From Warner & Swasey

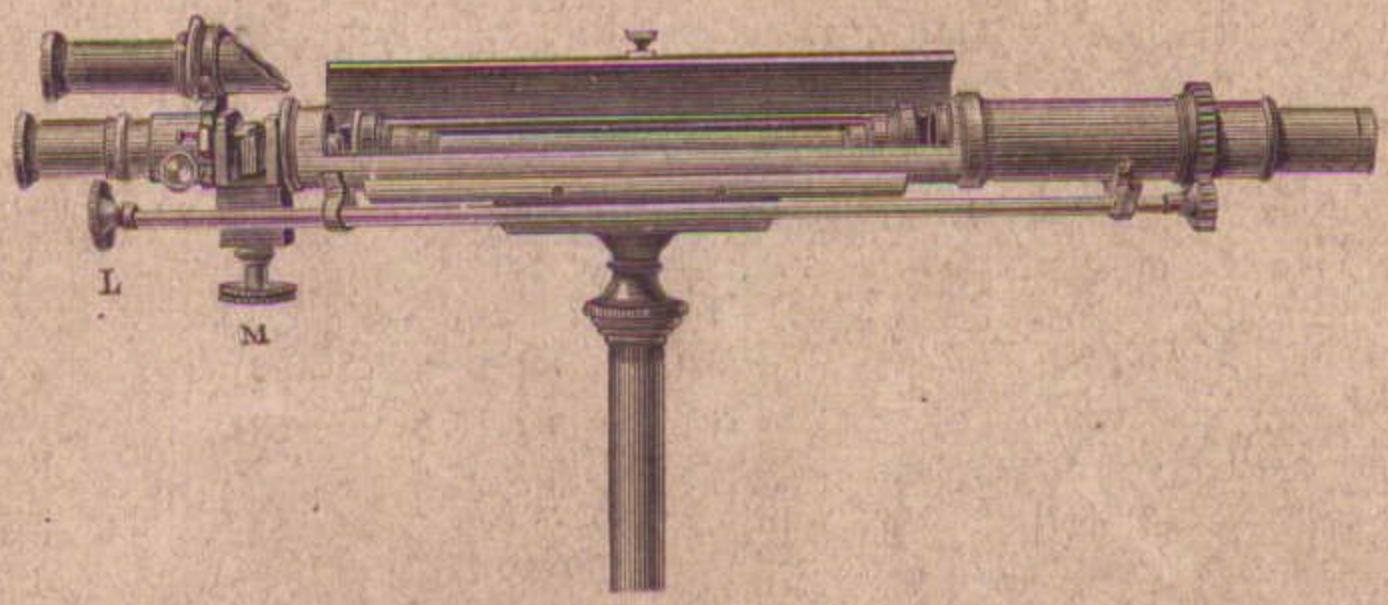
NO DATE PROBABLY BETWEEN 1890 & 1900

ILLUSTRATED & DESCRIPTIVE

CATALOGUE

OF

Optical Instruments



MANUFACTURED BY

Aug. Stendicke,

60 Third Ave.,

98 AND 98 FULTON STREET,

NEW YORK.

Sharps Publishing Co., 161 & 163 Franklin Street.

PREFACE.

THE construction of all the apparatus, and of all the preparations in this Catalogue, is such that even those at the lowest quoted prices are thoroughly suited to the employment for which they are devised.

In case of divers prices for an article, the higher is due either to size or purity of the material employed, or to the greater elegance of its mounting.

The prices for Nicol's Prisms are for those of pure material and correct workmanship. Such as have slight imperfections can be had at a reduction from regular rates.

Special care is given to packing, for which only the actual cost is charged.

No attention will be paid to complaints unless made within ten (10) days after receipt of goods.

Large pieces of Iceland Spar, pure and free from flaws and cracks, will be taken in trade.

When the person ordering goods is unknown to me, the money should accompany the order, either by bank draft or postal money order. Money should never be sent by mail.

When goods are ordered to be sent C. O. D. by Express, the Express charge for collection will be added to the amount of the bill.

A remittance of TEN DOLLARS must be sent with all orders. Bills of less amount cannot be collected by Express.

TELESCOPES.

1.	Plano Convex Lenses, from 3-10 to ¾-in. diam.,	$0.50
2.	" " " " ¾ to 1½ "	0.75
3.	Double " " " 3-10 to ¾ "	0.75
4.	" " " " ¾ to 1½ "	1.00
5.	Terrestrial Eye-piece, 2½, 3, 3½, 4, 5-in. long,	5.00
6.	" " 6 " each,	5.50
7.	" " 7 " "	7.00
8.	" " 8 " "	8.00
9.	" " 9 " "	9.50
10.	" " 10 " "	11.00
11.	Astronomical Eye-piece, ¾, 1, 1½, 1¾, 2-in. long, "	5.00
12.	" " 2-10, ¼, 3-10, 7-10, ½-in. long, "	5.00

		Best quality.	Minor quality.
13.	Objective Glass, 1⅛-in. diam., 6-in. focus,	$5.00	$3.50
14.	" " 1⅛ " 7 "	5.00	3.50
15.	" " 1⅜ " 12 "	5.00	3.50
16.	" " 1½ " 12 "	6.00	4.00
17.	Objective Glass, 2-inch. diam., 20 to 24-in. focus,	8.75	6.00
18.	" " 2¼ " 26 to 30 "	12.50	8.00
19.	" " 2½ " 28 to 32 "	20.00	15.00
20.	" " 2¾ " 32 to 34 "	25.00	20.00
21.	" " 3 " 34 to 38 "	32.00	25.00
22.	" " 3¼ " 36 to 40 "	45.00	30.00
23.	" " 3½ " 42 to 44 "	56.00	45.00
24.	" " 3¾ " 48 to 50 "	68.00	50.00
25.	" " 4 " 52 to 54 "	90.00	60.00
26.	" " 4½ " 62 to 64 "	112.00	75.00
27.	" " 5 " 70 to 74 "	150.00	110.00
28.	" " 5½ " 80 to 84 "	190.00	150.00
29.	" " 6 " 84 to 90 "	250.00	200.00

My Astronomical Telescopes, equatorially mounted, described below, are instruments of rare excellence.

I have given special attention to the production and perfection of Telescopes of this class, and can say with confidence, that for the purpose intended they are superior to instruments of foreign manufacture of a much higher price.

The Achromatic Object Glasses of these Telescopes (upon the accuracy of which the value of the instrument depends) are made of the finest crown and flint glass, selected with great care in regard to specific gravity, and ground to that perfection regarding correction for spherical and chromatic aberration as only the *highest skill* in this art has attained in modern times.

The Eye-pieces are also of a very excellent quality, and a solar or sun prism, or right angle prism, is neatly mounted in a brass case or box, fitting the instrument.

These Telescopes are mounted in highly-finished brass or galvanized iron tubes, at the option of the purchaser, each Telescope having an adjustable finder, with cross hairs and rack adjustment for focusing.

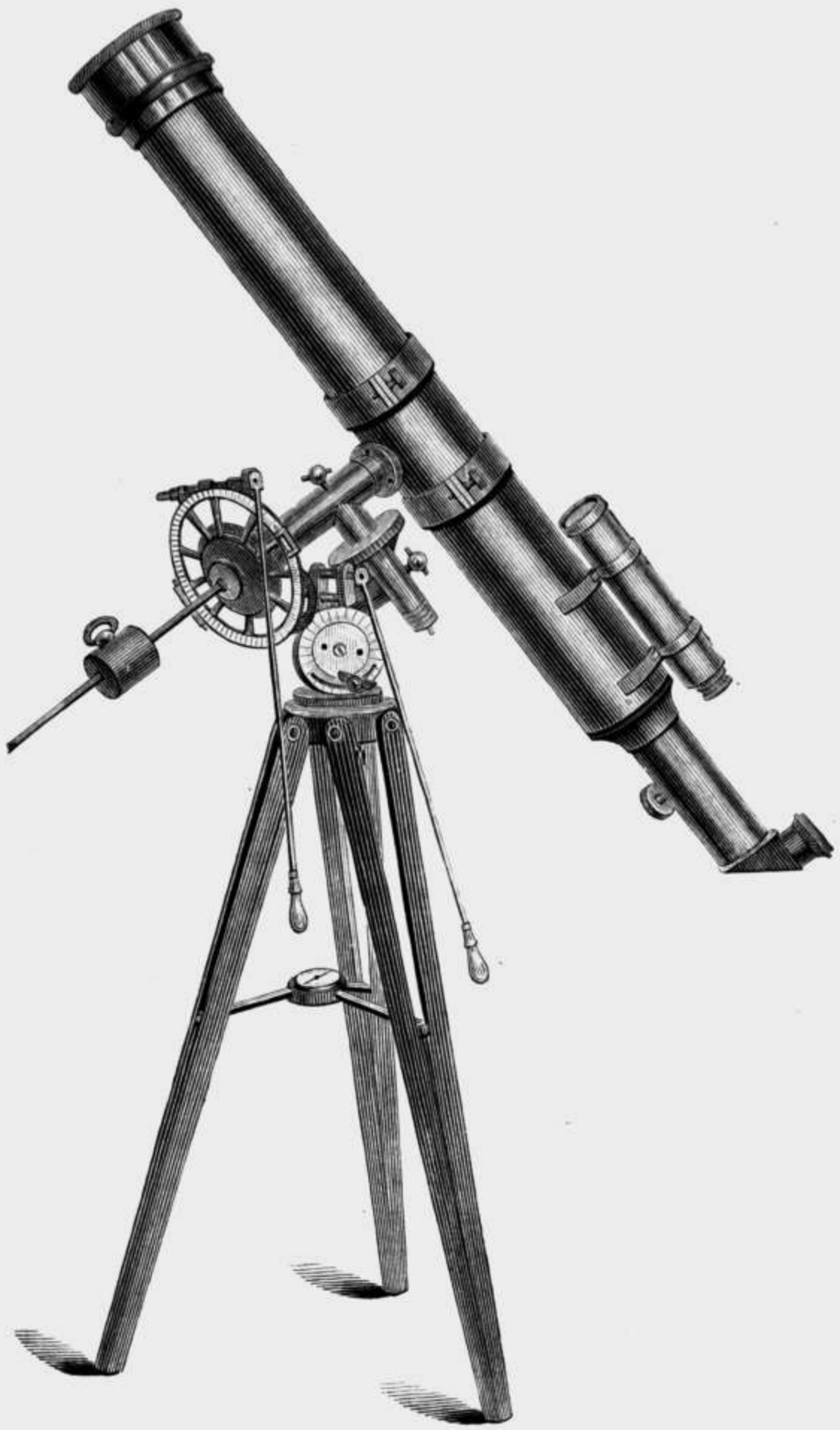
30. First-class Telescope, 2½-inch diameter object glass and about 30 inches focal length, with 3 astronomical and 1 terrestrial eye-piece ; tube and stand made of brass. Packed in a neat, black walnut box, - - - - - $125 to $150.00

31. First-class Astronomical Telescope, with a 3½-inch diameter objective glass and about 4 feet focal length ; 1 terrestrial eye-piece, magnifying 60 diameters ; 3 astronomical eye-pieces, magnifying, respectively, 50, 100 and 150 diameters ; mounted on equatorial stand, having declination circle, with 2 Verniers, reading to 2, 3 or 4 minutes, as may be desired ; latitude circle divided into single degrees, and hour circle reading to 30 seconds. *See illustration on next page,* - - - - - $200.00

32. First-class Astronomical Telescope, with 4½-inch object glass and about 6 feet focal length, with 1 terrestrial eye-piece, magnifying 75 diameters ; 4 astronomical or celestial eye-pieces, magnifying, respectively, 90, 120, 180 and 225 diameters ; having a 7-inch declination circle, with 2 Verniers, reading to 2, 3 or 4 minutes, as may be desired ; latitude circle divided into single degrees, and hour circle, with Vernier, reading to 30 seconds, - - - $325.00

33. First-class Astronomical Telescope, with a 5-inch object glass, about 7 feet focal length, and having the same mountings, adjustments, eye-pieces, etc., as No. 32, - - - $400.00

34. First-class Astronomical Telescope, with 5½-inch object glass, about 8 feet focal length, and having the same mountings, adjustments, eye-pieces, etc, as No. 32, - - - $450.00



ASTRONOMICAL TELESCOPE.

For description and prices see preceding page.

35. Landscape or Astronomical Telescope, with object glass of the finest quality 3 inches diameter; body, 39 inches long; tube of brass, wood or galvanized iron, as desired; brass mountings and sun shade; 1 terrestrial eye-piece, magnifying 65 diameters; 2 celestial eye-pieces, with sun glass, magnifying 60, 125 diameters; rack adjustment for focusing. Mounted on a firm substantial walnut stand, with metal supports and bearings for giving vertical and horizontal movements, - - - $90.00

With a well-corrected finder at the side, extra, - - 20.00

LANDSCAPE OR ASTRONOMICAL TELESCOPE.

36. Landscape or Astronomical Telescope, with objective glass 3½ inches diameter, 54 inches focal length, and mountings the same as No. 35; 1 terrestrial eye-piece, magnifying 60 diameters; 3 celestial eye-pieces, with sun glass, magnifying, respectively, 75, 100 and 150 diameters, ... $125.00

Well-corrected Finder, with adjusting screws and cross hairs, extra, 25.00

37. Landscape or Astronomical Telescope, with objective glass 4 inches diameter, and 60 inches focus; 1 terrestrial eye-piece, magnifying 75 diameters; 3 celestial eye-pieces and sun glass, magnifying, respectively, 100, 150 and 200 diameters, . . 175.00

Well-corrected Finder, with adjusting screws and cross hairs, extra, 25.00

38. Landscape or Astronomical Telescope, with objective glass 4½ inches diameter, and 72 inches focal length; 1 terrestrial eye-piece, magnifying 80 diameters; 4 celestial eye-pieces, with sun glass, magnifying, respectively, 100, 150, 200 and 250 diameters, ... 250.00

Well-corrected Finder, with adjusting screws and cross hairs, extra, 30.00

39.	Prisms (crown glass),	¼	-inch face,	90°,	.	.	each,	2.50
40.	"	"	½	"	90°,	.	.	" 3.00
41.	"	"	¾	"	90°,	.	.	" 3.50
42.	"	"	1	"	90°,	.	.	" 5.00
43.	"	"	1¼	"	90°,	.	.	" 6.00
44.	"	"	1½	"	90°,	.	.	" 8.00
45.	"	"	1¾	"	90°,	.	.	" 10.00
46.	"	"	2	"	90°,	.	.	" 12.00
47.	"	for Camera Lucida (Wallaston's), each,					.	$2.50 to 12.00
48.	"	(flint glass), 60°, 1¼ to 1½	-inch face,				.	each, 6.50
49.	"	(heavy flint glass), 60°, 1¼ to 1½	-inch face,				.	" 8.00
50.	"	"	"	60°, 1¾ to 2½	"		.	" 10.00
51.	"	compound (for direct vision), ¾	"				.	" 6.50
52.	"	heavy, compound (for direct vision), ¾	-inch face,				.	" 8.00
53.	"	"	"	"	"	1 "	.	" 12.00
54.	"	"	"	"	"	1¼ "	.	" 15.00
55.	"	ext. heavy, "	"	"		1 "	.	" 15.00

SPECTROSCOPES.

POCKET SPECTROSCOPE.

56. Pocket Spectroscope, 3¼ inches long, ⅝-inch diameter, with adjustable slit and collimating lens, - - - $10.00

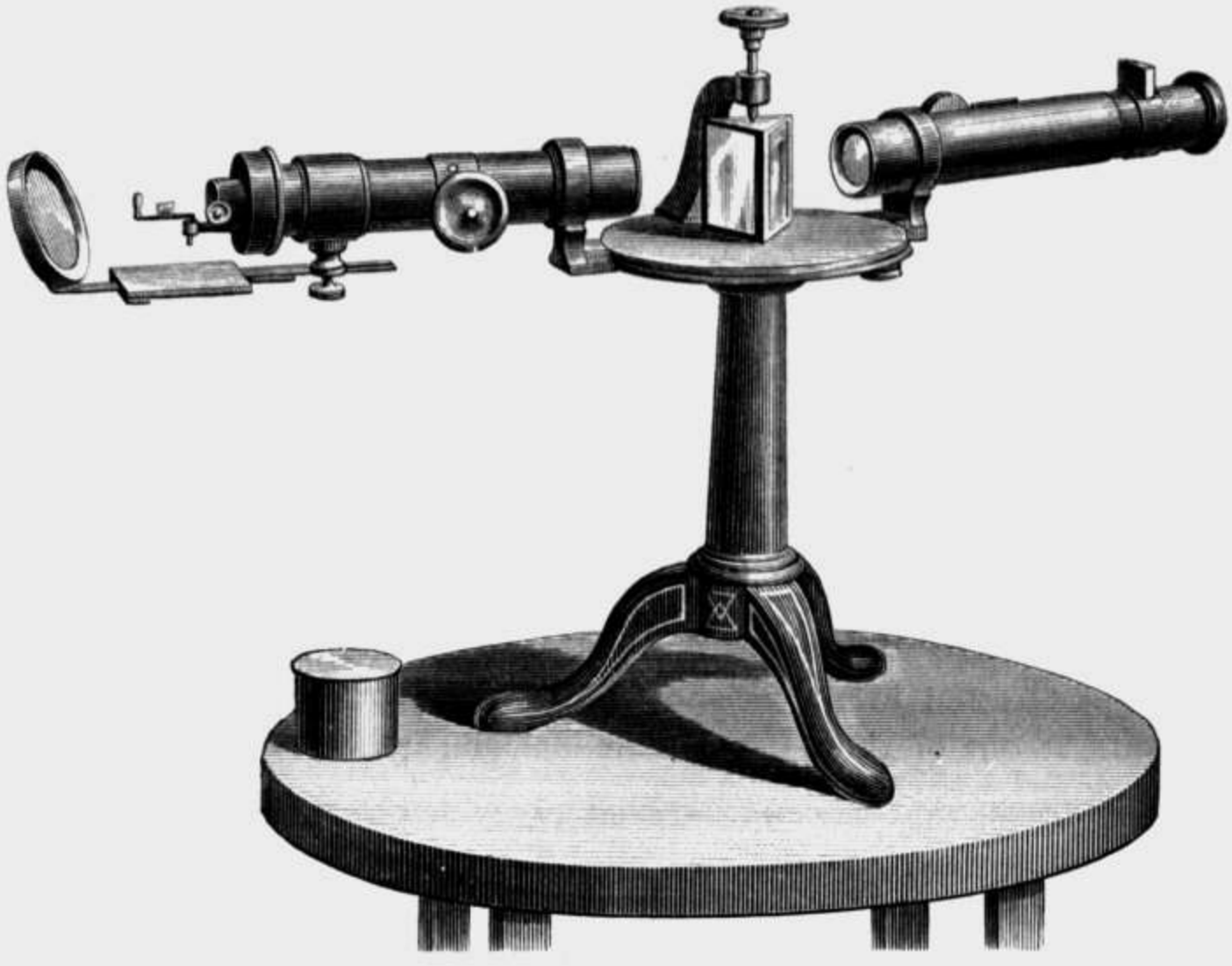
This little instrument gives a much greater dispersion than Browning's "Miniature Spectroscope." It will show a large number of Frauenhofer and metal lines, and gives a really fine spectrum. No one interested in the science, and certainly no teacher, should be without one of these cheap little instruments.

57. Pocket Spectroscope, same as No. 56, with the addition of a small observing telescope, which can be unscrewed, thus allowing the spectroscope to be used without it if desired. It also has a movement allowing the adjustment to rays of different refrangibility, - - - - - - $18.00

58. The Mineralogical Spectroscope is the same as No. 57, with the addition of a brass stand with vertical movement. It is especially designed for mineralogical cases, which, in the present state of science, are incomplete without a Spectroscope. This instrument, as well as No. 57, will divide the D lines, - - $25.00

59. Small Model Spectroscope, 12 inches long and ¾-inch diameter, with dense flint glass prism, adjustable slit, collimator and observing telescope. The latter is so arranged that it can be directed to different parts of the spectrum in succession. It has a neat stand, with horizontal and vertical movements, - - $40.00

60. Large Model Spectroscope, 20 inches long by 1¼ inches in diameter, mounted in stand, with vertical movement. This instrument has a large direct vision prism of dense flint, an adjustable slit, a prism of comparison, rack and pinion movement to both collimating and observing telescope. There is attached to the collimator a mirror with two movements for reflecting the rays of the sun into the slit, and the observing telescope has a horizontal motion by tangent screw, allowing it to be directed in succession to different parts of the spectrum. It is also furnished with a photographic glass scale, an exceedingly beautiful and ingenious device, which renders the scale telescope entirely unnecessary and takes the place for almost every purpose of the graduated limb. This Spectroscope is thoroughly finished in every part, - - $125.00



No. 62.—Students' Spectroscope.

61. Heidelberger's School Spectroscope, with photographic scale, - $36.00

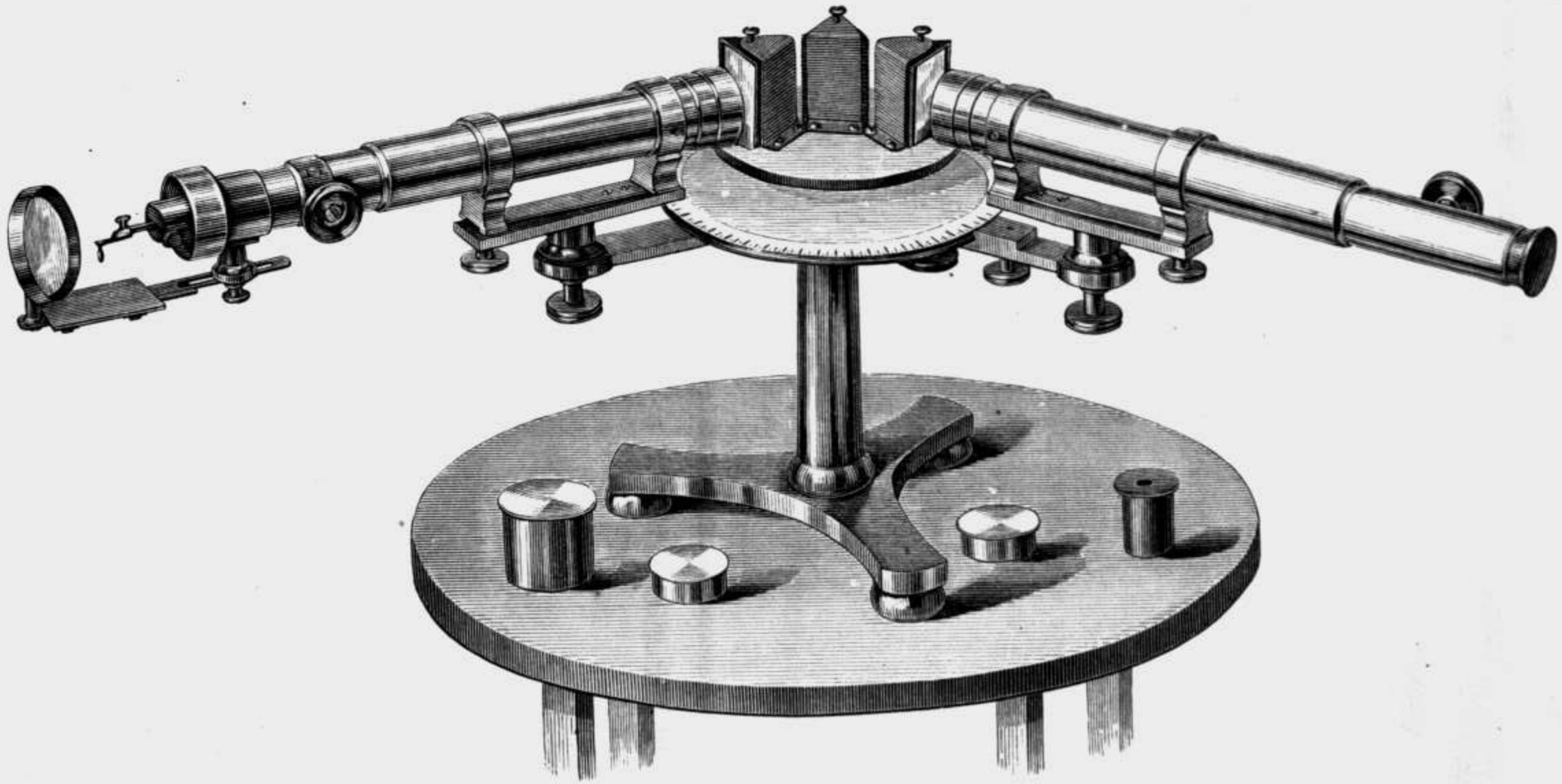
62. Students' Spectroscope, has a prism of highly dense flint glass of superior workmanship, a photographic scale, adjustable slit, collimator and observing telescope. A divided circle furnished if requested, - - - - 60.00
Without divided circle, - - - - - 50.00

63. Spectroscope, with 2 prisms of dense glass, 2 eye-pieces, rack and pinion movement; divided circle, with Vernier. It separates the D line. Packed in a black walnut case, or whatever kind requested, - - - - - - 100.00

64. Spectroscope, with 3 prisms. Is guaranteed to show the nickel line between the D lines in the solar spectrum. Packed in a black walnut case. *See illustration on opposite page*, - - 150.00

65. Large Table Spectroscope, for the use of physicists. Has 4 very dense glass prisms, 2 telescopes with objective glasses of 1¼ inches diameter, 12 inches focus, and 3 eye-pieces. It will show the two lines between the D line in the solar spectrum, 175.00
Automatic movement, extra, - - - - 30.00

66. Automatic Spectroscope, same as No. 65, with 6 prisms and automatic movement, - - - - - - 300.00



SPECTROSCOPE, WITH 3 PRISMS. *For description and price see opposite page.*

MICRO SPECTROSCOPE.

67. Micro Spectroscope. This arrangement is applied to the eye-piece of the Microscope by means of a direct vision prism. It is applicable to opaque objects without preparation, and by its means two spectra may be compared at the same time with one lamp. It possesses the immense advantage over all other contrivances of the kind, that the spectra of the smallest object, or a particular portion of an object, may be obtained with the greatest certainty and facility, $50.00
Ditto, with rack motion to eye-piece, - - - 58.00

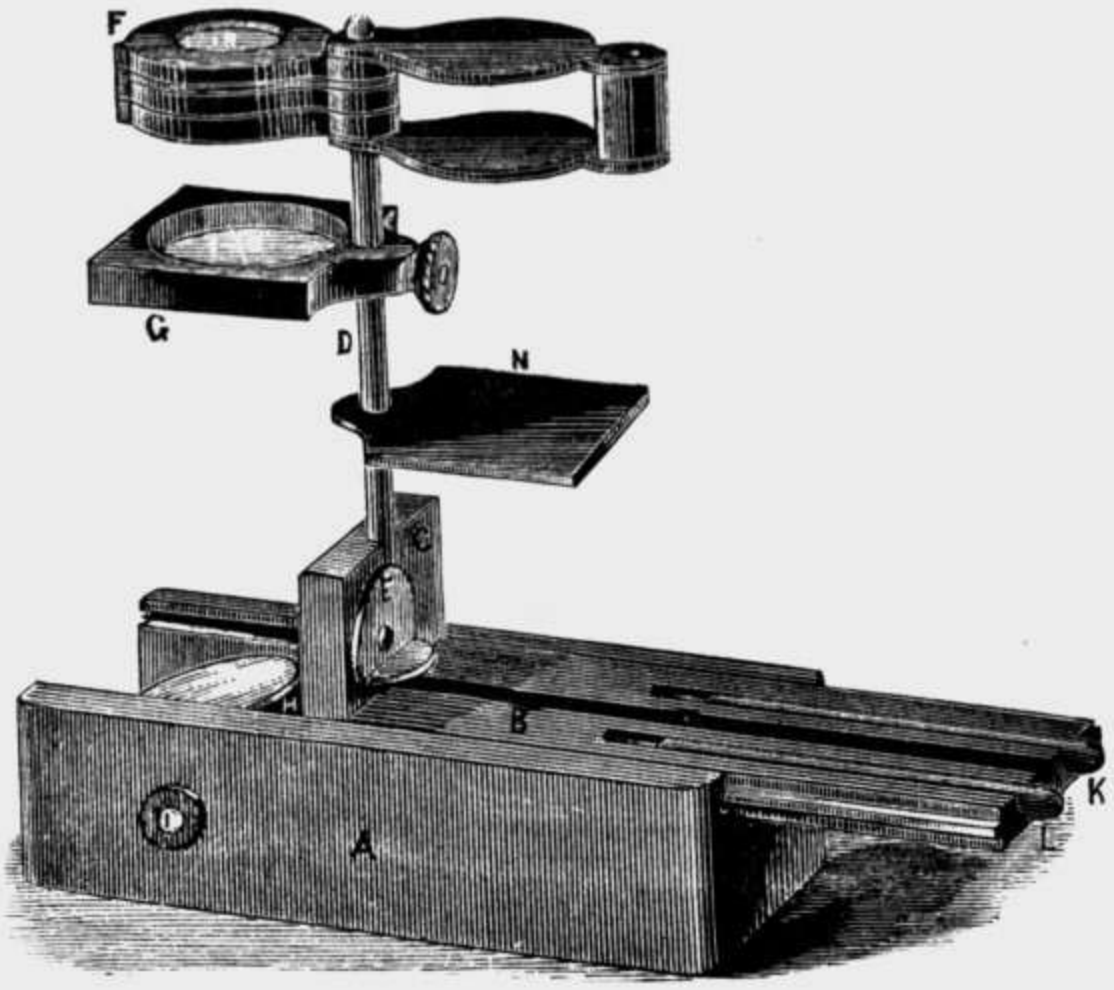
MICROSCOPES.

No. 68.—EXCELSIOR POCKET AND DISSECTING MICROSCOPE.

The construction and method of using this Microscope are very simple, and will be readily understood from an inspection of the engraving. It consists primarily of a small wooden case, about one-third larger than shown in the engraving. To one end of the lid of this case is attached one of the ends of the box; and when the lid is reversed and turned upside down it may be slid into the groove of the case, and then forms a stand for the lenses and glass stage, as is shown in the engraving. The lenses and stage are supported by a steel rod, D, the lower end of which is hinged to the lid so that it may be turned down and lie in a groove provided for it. When raised into the position shown in the engraving, it is held very securely in place by means of the button, E; and this button also serves to retain it in the groove when it is turned down. The glass stage, G, which is fitted into a frame of hard rubber, slides

easily on the stem, D, so as to be readily adjustable for focus, while at the same time it may be firmly fixed by means of a set-screw, at any desired height, and will then serve as a stage for dissecting purposes. The frame which holds the lenses fits on to the top of the stem. A mirror, H, is fitted into the case, and is readily adjustable, by means of the button shown on the outside, so that light may be reflected up through the stage when the objects to be examined are transparent, and when they are to be viewed by reflected light there is a dark ground of hard rubber, N, which is also carried by the stem, D, and may be turned under the stage, so as to cut off all transmitted light. Dissecting needles (K and L), with neat handles, fit into appropriate grooves.

As a Dissecting Microscope for botanical, entomological and physiological work this instrument is very efficient and convenient. The glass plate is fitted into the stage so as to form a cell capable of holding water, so that dissection



No. 68.

may be carried on under that liquid, or aquatic animals may be kept alive and examined at leisure. The stage may also be turned so that the flat side will be up when so desired. When the lenses and stage are removed they are readily packed in the case, and the entire instrument packed into a compass which readily admits of its being carried in the vest pocket.

The lenses may be used singly or together, are well made, and are provided with a proper diaphragm, which secures distinctness of definition. They give a range of power of from five to thirty diameters (twenty-five to nine hundred times the surface), the first being admirably adapted to the examination of minerals, textile fabrics, the larger parts of flowers, insects, etc., while the latter is sufficiently powerful to enable the student to dissect flowers and examine the more minute structures with great efficiency. Under good manage-

ment this Microscope shows the individual corpuscles in the blood of the frog, and will exhibit very clearly and beautifully the circulation in the foot of this animal.

69. With two lenses, - - - - $2.50
70. With three lenses, - - - - 2.75
71. Set of three hard rubber slides, with openings of different kinds to serve as linen provers, - - - 0.25

(*Cut one-third of actual size.*)

No. 72.—Library Microscope.

The Microscope represented in the above engraving, and offered *under the above name to the public*, is an attractive and well-made instrument. It is offered at a very low rate considering its quality, and is especially adapted for the use of amateurs, and of beginners in the study of entomology, of botany, and other kindred branches of science. It is a simple instrument, very easy to handle, and readily affords, even to persons inexperienced in scientific investigations, a very interesting insight into the mysteries of nature, which are hidden from our unassisted eyes. It will be found exceedingly useful in the household in the detection of adulterations in articles of food, and in many industrial occupations, while it will furnish an inexhaustible source of amusement and instruction in the family circle to young and old.

This Microscope has a finely-finished and japanned foot, arm with joint to incline, a nickel-plated body or tube, carrying the optical parts of the instrument and adjustable by rack and pinion, with draw-tube to increase magnifying power ; a concave mirror, swinging so as to give oblique illumination when

desired, and capable of being brought above the stage for illumination of opaque objects. The screw at the lower end of the tube is so arranged as to permit the attachment of achromatic triplets, so that if desired a much higher magnifying power than the above can be obtained. The stage is made of hard rubber, which is not injured by water or ordinary fluids, and is provided with spring clamps for holding object slides. The camera lucida which accompanies this Microscope, although exceeding simple, is a valuable addition to the same, and greatly adds to its usefulness ; it is very easily managed, and a little practice will enable anybody to make, by the aid of it, drawings of the magnified image of microscopic objects. The Microscope has one eye-piece and a divisible two-lens objective, giving in combination with the draw-tube magnifying power of from 50 to 125 diameters.

It is accompanied by a glass slide with cell for fluids, a plain glass slide, and one object.

A neat black walnut case encloses the instrument and accessories, price, - - - - $10.00

The same, with achromatic doublets, - - 12.00

(*Cut one-third of actual size.*)

No. 73.—Family Microscope.—*For description and prices see next page.*

No. 73.—Family Microscope.

See illustration on preceding page.

I was first induced to bring out this Microscope by the fact that no other of moderate price and good quality, supplied with a well-corrected objective and eye-piece, was then offered to the public, nor has any other similar instrument since appeared in the market equal to this, both in price and efficiency.

The ready sale which it has found, and the many recommendations it has received from those who have examined and used it, show that it is held in high esteem and gives general satisfaction, having sufficient range for doing excellent work.

Although the price of this instrument is very moderate, it cannot by any means be classed among what is generally termed *cheap* Microscopes—a term which usually implies that the quality of the workmanship has been sacrificed in order to lessen the price.

As much care and skill have been bestowed on this instrument in the design and execution of the optical, as well as the mechanical part of it, as on the higher-priced instruments, each part receiving its full and due share of attention and inspection, and the entire Microscope a thorough examination before it leaves my hands.

The base and pillars of this Microscope are of cast iron, neatly japanned. They support the axis, which carries the arm in such a way that the instrument may be inclined to any angle. Rack and pinion for adjustment of focus, made with such exactness as to leave no perceptible jar, and neither lost or lateral motion while adjusting. In order to give greater sensitiveness to the adjustment, the milled heads of the pinion have been made of large dimensions, in consequence of which the lower and medium powers can be adjusted and used with great ease; the 1-4 and 1-5 objectives can be comfortably used on it. The tube is supplied with standard society screw. The mirror, which is concave, is so arranged that it can, if desired, be swung above the stage for the illumination of opaque objects. A revolving diaphragm is fixed beneath the stage.

This stand is accompanied by one eye-piece, B, mounted in either hard rubber or brass, and one objective, ½ inch, which divides so as to permit the separate use of the posterior combination, thus giving the power of an excellent 1½ inch. Range of magnifying power, from 50 to 110 diameters.

In upright walnut case, with handle, lock and key, and receptacle for objectives and eye-pieces, - - - $20.00

No. 74.

The above, with fine adjustment, which consists of secondary brass stage, fastened upon the other and acted upon by fine micrometer screw, - - - - 24.00

(*Cut one-third of actual size.*)

No. 75.—The Investigator Microscope.

For description and prices see next page.

No. 75.—The Investigator Microscope.

See illustration on preceding page.

In this stand I confidently claim to have reached a higher degree of perfection than is possessed by any one approximating it in price. It combines, in a moderate-priced instrument, the features of a first-class and high-priced stand, at no sacrifice of its working qualities. The different parts are ingeniously combined, are strong and firm, and in the parts subject to friction I have introduced, as much as possible, new compensating bearings, which enable the instrument to endure any amount of work and still retain smooth and reliable movements. Working microscopists will understand the value of this quality. When contracted, it stands but 11 inches high, but can be extended to 18 inches.

The base is of brass, and has the tripod form; pillar and arm of brass, connected by a solid joint, which allows inclination of body to any angle; rack and pinion for coarse adjustment, fine adjustment by our patent frictionless motion; main tube, with two draw tubes. This is an entirely new feature in Microscopes, which is an unquestionable improvement. It permits the use of standard length of tube for quick adjustment in outside tube, same as in instruments without rack and pinion adjustment; the same for any low power objective and the use of amplifier in either combination. The outside tube has a broad gauged screw, and adapter with society screw. The stage lies in the same plane as centre of movement for mirror, is of brass, and has concentric, revolving motion with removable clips. It is thin to allow great obliquity, and, as it rests upon a strong projecting arm, is perfectly firm under any manipulation.

The mirror-bar swings with a perfectly easy but firm motion, upon one bearing to any obliquity below, and above the stage for the illumination of opaque objects, and has affixed to it a secondary bar, to which the mirror is attached and which allows the separate use of the latter in any position of the sub-stage. It is provided with a sliding arrangement, whereby the mirror may be moved to and from the object. The mirrors are plain and concave, and of large size. The sub-stage is adjustable along the mirror-bar and entire removable. It contains a diaphragm which may be brought directly under the stage. The ring is of standard size and is easily centered by a set screw. Steel pin for centering stage and sub-stage accompanies the instrument.

Eye-pieces A and C, the latter arranged with slot for micrometer.

Objectives, 3-4 inch and 1-5 inch.

Camera lucida, eye-piece micrometer, pliers, slides and covers.

Magnifying powers, 35 to 600 diameters.

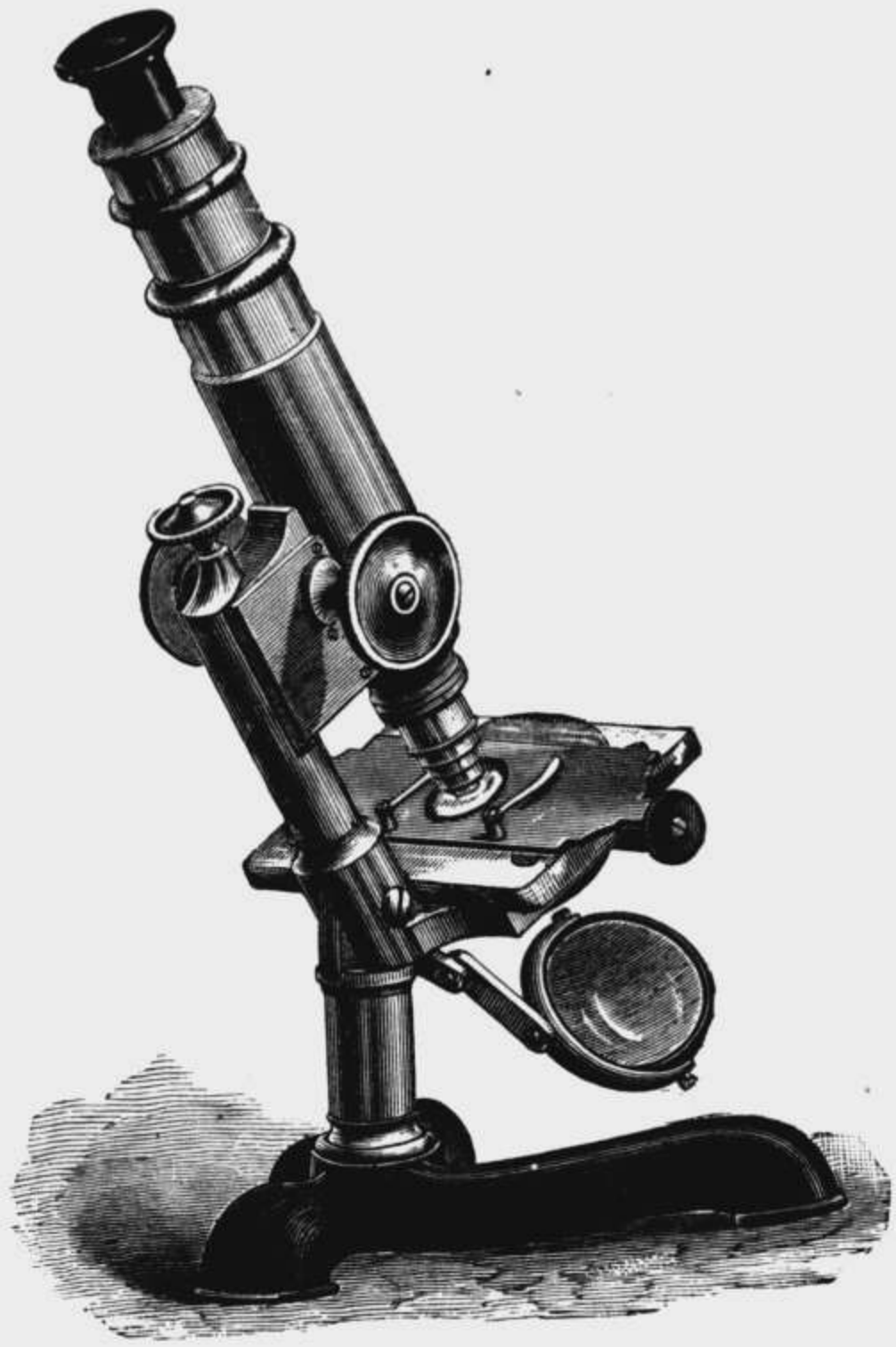
In upright walnut case, with handle and lock, drawer for accessories, and receptacles for eye-pieces and objectives, - - $70.00

The above, when double nose-piece is ordered with it, - - 75.00

Same stand, with any power eye-piece, in above case, - - 45.00

No. 76.

The above, with improved glass stage and slide carrier, which fastens to the brass stage, extra, - - - - 5.00



(*Cut one-third of actual size.*)

NO. 77.—PHYSICIAN'S MICROSCOPE.

For description and prices see next page.

No. 77.—Physician's Microscope.

See illustration on preceding page.

Some years ago it was intimated to me that an instrument of moderate price, possessing some of the most desirable qualities of the Continental pattern, especially solidity and compactness, would meet a long-felt want, especially if constructed with my new improvements and in a way to meet the wants and tastes of American professionals. I constructed in consequence thereof the stand here described and illustrated, which has from its first introduction met with universal favor from the scientific and professional public. I have sold a large number of them and find the demand still unabated. It has undergone various modifications and improvements, and I now believe that I may justly assert that no better and more practical Microscope is offered for the price.

The stand is firm and well-balanced, is finely-finished and of superior workmanship throughout. It is a Microscope best adapted for the use of physicians and students of histology, and is extensively used at present by professional men, and in many of our most prominent institutions of learning.

Heavy japanned cast iron foot, of neat design and finish, inlaid on the under surface with three soft rubber pads. Strong solid brass pillar and arm, both connected by a well-fitting joint, which allows the body to incline to any angle. Pillar and arm so marked as to indicate the correct inclination of the body for the use of the camera lucida. Draw-tube, which works in a special sheath, and has a range of 2½ inches; it is supplied with a stop when drawn to standard length, is nickel-plated, and has a firm but perfectly smooth movement. Coarse adjustment by rack and pinion, free from either lateral or lost motion. Fine adjustment by sensitive micrometer screw, acting upon patent movement described in preface. Patent glass stage and slide-carrier, to which is attached the sub-stage and diaphragm. Large plane and concave mirrors, and mirror-bar arranged with a double joint, so that they can be brought to any obliquity, and can be swung above the stage for the illumination of opaque objects.

Eye-pieces, A and C, the latter arranged with slot for micrometer.
Objectives ¾ inch and 1-5 inch.
Camera lucida, eye-piece micrometer, pliers, slides and covers.
Magnifying powers, with tube at full length, 50 to 485 diameters.

In upright walnut case, with handle, lock and key, drawer for accessories, and receptacles for objectives and eye-pieces, - - $65.00
The above, when double nose-piece is ordered with it, - - 70.00

No. 78.

The above Microscope, with solid brass stage and sub-stage in place of glass stage, - - - - - 60.00
Same, when double nose-piece is ordered with it, - - 65.00

OBJECTIVES.

In the following classifications the objectives are arranged solely with reference to their angular apertures. The difference in their prices is due to the amount of labor required in the construction of each. The corrections are equally perfect in all, as is also the mechanical execution of work in the lenses and mountings.

All the objectives are under my personal supervision from the moment they are taken in work until they leave my hands, and I therefore claim that they are the best for their price and that their standard is rigidly maintained. Whatever may be the amount or source of an order, a conscientious and prompt fulfillment of the same may be relied upon. They have society screw and are put up in neatly finished brass boxes.

STUDENT'S SERIES.

NUMBER.	FOCUS.	ANGULAR AP.	ADJUSTMENT.	PRICE.
1	4 inch.	6°	Non-Adjustable.	$6.00
2	3 "	9°	"	6.00
3	2 "	12°	"	6.00
4	1 "	20°	"	6.00
5	3-4 "	27°	"	8.00
6	1-2 "	42°	"	9.00
7	4-10 "	55°	"	11.00
8	1-4 "	100°	"	14.00
9	1-5 "	110°	"	15.00
10	1-8 "	115°	"	18.00
11	1-12 "	130°	"	24.00

8 to 11, inclusive, in neat adjustable mounting, $3.00 extra.

The objectives of this series accompany my stands when so mentioned. They all have perfect definition, flat field and large working distance. The 1-4 resolves Pl. Angulatum with central light ; the 1-5 shows the longitudinal lines of the Surrirella Gemma.

PROFESSIONAL SERIES.

NUMBER.	FOCUS.	ANGULAR AP.	ADJUSTMENT.	PRICE.
1	4 inch.	10°	Non-Adjustable.	$13.00
2	3 "	12°	"	13.00
3	2 "	15°	"	13.00
4	1 "	36°	"	15.00
5	3-4 "	40°	"	15.00
6	1-2 "	65°	"	18.00
7	1-4 "	110°	Adjustable.	20.00
8	1-6 " Im.	165°	"	23.00
9	1-8 " "	170°	"	25.00
10	1-10 " "	170°	"	28.00
11	1-12 " "	175°	"	30.00
12	1-16 " "	175°	"	35.00

Nos. 7 to 12, inclusive, are in adjustable mounting, having graduated collar and German silver front.

The lower powers of this series are two-system objectives and have flat field and clear definition. From Nos. 6 to 12, inclusive, are all three-system. The immersion objectives especially have a large working distance. They have unusually large lenses and take advantage of all the available illumination.

FIRST-CLASS SERIES.

NUMBER.	FOCUS.	ANGULAR AP.	ADJUSTMENT.	PRICE.
1	3 inch.	16°	Non-Adjustable.	$18.00
2	2 "	22°	"	18.00
3	1 "	45°	"	25.00
4	1-2 "	98°	"	25.00
5	1-2 "	98°	Adjustable.	28.00
6	4-10 "	110°	Non-Adjustable.	28.00
7	4-10 "	110°	Adjustable.	31.00
8	1-6 " Im.	180°	"	50.00
9	1-8 " "	180°	"	60.00
10	1-10 " "	180°	"	65.00
11	1-12 " "	180°	"	70.00

Any of these objectives will bear any amount of amplification. The 1-2 inch resolves Pl. Angulatum with central illumination. The 4-10 shows the lines on No. 17 in balsam.

Nos. 8 to 11 can be used with glycerine or water as immersion fluid; also dry, have a numerical aperture of 110° and will resolve the most difficult tests. They are four-system, with adjustment giving rectilinear movement to the inner systems, and have graduated and silvered collar.

LINEAR MAGNIFYING POWERS OF OBJECTIVES AND EYE-PIECES.

Objectives.....		4 in.	3 in.	2 in.	1 in.	¾	½	4–10	¼	1–5	1–6	⅛	1–10	1–12	1–16
Eye-Pieces.	A or 1½.....	12	18	25	46	50	92	130	210	275	325	400	550	650	800
	B or 1.....	15	23	30	54	70	110	160	250	325	390	490	650	775	980
	C or ¾.....	23	30	45	80	90	165	240	375	485	580	750	970	1160	1500
	D or ½.....	30	45	60	108	140	220	320	500	650	780	980	1300	1550	1960

EYE-PIECES.

HUYGHENIAN EYE-PIECES.

No. A, or 1 1-2 inch, mounted in hard rubber or brass, - $3.00
" B, or 1 " " " " - 3.00
" C, or 3-4 " " " " - 3.00
" D, or 1-2 " " " " - 3.00
" B and D combined in one, - - - 4.50

C and D arranged with slot to receive micrometer, covered by ring to exclude light, eye lens being adjustable for focus, with micrometer, extra $1.75.

PERISCOPIC EYE-PIECES.

No. A, mounted in hard rubber or brass,				-	$11.00
" B,	"	"	"	-	10.00
" C,	"	"	"	-	9.50
" D,	"	"	"	-	9.50
Higher powers,		-	-	-	10.00

C and D arranged with slot to receive micrometer, covered by ring to exclude light, eye lens being adjustable for focus, with micrometer, extra $1.75.

These eye-pieces consist of a triplet eye lens and double convex field lens. They have an extremely large and flat field, the image being sharply defined to the extreme edge. They are positive, the diaphragm being placed below the field lens, and are therefore admirably adapted for micrometer work. They also give excellent results as sub-stage condensers.

SOLID EYE-PIECES.

I make these eye-pieces of the very best construction and in improved mountings, whereby their cost is considerably reduced. The eye-piece proper is contained in a standard size mounting, which slips into the adapter for Microscope tube. Only one adapter is required for any number of eye-pieces, and these are properly protected by their mountings.

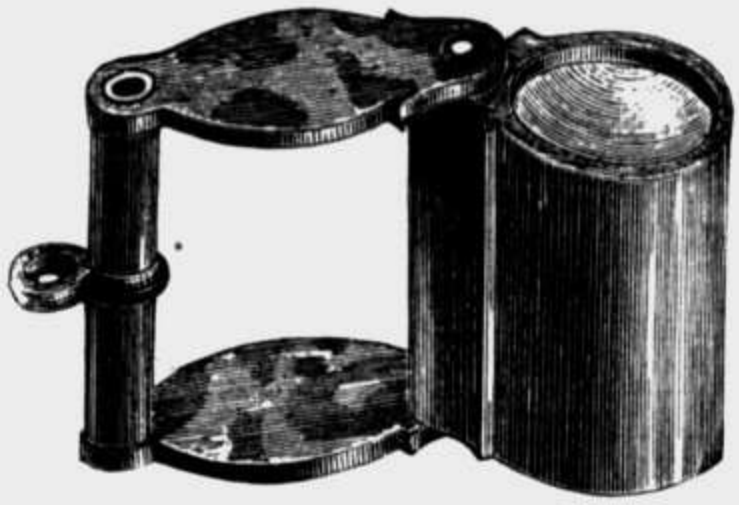
Eye-pieces, 1-2, 1-3, 1-4, 1-6, 1-8 inch focus,	-	each,	$6.00
" 1-12, 1-16 inch focus,	-	"	8.00
Adapter for any tube,	-	"	1.50

BULL'S-EYE CONDENSERS.

No. 81. No. 82. No. 79.

79.	Double Convex Lens, 1½ inch diameter, adjustment in any direction,				$1.50
80.	Bull's Eye, 1½ inch diameter,		"	"	- 2.50
81.	" 2½ "		"	"	- 6.00
82.	" 3 "	with extra joint,	"	"	- 10.00

APLANATIC TRIPLETS.

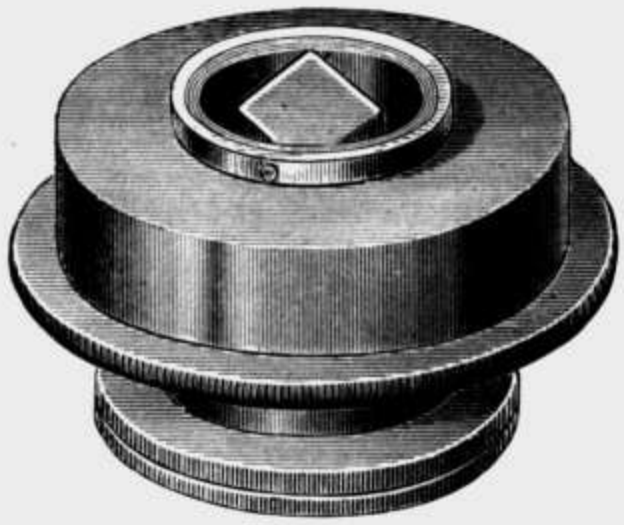


In these triplets the light is not shut off by diaphragms, but the whole diameter of the lens is gained. They have flat field and perfect definition. The optical axis may be held rectilinear to the eye, but also gives perfect results when held at the utmost obliquity.

83.	Aplanatic Triplet,	2	-inch	focus,	in	silver mounting, -	$10.00
84.	"	"	1½	"	"	" -	10.00
85.	"	"	1	"	"	" -	10.00
86.	"	"	¾	"	"	" -	10.00
87.	"	"	½	"	"	" -	10.00
88.	"	"	¼	"	"	" -	10.00

PROFESSIONAL ACCESSORIES.

No. 89.



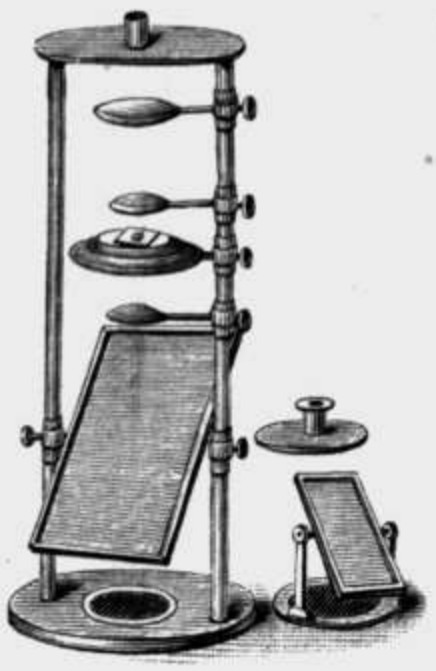
No. 89.

The following accessories are almost indispensable to the microscopist. They have been in strong demand, and this fact enables me to offer them at a lower price than would otherwise be the case.

89.	Polariscope, with revolving polarizer and stationary analyzer, which may be placed either in draw-tube or directly over the objective, - - - -	$11.50
90.	Three selenite films fitted to the same, -	4.00
91.	Paraboloid, for dark ground illustration, -	7.50
92.	Condenser, Sub-stage with reversible mounting, -	6.00
93.	Live Cage, - - - -	2.50
94.	Camera Lucida, - - -	1.50
95.	All the above, when taken in one order, -	30.00

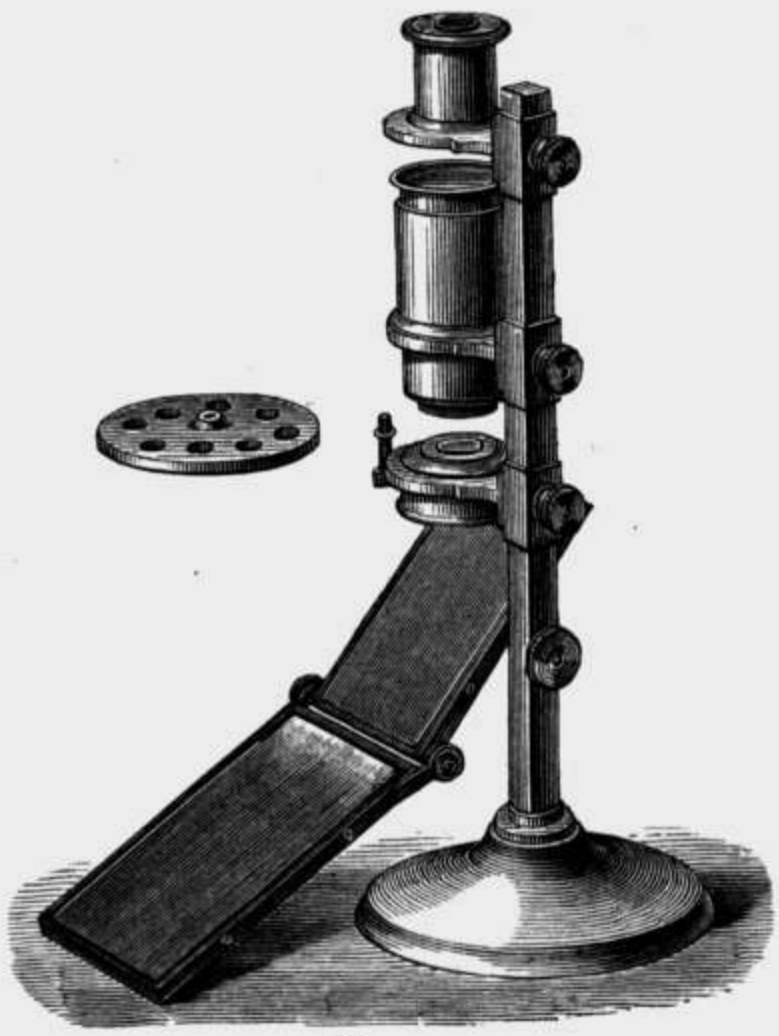
POLARIZATION.

1. Norremberg's Polarizing Apparatus, quite plain, in zinc and iron, - $12.50



No. 2.

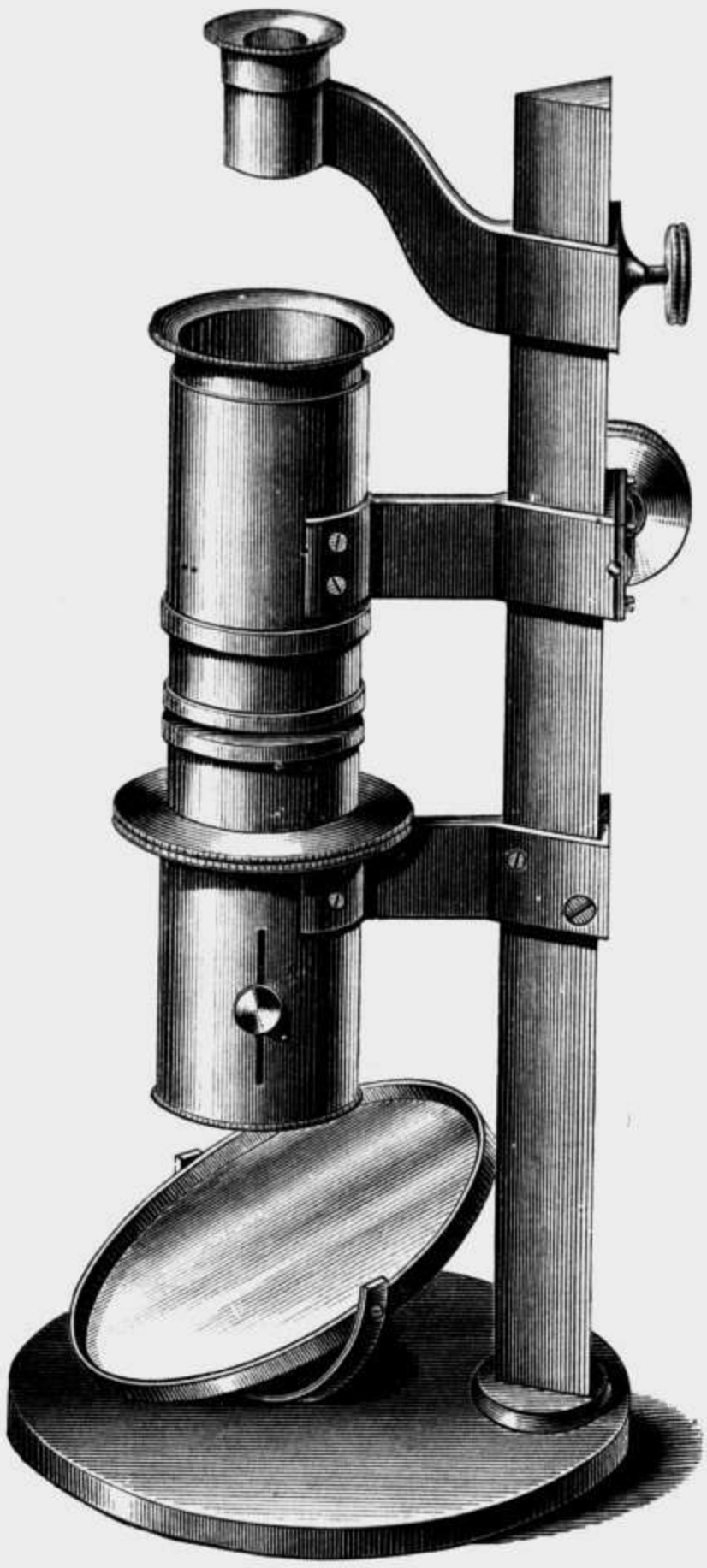
2. Ditto, with Nicol's prisms, - - - - $16.50
3. Ditto, elegant, in brass, with divided circle and three lenses, $35 to 37.50
4. Ditto, with Nicol's prisms, - - - - 47.50
5. Ditto, with a pile of thin glass, in addition, tube for circular polarization of fluids, - - - - $55.00 to 60.00
6. Ditto, of the most recent construction, with wide field wherein the poles of the rings of hypophosphate of soda may be viewed simultaneously, - - - - 65.00



No. 7.

7. Ditto, with draw tube for increasing the amplification of the axial images, with goniometer for measuring the angle by the axis, - $75.00

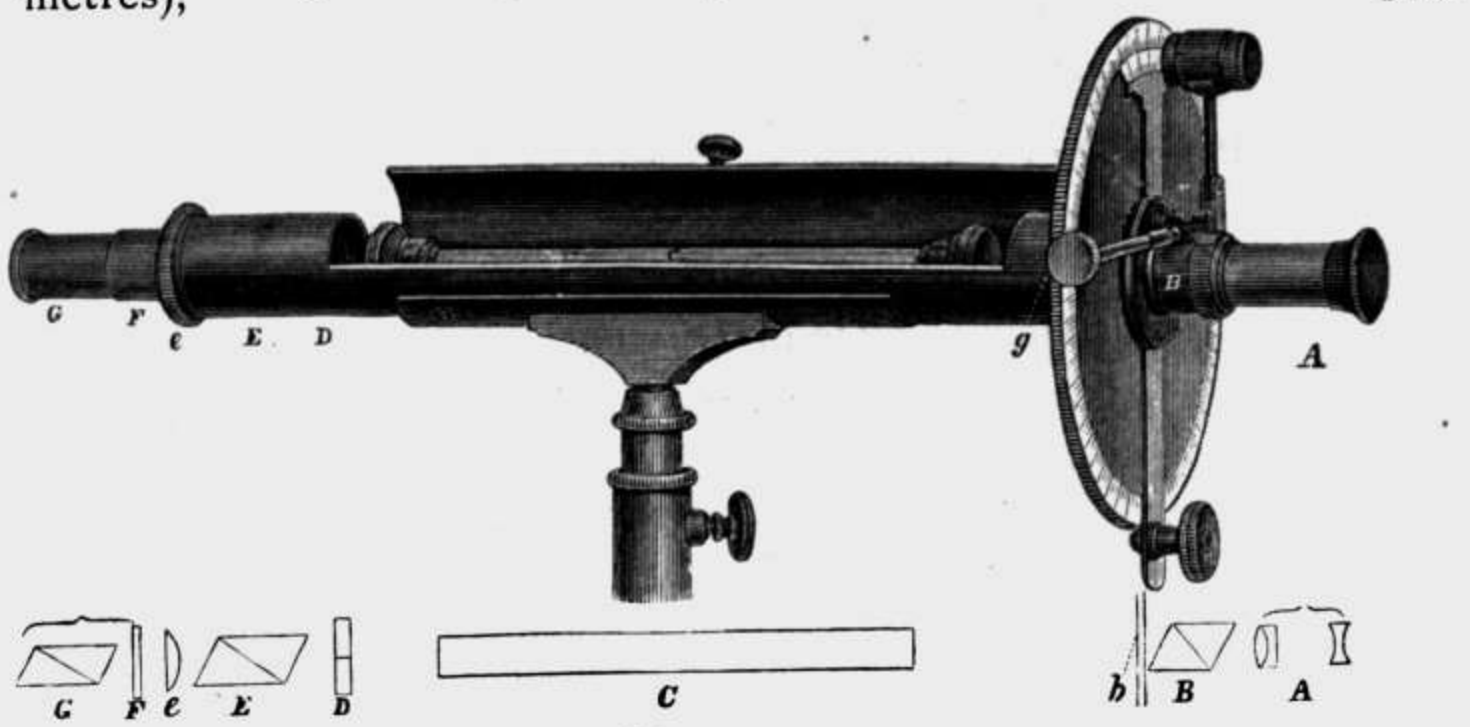
8. Norremberg's Polarizing Microscope (according to the construction of V. Lang). This apparatus is specially destined for the observation of the ring systems, in doubly refracting crystals. It consists of six parts, - - - - - $
9. Ditto, with photographic apparatus for photographing axial images, etc., 100
10. Photographic apparatus alone, for fitting to apparatus already on hand, - - - - - $25 to 30
11. Heliostat alone, - - - - - - 40



No. 8.

12. Mitscherlich's Polaristrobometer. This simple instrument will be found especially useful for physicians and chemists in quantitative determination of sugar or albumen in urine, etc. It allows

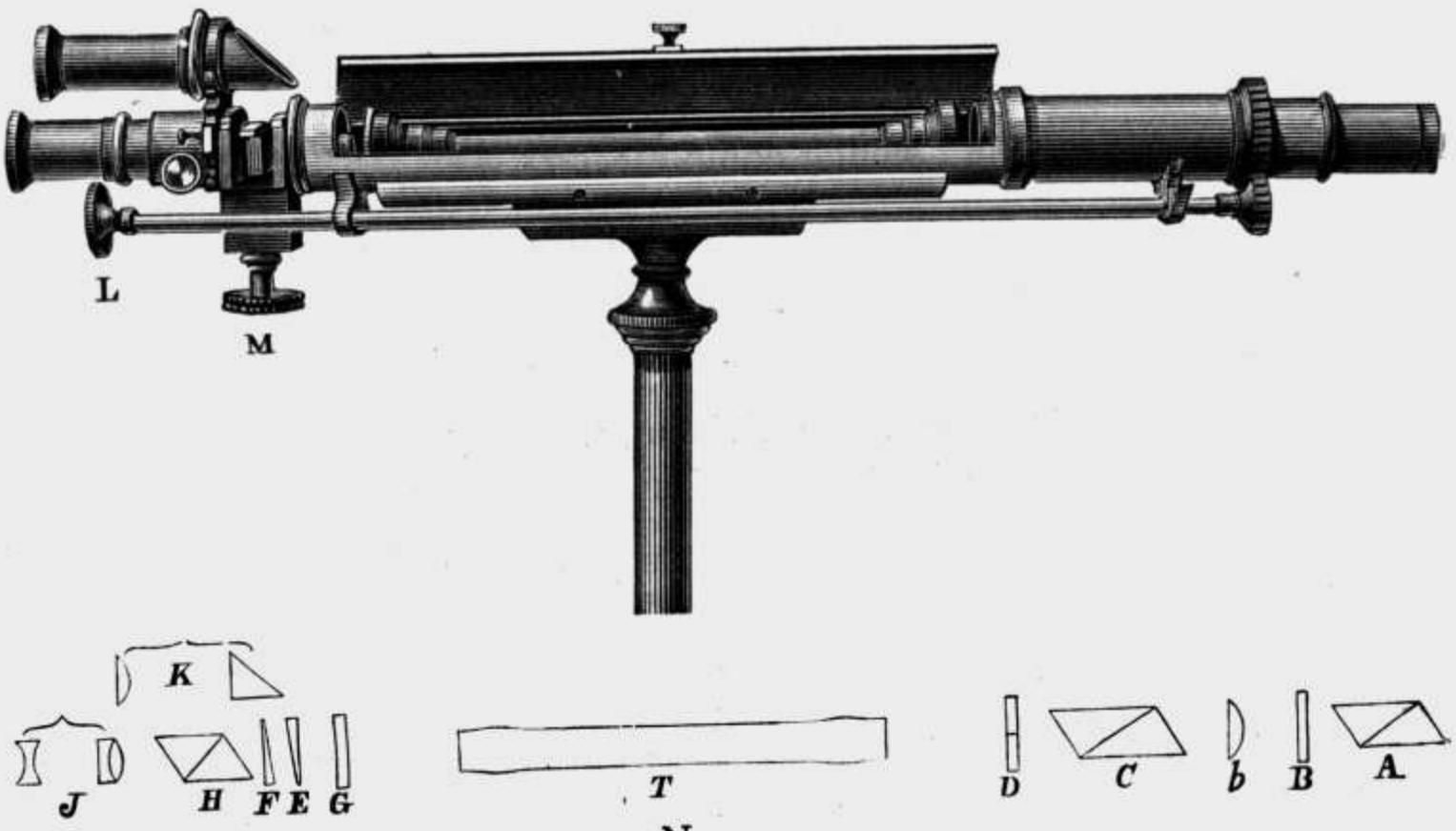
an exact measurement, the circle being divided into degrees and half degrees, and being provided with a Vernier, which allows the reading of minutes. Price, with two trial tubes (100 and 200 millimetres), - - - - - - $45.00



No. 13.

13. Compound Mitscherlich's Polaristrobometer. This more complicated and improved form is provided with the Soleil's double plate of quartz (bi-quartz), the regulator for producing the sensitive color, and telescope. It is, indeed, the Soleil-Ventzke-Scheibler, without the compensator. The measuring apparatus is as in a divided circle with Vernier. Price, with two tubes, packed in a fine mahogany case, lock and key, - - - - $95.00

With these or any similar apparatus (with divided circle) a printed polarization table will be furnished, showing the percentage of sugar, albumen and other substances for the 200 millimetre tube, and relieving the observer of tedious calculations.



No. 14.

14. Saccharimeter Ventzke-Scheibler, packed in mahogany case, - $150.00

Description of the optical parts of the instrument:

A. Nicol's Prism, *B.* Quartz Plate. } Regulator for reproduction of sensible colors.

b. Plano Convex Lens. } Turning around its axis by means of the screw *L.*

C. Polarizing Nicol.

D. Soleil's Double Plate of Quartz. (Bi-quartz).

T. Observing Tube for the Rotatory Fluid.

G. Quartz Plate. *E* & *F.* Quartz Wedges. } Compensator.

E is mounted in a brass hole carrying the scale, and moves toward the right or left by turning the screw *M.*

F is likewise mounted in brass, but stationary, carrying the Vernier, which may be adjusted to the zeropoint by means of a screw.

H. Analyzing Nicol, which can be adjusted by using a screw attached to *F.*

J. Telescope.

K. Magnifying Glass above the Scale.

Test Plates for Saccharimeter, 50 to 100 per cent., - - $10.00

Trial Tubes, 100 to 200 millimetres, - - - 3.50

15. Polaristrobometer, after Wild, of the latest and most improved construction, with division in degrees and in grammes, and three tubes with gas or spirit lamp, - - - - $200.00

16. Apparatus after Jelett-Corun, Penumbra apparatus (*dpénombie*), - 125.00

17. Ditto, with compensating wedge complete, - - - 200.00

18. " " tubes 400 or 600 millimetres long, - - $225 to 260.00

19. Polarizing Apparatus for Wine, for the examination of wines treated with grape sugar, complete, - - - - 24.00

20. Ditto, with semi-circle and fine division, whereby likewise the quantitative determination of all kinds of sugar may be carried out, 40.00

21. Tourmaline Pincers, from $5 to $20, according to size and purity of the tourmaline.

22. Plates of Tourmaline, mounted, at different prices.

23. Large Chromolithographic Plates of uniaxal and biaxal systems of rings, - - - - - $2.50 to 3.50

CALCSPAR PREPARATIONS.

Nicol's Prisms.

24.	Of about	4	millimetres,	$2.25	35. Of about	15	millimetres,	$13.50
25.	"	5	"	2.50	36. "	16	"	15.75
26.	"	6	"	3.00	37. "	18	"	20.00
27.	"	7	"	3.50	38. "	20	"	27.50
28.	"	8	"	4.25	39. "	25	"	40.00
29.	"	9	"	5.00	40. "	30	"	60.00
30.	"	10	"	6.00	41. "	40	"	125.00
31.	"	11	"	7.00	42. "	45	"	150.00
32.	"	12	"	8.25	43. "	50	"	180.00
33.	"	13	"	9.50	44. "	55	"	200.00
34.	"	14	"	11.50	45. "	60	"	225.00

Nicol's Prisms, the Terminal Planes of which do not lie at a slant.

46.	Of about	4	millimetres,	$5.00	52. Of about	13	millimetres,	$13.00
47.	"	8	"	6.50	53. "	14	"	15.00
48.	"	9	"	7.50	54. "	15	"	18.00
49.	"	10	"	8.50	55. "	16	"	21.00
50.	"	11	"	9.50	56. "	18	"	27.00
51.	"	12	"	11.00	57. "	20	"	35.00

Foucault's Prisms.

58.	Of about	15	millimetres,	$7.50	62. Of about	35	millimetres,	$20.00
59.	"	20	"	10.00	63. "	40	"	25.00
60.	"	25	"	13.00	64. "	45	"	30.00
61.	"	30	"	16.50	65. "	50	"	37.50

Equatorial Prisms, Parallel to the Axis.

66.	Of about	15	millimetres,	. . .	$6.00 to $7.50
67.	"	15x20	"	. . .	9.00 " 10.00
68.	"	20x20	"	. . .	12.00 " 13.50
69.	"	20x25	"	. . .	13.50 " 15.00
70.	"	25x30	"	. . .	15.00 " 17.50
71.	"	30x35	"	. . .	20.00 " 22.50
72.	"	35x40	"	. . .	25.00 " 30.00

73. Prisms, parallel to the axis, refracting angle of 30°, . 6.00 " 12.50
74. Ditto, with basic planes polished . . . 9.00 " 18.00
75. Lenses, Biconvex, perpendicular to axis of various diameter and radiance; for instance—
    40 millimetres in diameter, 150 millimetres radius, . 15.00 " 18.00
    50 " " 150 " " . 18.00 " 22.50
76. Doubly Refracting Achromatic Prisms, . . 3.00 " 12.00
77. Ditto, triplet, ... 6.00 " 14.00
78. Senarmont's Prisms, consisting of two calcspar prisms, according to size, ... 7.50 " 15.00

79. Rhombohedrons, with natural cleavage planes of any dimensions or purity desired.

80. Ditto, with the 6 faces polished :

Of about	20	millimetres in the side,	. .	$6.00 to	$7.50
"	25	" "	. .	7.50 "	9.00
"	27	" "	. .	9.00 "	12.00
"	30	" "	. .	10.00 "	13.50
"	35	" "	. .	13.50 "	15.00
"	40	" "	. .	18.00 "	20.00
"	50	" "	. .	25.00 "	30.00

81. Ditto, with addition planes worked perpendicular to the axis :

Of about	20	millimetres,	. . .	$8.50 to	$10.00
"	25	"	. . .	10.00 "	12.00
"	27	"	. . .	12.00 "	15.00
"	30	"	. . .	13.50 "	16.50
"	35	"	. . .	16.50 "	19.00
"	40	"	. . .	21.00 "	24.00
"	50	"	. . .	27.50 "	32.50

82. Ditto, with planes worked perpendicular and parallel to the axis :

Of about	25	millimetres,	. . .	$12.00 to	$15.00
"	27	"	. . .	13.50 "	16.50
"	30	"	. . .	16.50 "	18.00
"	33	"	. . .	18.00 "	20.00
"	36	"	. . .	22.50 "	25.00
"	40	"	. . .	30.00 "	32.50
"	50	"	. . .	37.50 "	40.00

83. Rhombohedron, with drops of water, . . . $6 to $18.00

84. Cube of Calcite, perpendicular and parallel to axis, according to size, - - - - - - $5 to $7.50

85. Spheres of Calcspar, about 70 millimetres in diameter, - 25.00

86. Cubes of Calcspar, consisting of prisms put together in different ways, after Rochon, Wallaston and Senarmont, the six sides of the cube polished. In a case, - - - $22.50 to 30.00

87. Davis Polarizer (rectangular calcspar prism), - 7.50 to 18.00

88. Plates of Calcspar between two Glass Prisms. Looked at from one side, it exhibits the system of rings ; from the other, it shows double refraction, - - - - - $4 to 6.00

89. Aragonite, which, without a polarizing apparatus, shows the two systems of rings (idiocyclophanous crystal), - - $5 to 10.00

90. Plates of Calcspar between Prisms of the same material, showing the phenomenon artificially, - - - $6 to 12.00

91. The preceding two preparations, suitably mounted in brass, - $15 to 18.00

92. Prisms of single pieces of Calcspar, showing the same phenomenon, - - - - $7.50 to 10.00

93. Apparatus of two Plates of Calcspar and a Plate of Mica, for explaining the hemitrope system of rings, - - $5 to $7.50
94. Apparatus, according to Beer, for the explanation of double refraction in calcspar, - - - - - $10 to 12.50
95. Two large Calcspar Rhombohedrons in rotating mount, for a similar purpose, about 25 millimetres in the side and 40 millimetres in length, - - - - - 40.00
96. Stephanometer, with two double refracting calcspar prisms, for a similar purpose, - - - - - $9 to 10.00
97. Press for the production of the slipping planes in calcspar and rock salt, after Reusch, with preparations, - - - $9 to 10.00
98. Pressed and Unpressed Preparations, loose, - - 75c to 1.50
99. Calcspar Rods for the Opthalmometer, after Coccins, - $4 to 5.00

QUARTZ PREPARATIONS.

100. Prisms, the refracting edge worked perpendicular to the axis :

Of about	20	millimetres	in the side,	. .	$7.50 to $10.00
"	25	"	"	. .	10.50 " 12.50
"	30	"	"	. .	13.50 " 15.00
"	35	"	"	. .	16.50 " 18.00
"	40	"	"	. .	18.00 " 22.50
"	50	"	"	. .	27.50 " 30.00

101. Prisms, the refracting edge worked parallel to the axis, 3 faces polished :

Of about	20	millimetres	in the side,	. .	$7.50 to $9.00
"	25	"	"	. .	10.50 " 12.00
"	30	"	"	. .	12.00 " 13.50
"	35	"	"	. .	15.00 " 16.50
"	40	"	"	. .	18.00 " 21.00
"	50	"	"	. .	27.50 " 30.00

102. Lenses, Biconvex, worked perpendicular to the axis, with radius of 1,500 millimetres, 300 millimetres and 150 millimetres :

Of about	40	millimetres	diameter,	. .	$7.50 to $9.00
"	45	"	"	. .	10.50 " 13.50
"	50	"	"	. .	12.00 " 15.00
"	60	"	"	. .	15.00 " 18.00
"	70	"	"	. .	22.50 " 27.50

103. Plano Convex Lenses, perpendicular to the axis, for object glasses and eye-pieces of telescopes, according to their dimensions, and of size and radius specified in order. Complete telescope, with quartz lenses to order.

104. Cylindric Lenses, of about 150 millimetres radius, worked perpendicular to the axis, according to their size, . $15.00 to $20.00
105. Spheres of any size desired.
106. Compensator, after Soleil, Ventzke and Scheibler, . 20.00 to 25.00
107. Double Plates of Quartz, with right and left rotation, 3·75 millimetres thick, ... $6.00 to $8.00
108. Ditto, very accurately worked, for measuring instruments, 10.00 to 12.00
109. Ditto, 7 millimetres thick, . . . 15.00 to 20.00
110. Ditto, 33 millimetres thick, . . . 30.00 to 36.00
111. Wedges, quite thin, ... 8.00 to 12.00
112. Concave Plates, ... 10.00 to 12.00
113. Thin Plates, parallel to the axis, for experiments, of Plücker and of Groth, ... $4.00 to $8.00
114. Collection of 7 plates of quartz, perpendicular to axis, of different thicknesses, showing the colors of the spectrum, . $15.00 to $25.00
115. Two quartzes, worked in the form of prisms, which exhibit the colors in succession (gradation of double refraction), . $10.00 to $15.00
116. Double Image Achromatized Quartz Prism, after Rochon, 10.00 to 12.00
117. Ditto, smaller, for lessons, goniometer, . . 6.00 to 8.00
118. Fresnel's Prisms, of right and left handed quartzes, . 15.00 to 20.00
119. Ditto, of 3 prisms, ... 25.00 to 30.00
120. Compensating Quartz Plate, hexagonal, of about 9 to 10 millimetres thick, ... $8.00 to $10.00
121. Cylinders, the terminal planes perpendicular to axis, and polished, ... $15.00 to $20.00
122. Cubes, perpendicular and parallel to the axis, . 8.00 to 18.00
123 Natural Quartz Crystals, with R and L trapezoidral planes, per pair, ... $4.00 to $15.00
124. Quartz Ruler, parallel to axis, about 100 millimetres long, divided to 0·1 millimetres, . . . $60.00 to $75.00

SELENITE AND MICA PREPARATIONS.

Those preparations which may be used also for investigations with the Microscope, have an asterisk affixed to them.

125. Selenite Wedges, ... $4.00 to $5.00
126. Selenite Wedges, larger and purer, . . 6.00 to 14.00
*127. Selenite Wedges, with broad bands of color proceeding from the first to the third order, . . . $4.00 to $6.00
*128. Selenite Wedges, from the third to the fifth order, . 4.00 to 6.00
129. Concave Selenite Plates, . . 4.50 to 6.50
130. Concave Selenite Plates, larger and purer, . . 6.00 to 8.00

131. Convex and Concave Selenite Plates, in mount, to turn round over each other, for altering the colors of the rings, - $14 to $16.00

132. 8 Selenite Films, in different colors, after Müller, - $5 to 7.00

*133. Selenite Films, of ¼, ¾ and 9-4 wave length, with which, by means of variable super-positions, 13 different retardations of wave length can be brought about. In brass or pasteboard bound, the set, - - - - - $5 to 8.00

134. Selenite Designs, such as cubes, stars, flowers, birds, butterflies, etc., which in polarized light exhibit the most brilliant colors, $4 to 10.00

*135. Bravais' Double Plate, - - - - $4 to 8.00

*136. Circularly Polarizing Double Plate, a combination of selenite and mica, with right and left rotation, according to size, $6 to 12.00

137. Selenite and Mica Films, for converting plane into circular polarization. The set of 3, according to size, - - $4 to 8.00

*138. Selenite and Mica Films are suggested by Von Mohl. The set of 8, consisting of 4 selenite films, giving red of the 1st to the 4th order, and 4 mica films of ⅛ to ½ wave length, - - $6 to 12.00

*139. Single Selenite Films, in colors of the 1st order, - 1.50 to 2.00

140. Selenite Plates, worked and unworked, - - 1.00 to 3.00

141. Plates of Calcspar, worked and unworked, - - 1.00 to 3.00

142. Plates of Mica, black and transparent, - - 1.00 to 2.00

143. Plates of Agate, 2 to 6 millimetres thick, - - 2.00 to 3.00

144. Plates of Quartz, worked perpendicular or parallel to axis, 2 to 6 millimetres thick, - - - - $3.00 to 8.00

145. Plates of Crown or Flint Glass, - - - 1.00 to 3.00

146. Plates of Black Glass, - - - - 1.00 to 2.50

147. Senarmont's Apparatus, in illustration of the unequal conducting of heat in crystals in different directions, with perforated sections of crystal, - - - - - $20.00 to 30.00

*148. Single Selenite Films, in colors of the higher order, - 1.00 to 1.50

149. Quarter Undulation Mica Plate, for examining the character of the double refraction in uniaxal crystals. Large size, square, 2.50

150. Ditto, middle size, round, - - - 1.50

151. Ditto, small size, round, - - - - 1.00

152. Selenite and Mica Combinations, which in the Polarizing Apparatus, Nos. 6 and 7, exhibit the most splendid phenomena. The collection of from 6 to 8 pieces, - - - - $15 to 20.00

153. Mica Combination, after Nörremberg, for showing how from biaxal mica the uniaxal originates. The collection of 6 preparations, $12 to $15.00

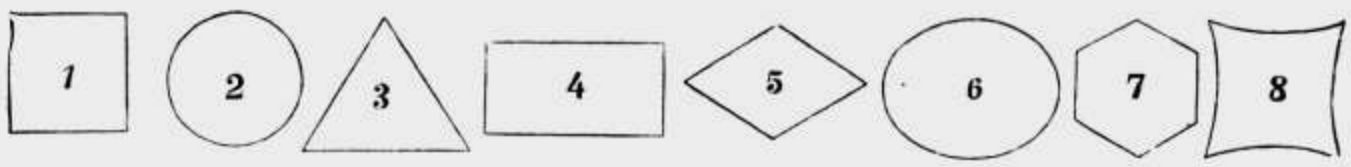
154. Ditto, in a single preparation, with plates of mica crossed at right angles, - - - - - - $6 to 8.00

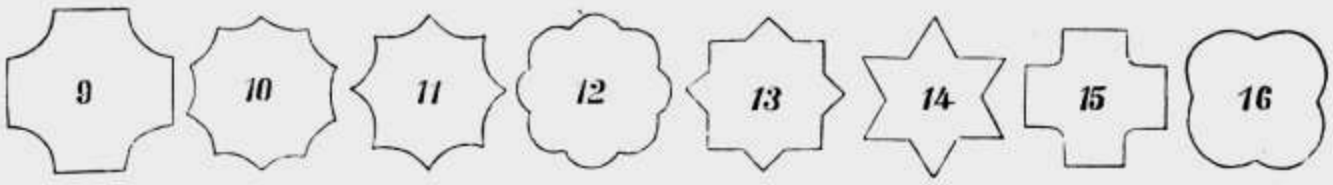
155. Uniaxal Circularly Polarizing Mica Combinations, after Reush, right and left handed, crossed at an angle of 60°, the pair, - $12 to 15.00

156. Ditto, crossed at an angle of 45°, the pair, - - $12 to 15.00

157. Ditto, with films of unequal thickness, imitating the biaxal phenomena seen in many specimens of quartz and amethyst, each, - $6 to 8.00

VARIOUS APPARATUS FOR POLARIZATION.





158. Unannealed Glasses, in 16 different shapes, according to their size and beauty—

Nos. 1, 2, 3, 4, 5,	each	$1.50 to $2.00
" 6, 7, 8,	"	2.00 to 2.50
" 9, 16,	"	2.25 to 3.00
" 10, 11, 12, 13, 14, 15,	"	2.50 to 4.00

159. Plates of Uranium Glass, - - - 4.00 to 8.00

160. Cubes of Uranium Glass, - - - 3.00 to 6.00

161. Piles of Thin Glass Plates, according to their size and number of plates, - - - - $2.50 to 7.50

162. Black Mirror, for experiments in polarization, in mahogany frame, - - - - - $2 50 to 5.00

163. Presses for showing in glass, by pressure, the phenomenon of polarization, - - - - $6.00 to $7.50

164. Ditto for Bending Glass, - - - 6.00 to 7.50

165. Apparatus for Heating Glass, - - - 3.00 to 5.00