ...
No. 4001. „ 1.0 „ ... ...
No. 4003. „ 1.25 „ ... ...
No. 4005. „ 1.50 „ ... ...
No. 4007. „ 1.75 „ ... ...

Eyepiece lenses. These lenses are plano-convex, unmounted, and are suitable for experimental work in connection with spectroscopes and other optical instruments.

No. 5040. Diameter .25 in. focus .50 in. ... ...
No. 5041. „ .35 „ „ .70 „ ... ...
No. 5042. „ .40 „ „ .85 „ ... ...
No. 5043. „ .50 „ „ .85 „ ... ...
No. 5044. „ .50 „ „ 1.10 „ ... 1d/= ... each ... ...
No. 5045. „ .50 „ „ 1.30 „ ... ...
No. 5046. „ .75 „ „ 1.65 „ ... ...
No. 5047. „ .70 „ „ 1.70 „ ... ...
No. 5048. „ .80 „ „ 1.70 „ ... ...
No. 5049. „ .80 „ „ 2.00 „ ... ...