

FORTY FOURTH EDITION.

PART SECOND.

PRICED AND ILLUSTRATED CATALOGUE  
OF  
OPTICAL INSTRUMENTS.



MADE, IMPORTED AND SOLD, WHOLESALE AND RETAIL,

BY

**JAMES W. QUEEN & Co.,**

No. 924 Chestnut St., and 923 Sansom St.,

**PHILADELPHIA.**

1880.

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JAMES W. QUEEN & CO.

PHILADELPHIA, 1880.

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NO. 924 CHESTNUT ST., & 925 SANSON ST., PHILADELPHIA.

Please let friends interested in Science see this Catalogue.

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## NOTICE

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THE optical instrument business, of which this catalogue is an exponent, was established twenty-four years ago by Mr. James W. Queen, of this city, who had been previously connected for more than a quarter of a century with the oldest optical firm in the United States.

Though small and unpretending as his store and business were at the outset, Mr. Queen's thorough knowledge of the business, together with a full appreciation of the wants of those engaged in scientific research, soon convinced the community that his was an institution of great value; and from this small beginning rapidly grew the largest and most comprehensive establishment of the kind, not only in the United States, but in the world.

The character and uses of scientific instruments are so varied and the stock so large as to require, in our establishment, their division into special departments, each of which is under the oversight of a person competent, both by his knowledge and business ability, to keep the instruments of his department up to the highest standard.

Our spectacle department has its competent manager and corps of assistants; and the reputation the house now enjoys is a national one for perfection of its spectacles and eye-glasses, and precision of adaptation to the form of the face and defects of the sight.

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It is our intention to make and sell none but perfect instruments in each of the departments of our business, and to supply to our customers the article or articles ordered or that will be best suited for the purposes wished to be accomplished.

JAMES W. QUEEN & CO.

VISION.

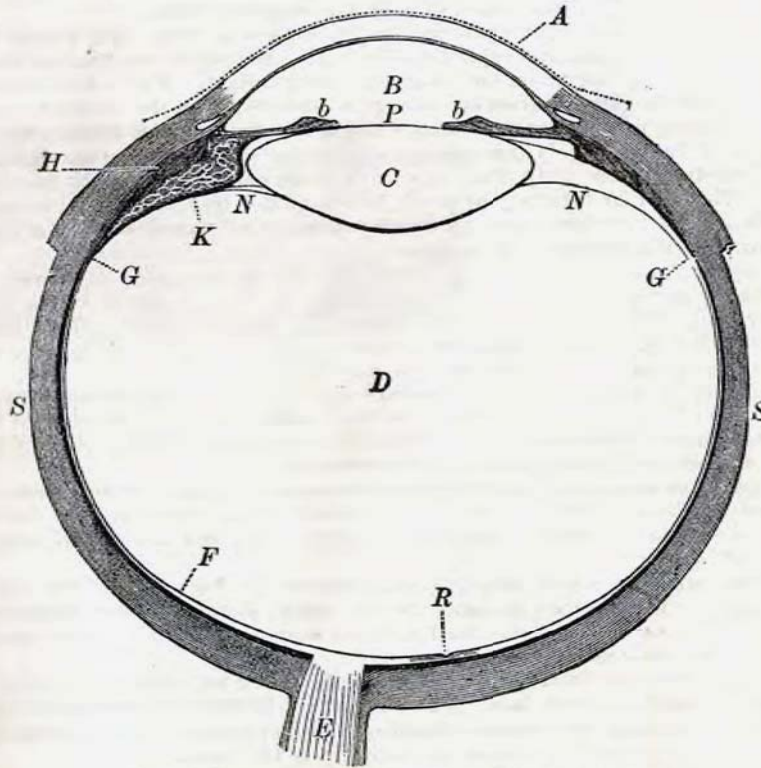


FIGURE OF THE EYE. (After HELMHOLTZ.)

As the eye was the first optical instrument constructed, and as by it all other optical instruments are appreciated by man, it is very appropriate, at the beginning of this catalogue, to describe the structure of that organ of the human body, and show how we are able to appreciate external objects.

In connection, we will also explain what the perfect eye is capable of doing and should do, and show the various malformations, either inherent or acquired, which unfit it from giving us that maximum vision, and to describe the methods science has discovered to correct these defects, and state when and how they should be made use of, either to prevent or remedy the troubles.

ANATOMY OF THE EYE.

The globe of the eye or eyeball is nearly spherical in form and about one inch in diameter. It is a very complex structure, being made up of a series of coats, humors, and muscles, each of which exercises its peculiar function whilst we are enjoying the sense of sight, either of objects at a distance from us or near at hand.

The illustration above represents an enlarged section of the human eye cut through from the centre of the cornea to the optic nerve.

*S.* The sclerotic coating is the external coat of the eyeball; it is white in appearance and extremely hard and tough, giving shape, support, and protection to the delicate structures contained within it.

*A.* The cornea, or transparent front portion of the eyeball. It is more convex in

form than the other portions of the ball. The rays of light from objects looked at fall first on the cornea, and at its surface are very strongly bent inwards from their original course.

**B.** *Aqueous fluid*, through which the light passes after leaving the cornea.

**bb.** *Iris* or colored portion of the eye is a delicate, circular curtain, covering a greater portion of the lens, having an opening in the centre, which enlarges or contracts according to the amount of light reaching the retina.

**P.** *The pupil* or circular opening in the iris, through which the light passes to the lens; by the contraction and expansion of the iris, the pupil is made larger when the light is dull, or smaller under the effects of a bright light. This action is involuntary to us, and is going on from one change to another, upon the slightest variation in the direction of the eyes or amount of light seeking entrance through the lens.

**C.** *Crystalline lens* is a highly transparent, double-convex body, about one-third of an inch diameter and one-sixth of an inch thick, more curved in the back part than in front. The light, on entering the pupil, falls upon this lens, and in passing through it is bent from the course given it by the cornea, and passed towards a point on the retina, at the back part of the eye.

**K.** *Ciliary processes*, or ciliary body, surround, but do not touch, the lens. They are about seventy in number, and pear-shaped in form, being attached at their smaller ends to the choroid coat, and, like it, jet black in color. Their function appears to be, in connection with the ciliary muscle, to adjust the eye for seeing objects clearly that are at different distances from it.

**II.** *Ciliary muscle*, a circle of muscular fibre outside the ciliary processes near the outer edge of the iris. By the contraction of this muscle, the crystalline lens is made to assume a more convex form whenever the eyes are directed to objects close at hand, — say from ten inches to five feet distant.

**D.** *Vitreous chamber*, which is filled with a transparent, jelly-like substance called the vitreous humor. The function of this semi-fluid is to transmit to the retina the rays of light which have passed through the lens, and also to give form and strength to the eyeball.

**F.** *The retina* or nerve tissue, covering the whole of the back part of the inside of the eyeball up to the ciliary muscle. On the retina, pictures of the objects looked at are formed by the combined action of the cornea, aqueous humor, crystalline lens, and vitreous humor.

**E.** *Optic nerve*, coming from the brain, enters the back part of the eyeball a little toward the nose from the centre. The optic nerve, after entering the ball, spreads out over the whole of the vitreous chamber, and forms the retina. Through it the impressions made upon the retina are conveyed to the brain.

**G.** *Choroid coat*, a dark-colored membrane covering the whole of the vitreous chamber outside of the retina. Its inner or pigment layer seems to be intended for the purpose of absorbing the superfluous rays of light which are not focused on the retina; in other words, for a background to the retina.

**R.** *Macula lutea*, or yellow spot of the retina, is a very small indentation on the retina, nearly in a line with the centre of the lens and cornea. It is about one-tenth of an inch outwardly from the optic nerve, and is the most sensitive part of the retina. Clear, sharp vision of an object can only be had by turning the eye so that the picture of the object can be formed on this yellow spot of the retina. The eye takes cognizance of an object that is very much to one side, or above or below its axis; but no distinct vision of the object can be obtained except by turning the eyes directly toward it, so that the picture of it will be formed on the macula lutea.

On the outside of the eyeball of each eye there are several muscles, by which it is moved inwardly and outwardly, or up and down, as the position of the object that is to be distinctly seen may require.

#### PERFECT SIGHT.

Our two eyes are absolutely necessary for a right comprehension by sight of size, form, and distance. No correct conception of these can be obtained by one eye.

A double-convex lens covering a hole in the shutter of a darkened room will cause a picture of objects outside the shutter to be distinctly formed on a screen placed at the focal distance of the lens within the darkened room, provided the out-

side objects are twenty or more feet distant from the lens. The rays of light coming from the objects which form the picture may be considered parallel rays.

If the objects are brought closer to the lens on the outside of the window, the screen in the darkened room must be removed farther from the lens before a clear picture will be formed. The rays which pass from any point of an object so located, and fall on the lens in the shutter, are called divergent rays. All objects nearer to the eye than twenty feet give off divergent rays of light.

In the human eye the chamber behind the iris is a dark room—the cornea, aqueous humor, crystalline lens, and vitreous humor together act as a double-convex lens, and the retina is the screen on which the pictures of external objects are formed.

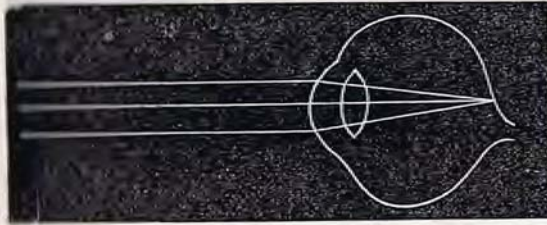


DIAGRAM OF A PERFECT EYE.

The optical, or seeing, and the muscular arrangements of the different parts of a perfect eye are such that, when the attention is directed to an object twenty or more feet distant from the observer, a perfect picture of such object is formed on the retina, and distinct vision is the result. Then all muscles of the eye are at perfect rest, and while so, an object, such as printing, could not be distinguished if held

at twelve or fifteen inches from the eye.

The function of the eye termed by oculists "accommodation," is exercised instantly upon the attention being directed to small objects near at hand. It is simply the contracting of the ciliary muscle, which surrounds the circumference of the lens. The effect of this contraction is to cause the lens to assume a more convex form, and consequently the combined action of the cornea, aqueous humor, crystalline lens, and vitreous humor, is increased in power, and these divergent rays of light are made to form a distinct picture on the retina. The external muscles of the eyes turn the balls inward toward the nose instantly for near vision; then the retina in each eye receives at the same moment of time a similar impression of the object, and thus the convergence muscles, and the muscle of accommodation, act simultaneously for clear vision of near objects.

The perfect eye, with good daylight, can read this large type at the distance of twenty feet from the eye.

A B C D

And the same eye, at thirty-five years of age, should be able to read this small type from fourteen inches up to six inches from the eyes; at an earlier age still nearer than six inches, without blurring:

The first of May! There is a merry freshness in the sound, calling to our minds a thousand thoughts of all that is pleasant and beautiful in nature, in her sweetest and most delightful form. What man is there, over whose mind a bright spring morning does not exercise a magic influence—carrying him back to the days of his childish sports, and conjuring up before him the old green field with its gently waving trees, where the birds sang as he has never heard them since—where the butterfly fluttered far more gaily than he ever sees him now, in all his ramblings—where the sky seemed bluer, and the sun shone more brightly—where the air blew more freshly over greener grass, and sweeter smelling flowers—where everything wore a richer and more brilliant hue than it is ever dressed in now? Such are the deep feelings of childhood, and such are the impressions which every lovely object stamps upon his heart. The hardy traveller wanders through the maze of thick and pathless woods, where the sun's rays never shone, and heaven's pure air never glared; he stands on the brink of the roaring waterfall, and, giddy and bewildered, watches the foaming mass as it leaps from stone to stone, and from crag to crag; he lingers in the fertile plains of a land of perpetual sunshine and revels in the luxury of their balmy breath. But what are the deep forests, or thundering waters, or the richest landscapes that bounteous nature ever spread, to charm the eyes and captivate the senses of man, compared with the recollection of the old scenes of his early youth?—Magic scenes indeed; for the fairy thought of infancy dressed them in colors brighter than the rainbow, and almost as fleeting; colors which are the reflection only of the sparkling sunbeams of childhood, and can never be called into existence in the dark and cloudy days of after-life!—in former times spring brought with it not only such associations as those connected with the past, but sports and games of the present—merry dances round rustic pillars, adorned with emblems of the season, and reared in honor of its coming. Where are they now? Pillars we have, but they are no longer rustic ones; and as to dancers, they are used to rooms and lights, and would not bow well in the open air.

Whenever these specimens cannot be read at the distance named, the eyes are either optically or physically out of order. As opticians, we only have to do with optical defects, that is, the causes that prevent the cornea, lens, and humors from forming clear pictures on the retina.

## MALFORMATIONS PRODUCING IMPERFECT VISION.

### MYOPIA, OR NEAR-SIGHTEDNESS.

The difficulty to see distant objects distinctly arises from a defectively constructed eyeball, the distance from the lens to the retina at the back part of the eye being too great, and, as a consequence, the rays of light coming from a distant object are bent to a focus before reaching the retina, and form on the retina only confused pictures. Myopia is a condition of the eyes existing at birth in most of the cases where it is discovered, but it may be contracted in youth, by long continued application to reading,

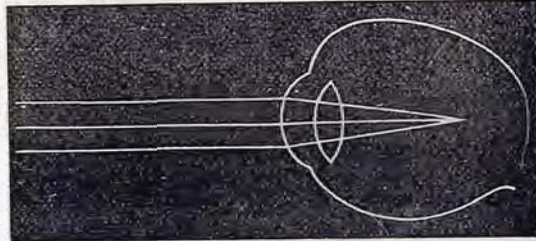


DIAGRAM OF A MYOPIC EYE.

writing, or sewing, particularly where the light is poor, and the head is held close to the work to overcome the want of light. It then may be due either to the failure of the muscle of accommodation to relax itself, or of the lens to regain its normal form. Near-sighted eyes are generally large and quite prominent, and require concave lenses to correct their defect. Such eyes, especially in young people, are rarely healthy eyes, and in wearing glasses they should only do so by the advice and careful measurement of the oculist. Myopia is all the more serious from the wide-spread impression that near-sighted eyes are unusually strong.

It is not proper to conclude hastily that a person is near-sighted simply because small objects are brought closer to the eye than natural to see distinctly, as there are other defects which require the objects to approach the eye for good sight.

Myopia, although transmitted from parents to children, is seldom noticed before the seventh year of the age, but after that it begins to manifest itself in those whose antecedents predispose them to it. But Myopia is liable to be contracted by children of families where a near-sighted member was previously not known. It may then be the result of a prolonged and steady looking at an object, or at objects near the eye, though at proper distance, without rest or frequent change of the visual focus, as in long and absorbed novel reading, intense study, or persistent diligence in needlework.

The practice of reading or otherwise using the sight at too short range. This results in part from insufficient light, or from its faulty direction, so that the hand or body throws a shadow on the page, or that the direct rays fall upon the eye, causing undue contraction of the pupil, while the page is in shadow.

A prone or forward position of the head too long maintained, or frequently repeated, and becoming a habit. This results from reading or studying with the book in the lap, and from the use of desks not graded to the height of the pupil.

Donders says: "In the hygiene of Myopia, the very first point is to guard against working in a stooping position."

Near-sighted people who have inherited Myopia, often grow more or less near-sighted as they advance in life, but those who have contracted it between their seventh and twentieth years are specially apt, than otherwise, to find their near-sightedness growing more annoying year by year. Abandoning the injurious causes that have induced the Myopia, and correcting with proper lenses the existing trouble, is now the only preventive to the onward progress of the disease.

Myopia is an accompaniment of civilization, being, it is said, almost unknown among barbarous nations. It is rare among the poorer classes, and of these the inhabitants of cities, from the nature of their occupations, are more liable to it than the inhabitants of the country.

When the Myopia is of a low grade, glasses need only be worn for seeing distant objects, but when the number for distance reaches No. 10, another and less powerful glass should be used for reading and sewing.



## HYPERMETROPIA.

Hypermetropia also arises from a defectively constructed eyeball, but it is the reverse of Myopia, being too short from the lens to the retina, consequently the rays of light from distant objects are not sufficiently bent so that they will come to a focus on the retina, when the accommodation function of the eye is not exercised. The impressions of the object formed on the retina are then confused, very much the same as is the case with myopic eyes. Hypermetropia is also a birth inheritance, where it is found

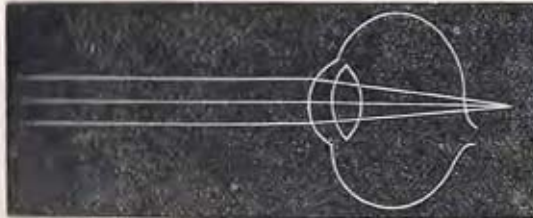


DIAGRAM OF A HYPERMETROPIC EYE.

to exist in after years, though old-sighted people are apt to become hypermetropic after their sixtieth year. Convex glasses are required for correcting the defect in hypermetropic eyes.

Physicians who give their special attention to the eye and its defects, tell us the most frequently occurring cause of weak eyes is this defect called *Hypermetropia*. Nature has made it possible, however, for persons having such eyes, to see distinctly by making their crystalline lens stronger, *i. e.* shortening its focal length, so that the focus is brought forward on to the retina, and they see for the time-being distinctly. This is done by means of the ciliary muscle situated near the circumference of the lens within the eyeball. In order to maintain distinct vision, this muscle of accommodation must be kept in a constant state of tension, under which it soon becomes exhausted, and gives up, or contracts spasmodically, at first causing blurred and indistinct vision, finally causing pain which may be felt in the eye, but is oftener referred to the forehead and temples.

This malformation is often the undiscovered cause of the headaches and neuralgias from which so many persons are constant or periodical sufferers. This, too, is one of the fruitful causes of the sick headaches, etc., which are the penalty frequently paid for an evening spent at a lecture, or place of amusement, or at church; the burning in the eyes, etc., being laid to bright gas-light, when in reality it was caused by the strain upon the little muscle within the eye in maintaining distinct vision. The extreme annoyance it is possible to occasion by muscular strain, will be vividly illustrated by holding a moderate weight in the hand at arm's length, without interruption, for half an hour, or even less.

Many a person with a low degree of Hypermetropia gets through life until adult age, all the while doing a large amount of eye-work, without glasses, and, although feeling great inconvenience in the head, has no idea that defective eyes are the cause of the trouble experienced. Such persons will find entire relief from these annoying and painful symptoms by a properly adjusted pair of glasses, which act by assisting the crystalline lens of the eye, and thus removing the necessity for the muscular strain. The correct plan is to apply the remedy as early as the defect is discovered, whether that be in childhood, youth, or mature age. The truth is, that many children attending school suffer from this trouble, while thought by their parents and instructors to be near-sighted.

**INTERNAL SQUINT.**—This affection of one or both eyes, producing the deformity called *cross-eyed*, is, in a great majority of cases, the result of the eyes being hypermetropically formed.

As the eyes are too short from the cornea to the retina, no distinct pictures of distant objects are formed on the retina, without an effort on the part of the ciliary muscle to shorten the focus of the crystalline lens, which, in the perfect eye, is not required, except for seeing objects close at hand.

Now the ciliary muscle never contracts without being accompanied by a contraction of the external muscles of the eye, which turn the balls inward towards the nose.

Persons, therefore, who have hypermetropically-formed eyes, when looking at distant objects, instead of having the axes of the two eyes parallel, really have the axes inclined towards each other, one eye generally more than the other.

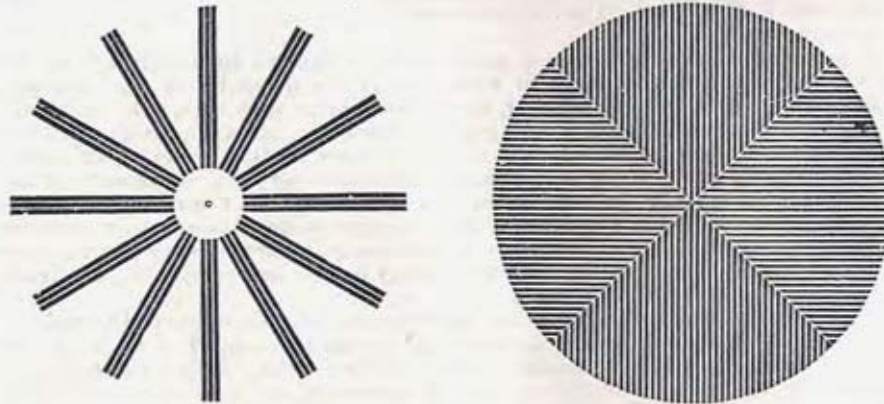
It is very rare to find in eyes affected with the tendency to internal squint the

absence of hypermetropia; and it is also rare to find a case of internal squint, between the ages of ten and eighteen years, that cannot be cured by a pair of convex spectacles of the right power to correct the hypermetropia.

### ASTIGMATISM, OR CYLINDRICAL EYE.

In the perfect eye, the cornea (A in the illustration) is nearly the segment of a sphere, and the pupil is about opposite the centre or apex of that sphere. But it frequently happens that the cornea is not the segment of a sphere, but is more convex in one direction than in another — in other words, of unequal curvatures in directions at right angles to each other. The consequence of this irregularity upon the sight is, that while the eye may be perfect for seeing objects that are perpendicular, it is defective at the same time for seeing horizontal objects, or *vice versa*.

An astigmatic person generally holds objects close to the eyes in order to enlarge them, and so in a measure compensate for the loss of sharpness of vision. When looking at a series of parallel lines like those illustrated below, an astigmatic eye will often



only be able to see one set clearly, those in the reverse direction being blurred and indistinct. People having a high degree of astigmatism frequently consider themselves near-sighted, and are surprised, when attempting to obtain glasses, that none can be found among concave glasses that will greatly improve their vision. Children who learn to read with difficulty, annoying their parents and teachers by their apparent stupidity, are generally troubled with Astigmatism, which can only be remedied by cylindrical glasses, carefully ground to the oculist's order after accurate measurement of the defect.

The eye may be myopic and astigmatic at the same time or hypermetropic and astigmatic, or simply astigmatic. To correct astigmatism of the eye and render good and comfortable sight possible, a lens must be selected one surface of which is the segment of a cylinder; this, by its concavity or convexity and placed in the proper position, will correct the defective curve of the cornea without interfering with the more perfect curve of that cornea.

### IMPERFECT SIGHT RESULTING FROM AGE, PHYSICAL WEAKNESS, OR INJURIES.

#### PRESBYOPIA.

"Old-sight," "far-sight" or "Presbyopia," as it is variously called, is a physiological defect, depending upon the hardening of the lens of the eye so that it can no longer change its shape to the same extent as in former years. This process of hardening begins quite early in life and gradually increases, but in natural eyes causes no inconvenience until middle life,—from the 40th to 45th year,—when it will be found difficult or impossible in ordinary light to longer see the eye of a cambric needle, or to read diamond type nearer than 8 inches from the eyes. At this point *Presbyopia* is said to begin, and, for comfortable use of the eyes by gas-light, it

is found necessary to use a weak convex glass to assist the lenses of the eyes in focusing rays of light upon the retina. In the hypermetropic and astigmatic eye, Presbyopia begins at a much earlier age.

Persons with properly shaped eyes cannot hope to avoid the inconvenience thus occasioned, nor will they retain their "young sight" longer by avoiding the use of glasses. The popular impression in this regard is erroneous, and in deferring the use of their first glasses, they are subjecting themselves to unnecessary discomfort.

As the office of the glass is to supply the refracting power which the eye, through age or malformation, cannot furnish, it is evident that so soon as a need of this artificial power is felt we should resort to it. By failing to do so, we deprive ourselves of much useful work of the organ, while the work it does is done under a disadvantage, and with greater or less risk of permanent and painful injury, more especially when the eyes are imperfectly formed.

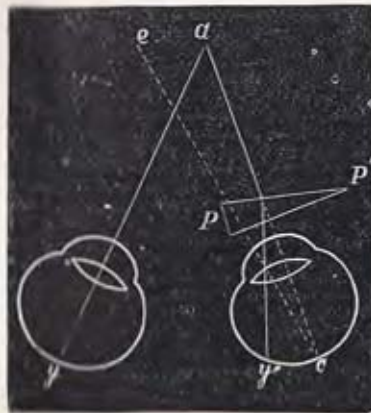
Those who are able to put off the use of glasses longer than the 45th year, and still maintain distinct vision for reading fine print, have probably always been slightly near-sighted, and may find their distant vision is improved by a weak near-sighted glass. Many persons have this defect in low degree without ever being conscious that they do not see as well as other persons.

When Presbyopia, or old-sightedness, commences, inconvenience will first be felt in the use of the eyes in the evening, and for a year or more one may confine the use of his glasses to work at that time. But soon they will become necessary during the day, especially if he has work requiring close and accurate attention, and the light is not good.

Under ordinary circumstances, that is, when there is no myopia, hypermetropia or astigmatism, and when the eyes are in other respects healthy, the first glasses should be weak—say about No. 60, according to the numbering in this country. Such a number, however, should be selected as will enable to read the finest print at twelve inches. After the lapse of a year or two it will be found necessary to increase the number of the glasses to about 48; these will then serve both for evening and day work. As regards the frequency with which the glasses have to be changed, it differs in different individuals. As a general rule, however, they should be increased as much as the individual case may demand—probably every two to five years—always keeping the "near point" of good, clear vision at about twelve inches. The general health will influence this largely; the weak, nervous woman feeling the need of an increase in the strength of her glasses much sooner than a robust, healthy man. Those who use their eyes much, especially if at trying work, will also experience a demand for a more frequent change.

### DIPLOPIA, OR DOUBLE VISION.

To insure correct and comfortable vision the two eyes must work in unison; for if the rays of light do not fall on a corresponding spot of the retina of each eye, two objects instead of one will be seen.



DIPLOPIA.

Diplopia, or double-sight, is caused by weakness of the muscles which move the eye from side to side. They are no longer able to hold the two eyes steadily fixed toward the object, and the eye moving out or in causes the individual to see the object double. This can often be very much relieved by prismatic lenses.

### PARESIS OF THE CILIARY MUSCLE

Is the inability to maintain the adjustment of the eyes for near objects any length of time without fatigue; for instance, in reading or sewing, especially by insufficient light, the fatigued ciliary muscle relaxes and the accommodative power of the eyes is suddenly lost, causing the print or work to become confused and unintelligible, together with a feeling of fatigue and

pain about the eyeballs. In such cases, after a few minutes' rest and closing the eyes, work can be resumed but for a short time only, as the muscle will again lose its strength and relax.

This disagreeable trouble arises from a debilitated condition of the whole system, which, though not felt in other parts of the body, is apparent in the muscle of accommodation, on account of its position and the character of the work it is called upon to perform.

After a fit of illness, or a great shock causing nervous prostration, this difficulty is often apparent.

Persons whose eyesight had been previously perfect should not resort to glasses of any kind when affected with these spasms of the sight, but wait patiently until nature does the work by restoring the tone of the whole system. This advice does not apply to those who have this same trouble that arises from a hypermetropic form of the eye, and not from the cause mentioned above. A skilled oculist, on examination, would at once detect the cause, and prescribe the remedy.

### CATARACT.

Cataract is a term used to denote the gradual loss of sight arising from the lens of the eye becoming turbid. At the proper time the lens is removed by an oculist, after which very strong convex lenses will restore the vision.

There are many other causes that produce defective sight, but they arise from a diseased condition of the coatings or other parts of the eye, and are only remedied by medical treatment.

## LENSES FOR CORRECTING THE OPTICAL DEFECTS OF THE EYES.

A lens is a transparent substance having one or both surfaces ground to a curved form and polished. Rays of light in passing through a lens are bent from their original straight course; convex lenses concentrate the light to a focus and form pictures; a concave lens disperses the light and will not form a picture.



DOUBLE CONVEX. PERISCOPIIC CONVEX. DOUBLE CONCAVE. PERISCOPIIC CONCAVE.

Spectacle lenses are called double convex, periscopic convex, double concave, periscopic concave, plano-cylindrical, and sphero-cylindrical. Double convex and periscopic convex lenses are required for giving perfect sight to hypermetropic and presbyopic eyes.

Double concave and periscopic concave lenses are required to correct the defective vision of myopic eyes. The periscopic form is rather the best, simply because the inner surface corresponds more nearly with the convex curve of the cornea. Persons who have accustomed themselves to the use of either one of these forms should adhere to that one, and not change, as the eyes will not feel natural until the muscles of convergence of the two eyes have acquired the habit of adjusting the eyes to the changed form of the inner curve of the lens.

A cylindrical lens has the curved surface, a section of a hollow cylinder, and not a section of a sphere. Such lenses are applied to astigmatic eyes to correct the irregular curvature of one axis of the cornea. When Myopia or Hypermetropia is found to exist in addition to the Astigmatism, a proper spherical curve is ground on the opposite side of the same lens. Such a lens is called sphero-cylindrical. Cylindrical

lenses require great care, when being set in frames, to have the axis of the cylinder at the required angle for correcting the Astigmatism of the cornea. None but a good workman of long experience can do it successfully.

The material of which lenses are made are crystal, Brazilian quartz, commonly called pebbles, and white glass.

Pebble lenses possess the advantage of being extremely hard, and do not scratch or break readily. They bear a very much higher polish than glass, and are more refractive, and therefore not so thick. Next to pebbles, fine white flint is a good material for spectacle lenses, and of it are the lenses found in ordinary spectacles made. Travelling vendors of spectacles are very apt to impose ordinary glasses for pebbles upon those whom they may persuade into buying of their wares. Never buy spectacles of a peddler.

Our Cobalt lenses are very excellent for those who use their eyes much over white paper or at white sewing, particularly after gas-light.

Great care should be observed in setting the lenses in spectacle or eye-glass frames that the optical centre of the lens corresponds with the centre of the eye, because the lens becomes a prism when its optical centre deviates from the centre of the spectacle eye. Such spectacles are very injurious to the eye. Low-priced, common spectacles are very defective in this respect.

Concave lenses should be brought as close to the eye as the eyelashes or eyelids will admit, and be in such a position before the eye that the centre of the lens will be directly opposite the pupil when the attention is directed to distant objects. There should be no forced inclination of the head backward to accomplish this result.

Convex lenses should be placed at about three-quarters of an inch from the eyes, and at such an angle to the line of the face as will bring the axis of the lens and the axis of the eye, when directed to close objects, directly in one line.

When the eyes are exceedingly sensitive to bright light, such as sunlight reflected from snow, or white sand, or the white page of a book, colored glasses should be worn, but care should be taken to remove them instantly, as soon as they cease to be exposed to the irritating influence.

For cleansing the lenses, use a piece of old soft cotton cloth. Silk, linen, and paper are all liable to scratch the glass.

## SPECTACLES AND EYE-GLASSES.

The important parts of a perfect pair of spectacles are the sides or temples, the nose-piece or bridge, and the lenses.

The sides should be elastic, and yet firm enough to hold the lenses securely and correctly to their position before the eyes.

The nose-piece should be of the proper length, and its curve of the right depth, so that the centre of each lens shall be opposite the pupil of the eye.

For reading spectacles the curve of the bridge should be deep, and the bridge at the curve bent out from line of the lenses. For distant sight the curve of the bridge should be quite shallow, and not bent forward from line of lenses.

In order to bring the surface of the lenses at right angles to the axes of the eyes, when the spectacles are on the face, we have devised the plan of setting the sides at an angle with the line of the lenses, and find it to work admirably.

The important parts of an eyeglass are the form of the eye, the spring, and the lens. The oval form is best suited for the eyes, as it is impossible with any other shape to have the centres of the lenses to correspond or be opposite the pupils of the eyes. The spring, or bridge, must be of the form and strength that will in each case fit the nose and maintain the lenses in their proper position before the eyes.

## GENERAL REMARKS.

There is a great public need for information regarding the proper selection of spectacles and care of the eyes. A large proportion of habitually weak eyesight may be entirely remedied by the use of a carefully adjusted glass to assist the sight, and thereby remove the undue strain to which the eyes under certain conditions are subjected.

Those whose eyes are in a condition of perfect health will fail to understand ade-

quately the stress laid upon apparently trivial matters in the preceding remarks; but those who have suffered from any defect or weakness of the eyes will comprehend at once the great importance of the seemingly most insignificant point mentioned. The former class of individuals, however, should have quite as much interest in the matter as the latter, for the old proverb, that "an ounce of prevention is worth a pound of cure," can find no fitter application than in the care of the eyes.

During convalescence from severe illness, the eyes are generally the last to regain their lost power. Too much care cannot be taken to put as little strain upon the eyes as possible at this time.

Reading whilst lying down is very injurious to the eyes, for the reason that the internal structure of the eye being generally of a soft and yielding nature, the lens drops a little back from its true position, and greater effort on the part of the ciliary muscles, and consequently great strain, becomes necessary for focusing the objects on the retina.

When the discovery is made that one's power of vision is deficient, the advice of a conscientious oculist or optician should at once be had. Those who can afford a doctor's fee, should by all means consult an oculist, and obtain from him a formula by which the optician can select or grind the proper lenses to correct the defective refractive power of the eyes.

In all our large cities and towns, at the present time, there are physicians (oculists) who give special attention to treatment of diseases of the eye. They have all the appliances and knowledge requisite for a full examination of the eyes, so that an opinion and formula given by one of them may be relied upon as the ultimatum in the case. An optician does the mechanical work; he may have much practical knowledge upon the subject, and should be competent to furnish suitable glasses for all the ordinary cases of Myopia and Presbyopia, but when he meets with a high degree of Myopia or Astigmatism, or complications of it with Myopia or Hypermetropia, or when, from causes not known, his spherical lenses will not give normal vision, he should advise his customer to apply at once to an oculist. No conscientious optician will sell unsuitable spectacles simply to get the money they bring, regardless of their effect upon the eyes of his customers.

There is no such thing as a travelling oculist or optician, and those who advertise themselves as such are charlatans and impostors. They are always foreigners, dirty and ignorant, without the slightest knowledge of the theory of optics or the mechanical process by which a lens is made. They get by lying ten or fifteen prices for their spectacles, which are often a positive injury to the buyer. One of these itinerants, with box in hand, will approach a gentleman reading in the parlor of a hotel, "Excuse me, zir, you spoil you eye mit dem glass; just dry dis ones." As he has noticed previously that his victim turns and twists the paper to get the best light on it, he thinks that a higher-power lens is required, and hands him a pair of spectacles which he guesses are stronger. Old gentleman does see better, and says so. Itinerant tells him "Dems beesh the berry finisht Woussian bebbles. I bakes dem unself. You glass very bad made indeed." And, after a voluminous flow of such gibberish, gets from old gentleman ten or fifteen dollars for a pair of glasses not worth more than fifty cents.



## GENERAL INSTRUCTIONS FOR SELECTING SPECTACLES.

For the benefit of those who sell spectacles, but have not had as much experience on the subject as ourselves, as well as for persons who have imperfect sight but are unable to consult an oculist or optician, or visit a store where a suitable pair of spectacles could be obtained, we give below a synopsis of our method of determining the character of an imperfect sight, and by what it is caused, and the proper lenses to give for remedying the trouble.

### FOR PRESBYOPIA.

In all cases we hand the person our book of Jaeger's test-types and figures, and direct that it be held at about twelve inches from the eyes. We then ask which series of the types can be just read with difficulty.

If that type is Series No. 1, we then push the book two inches closer to the eyes, and if the ability to read that series is entirely gone, we know the person is presbyopic, and that No. 60 convex glasses will restore clear vision for any description of close reading, sewing, or other fine work.

If, when the book is held at twelve inches from the eyes, Series No. 12 type can only be read with difficulty, and when the book is held closer to the face that type cannot be read, we know that No. 15 convex lens will give perfect sight in that case for close work.

In this way we can go through the whole scale with great confidence; but in every case, to make ourselves perfectly sure that the spectacles selected are the right ones to be worn, we direct the person to bring the book two or three inches closer than twelve inches, and then remove it as many inches, and if no apparent improvement is noticeable when those changes are made, we know that the glasses selected are correct, and the right ones to be worn.

We subjoin Jaeger's test-types, with the numbers of glasses marked according to the preceding rule. See pages 16 to 20.

### FOR MYOPIA.

If, when we push the book closer to the person's eyes than twelve inches, we are told Series No. 1 types can be read more distinctly, we at once know that the person is myopic, and we lay aside Jaeger's test-types and direct the person to tell us what can be read on a card of Snellen's test-letters hanging ten feet distant. If the sized letters which can just be made out are No. 12, while No. 10 cannot be made out at all, we give a concave glass of No. 60, and with that clear vision is restored for distant objects, provided there is no other complication with the myopia. In following this rule, we find the scale herewith given will hold good in most cases.

If No. 15 type can be just read, but not No. 12, concave glasses No. 48 are required.

Do. 20	do.	do.	do. 15,	do.	42	do.
Do. 30	do.	do.	do. 20,	do.	36	do.
Do. 40	do.	do.	do. 30,	do.	30	do.
Do. 70	do.	do.	do. 40,	do.	24	do.
Do. 100	do.	do.	do. 70,	do.	18	do.

When the glasses required seem to be stronger than No. 18, we bring the test-types to about five feet distant, and then we find the scale will run as follows:

If No. 40 type can be just read, but not No. 30, the glass required is No. 16.

Do. 70	do.	do.	do. 40,	do.	do.	15.
Do. 100	do.	do.	do. 70,	do.	do.	11.

These numbers are not to be accepted as being exact, but as a guide for a commencement of the trial with different glasses. We invariably try one or two numbers, both stronger and weaker, than the one indicated by the scale, and select that one which gives the nearest perfect sight, and we always tell the person not to trouble themselves about the number of the glass being strong or weak, but to select and wear those which give the best vision.

## FOR ASTIGMATISM.

If the person appears to be myopic, and yet the number of glass which his ability to read the Snellen test-letters without glasses would indicate should be used, does not give perfect vision, nor is there any improvement on trying one or two numbers both stronger and weaker, we suspect that astigmatism exists in addition to myopia. We then direct the person to look at our card of Pray's astigmatic letters, ten feet distant. If the letter N appears very black, P not so black, and Z quite gray, we know beyond a doubt that astigmatism of the cornea does exist, and we recommend such persons to consult an oculist, and get a formula from him by which we can grind the proper lenses.

## FOR HYPERMETROPIA.

If the person applying for spectacles complains of weariness in the eyes and headache after reading or sewing for an hour or more, and has the same distressing symptom whenever fine near work is attempted; and to see the most distinctly, the book or sewing must be brought closer than twelve inches from the eye; and when looking at Snellen's test-types, which are twenty feet distant, No. 20 type cannot be read, and the larger types are seen for an instant and then become confused, we conclude hypermetropia is the trouble. To convince ourselves, we try a concave glass of No. 20, and if the sight at a distance is rendered more indistinct with that glass, we then try a convex glass of No. 24, and if with that the sight is somewhat improved, and the larger letters do not so soon become confused, we then know without doubt that the eyes are hypermetropic. We then give stronger glasses, one after the other on the scale, until no additional improvement is noticed, and direct the person to take the weakest number for distant sight that will give clearest vision. Then for reading we give one or two numbers more powerful than those used for distant sight. We can lay down no scale of numbers for glasses based upon type readings for persons who have hypermetropically-formed eyes, from the fact that their ciliary muscle is in a constant state of contraction, both for distant and near vision, and the power of that muscle varies in every case, so that no two persons with such eyes would see letters equally of a particular size at a given distance.

If we are unable to give perfect sight with the number of glass with which the person sees best, we then try the astigmatic letters, and mostly find that that malformation also exists. Persons who have hypermetropic eyes, after selecting spectacles by the above rule, will find that while they can read a much longer time with their spectacles than formerly without experiencing the weariness and headache, yet will still have more or less annoyance of that kind. This is due to the fact that with the trial we make to suit them, we do not correct the whole trouble, on account of the constant over-activity of the ciliary muscle, which thereby conceals a portion of the defect. At all times afterward this over-activity must be kept up, and it is the effort to do that which causes the weariness and headache.

For cataract, or absence of the lens, we generally find, after extraction of the lens of the eye, that a convex glass,  $2\frac{1}{4}$  or  $2\frac{1}{2}$  inches focus, gives the best effect for close reading, and that  $3\frac{1}{2}$  inches focus for distant sight should be used. We always begin with these numbers, and try those of one-quarter inch both stronger and weaker.

The prices for spectacle glasses, from No. 1520 to 1551, are for the lenses and setting them to frames; the price of frames or bows, which may be selected, is added to the price of the lenses, for the cost of the spectacles or eye-glasses when completed.

Thus, if we have a prescription of this description —  $R + \frac{1}{2}S \odot + \frac{1}{3}c$ , axis  $65^\circ$   
 $L + \frac{1}{2}S \odot + \frac{1}{3}c$ , axis  $110^\circ$   
 the lenses would be No. 1522, price \$5; and if the person selected steel spectacles, No. 1390, price \$2.50, the cost of spectacles when completed, according to the formula, would be \$7.50.

## TO PHYSICIANS.

Oculists, in writing prescriptions for us to fill, would do well to give the distance between the centres of pupils of the two eyes, and state whether the nose near the eyes is high and sharp or low and broad, and if the eyes are prominent or deep-sunken under the brows, and also to say whether the glasses are to be worn for distant or close sight.

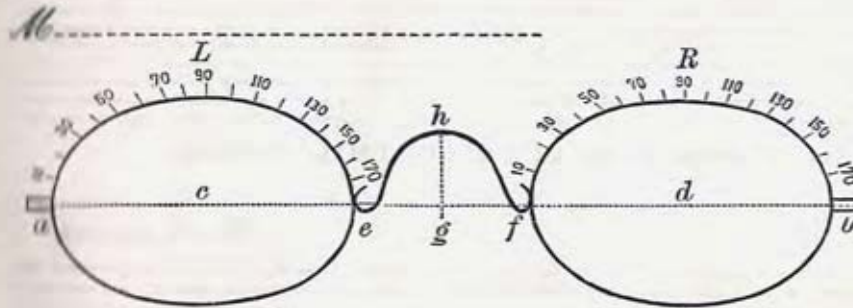


We glaze astigmatic and prismatic glasses to eye-glass frames of any form. To have the axis of the lenses correct, we put the eye-glass frame the patient selects up the nose at the place and in the position they will be worn, and with a camel's-hair pencil and red paint we mark a line across the glass from the inner to the outer canthus, across the centre of the pupil, which gives us the horizontal axis of each eye of the frame. This is only necessary for eye-glasses.

In order that oculists may meet the fancy of their patients in reference to the kind of frames they would prefer wearing, and thus more certainly insure their being worn, as well as to be able to give us correct information for alteration to meet any peculiarity in the form of patient's nose, eyes, or head, we will send by mail when requested several pair of spectacles or eye-glasses for trial, which can be returned with the prescription, and the frame selected designated, so that we will know which it is, and if any alterations are required, what they should be.

We will also furnish to physicians blank prescription papers, as illustrated below, which will only require the figures of the formula added and the name of patient to make them complete.

-----, 187  
**PRESCRIPTION FOR SIGHT OF**



Width of front, from *a* to *b*.....  
 Pupillary distance, *c* to *d*.....  
 Width of nose-piece, *e* to *f*.....  
 Height of nose-piece, *g* to *h*.....  
 Position of bridge as to centre line.  
 Fraction of an inch top of bridge is thrown forward from  
 line of eyes.....

Reading { R.....  
 L.....

Distance { R.....  
 L.....

-----, M. D

## JAEGER'S TEST-TYPES.

No. 1.

No. 60, Convex.

The first of May! There is a merry freshness in the wind, calling to our minds a thousand thoughts of all that is pleasant and beautiful in nature, in her sweetest and most delightful form. What man is there, ever whose mind a bright spring morning does not exercise a single influence—carrying him back to the days of his childish sports, and conjuring up before him the old green field with its great yew tree, where the birds sang as he has never heard them since—where the lark's fluttered far more gaily than he ever saw him now, in all his ramblings—where the sky seemed blue, and the sun shone more brightly—where the air blew more freely over grassier green, and greater smiling flowers—where every thing wore a richer and more brilliant hue than it is ever dressed in now! Such are the deep feelings of childhood, and such are the impressions, which every lovely object stamps upon his heart. The hasty traveller wanders through the maze of thick and pathless woods, where the sun's rays never shone and heaven's pure air never played. He stands on the brink of the roaring waterfall and giddy and bewildered, watches the flaming mass as it leaps from stone to stone, and from rock to crag; he lingers in the fertile plain of a land of perpetual sunshine and revels in the luxury of their balmy breath. But what are the deep fountains, or the towering waters, or the richest landscapes that hortensia nature ever spread, to charm the eye and captivate the senses of man, compared with the recollection of the old scenes of his early youth!—Magic scenes indeed! for the fairy thought of infancy dressed them in colours brighter than the rainbow, and almost as fleeting; colours which are the reflection only of the sparkling emotions of childhood, and can never be called into existence in the dark and cloudy days of after-life!—In former times spring brought with it not only such associations as those connected with the past, but sports and games of the present—merry dances round rustic pillars, adorned with emblems of the season, and reared in honour of its coming. Where are they now! Pillars we have, but they are no longer rustic ones; and as to dances, they are used to rooms and fights and would not bow well in the open air. Think of the immorality, too! When would your sabbath enthusiast say to an aristocratic ring enclosing the Duke of York's

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No. 2.

No. 48, Convex.

column in Carlton-terrace or a grand possesite of the middle-classes, round Alderman Waltham's monument in Fleetstreet,—or a general hands-four-round of ten-pound householders, at the foot of the Obelisk in St. George's-field! Alas! romance can make no head against the riot act, and pastoral simplicity is not understood by the police. Well; many years ago we began to be a steady and matter-of-fact set of people, and dancing in spring being beneath our dignity, we gave it up, and in course of time it descended to the sweeps—a fall certainly, because, though sweeps are very good fellows in their way, and moreover very useful in a civilized community, they are not exactly the sort of people to give the tone to the little elegance of society. The sweeps, however, got the dancing to themselves, and they kept it up, and handed it down. This was a severe blow to the romance of spring-time, but it did not entirely destroy it either: for a portion of it descended to the sweeps with the dancing, and rendered them objects of great interest. A mystery hung over the sweeps in those days. Legends were in existence of wealthy gentlemen who had lost children, and who after many years of sorrow and suffering, had found them in the character of sweep. Stories were related of a young boy who, having been stolen from his parents in his infancy, and devoted to the occupation of chimney-sweeping, was sent, in the course of his professional career, to sweep the chimney of his mother's bedroom; and how, being hot and tired when he came out of the chimney, he got into the bed he had so often slept in as an infant, and was discovered and recognized therein by his mother, who once every year of her life, thereafter, requested the pleasure of the company of every London sweep, at half-past one o'clock, to roast-beef, plum-pudding, porter, and sixpence. Such stories as these, and there were many such, threw an air of mystery round the sweeps, and produced for them some of those good effects which animals derive from the doctrine of the transmigration of souls. No one, it is

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No. 3.

No. 42, Convex

the masters, thought of ill-treating a sweep, because no one knew, who he might be, or what nobleman's or gentleman's son he might turn out. Chimney-sweeping was, by many believers in the marvellous, considered as a sort of probationary term: as in earlier or later period of which divers young noblemen were to come into possession of their rank and titles: and the profession was held by them in great respect accordingly. We remember, in our young days, a little sweep about our own age, with curly hair and white teeth, whom we devoutly, and sincerely believed to be the lost son of some illustrious personage—an impression which was resolved into an unchangeable conviction on our infant mind, by the subject of our speculation; inferring us, one day, in reply to our question, propounded a few moments before his ascent to the summit of the kitchen chimney, "that he believed he'd been born in this vorkis, but he'd never know'd his father." We felt certain from that time forth that he would one day be owned by a lord at least; and we never heard the church-bells ring, or saw a flag hoisted in the neighbourhood, without thinking that the happy event had at last occurred, and that his long-lost parent had arrived in a coach and six, to take him home to Grosvenor-square. He never came, however; and, at the present moment, the young

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No. 4.

No. 40, Convex.

gentlemen in question is settled down as a master sweep in the neighbourhood of Battle-Bridge, his distinguishing characteristics being a decided antipathy to washing himself, and the possession of a pair of legs very inadequate to the support of his somewhat wild and corpulent body. The romance of spring having gone out before our time, we were fain to console ourselves as we best could with the uncertainty that enveloped the birth and parentage of its attendant dancers, the sweeps; and we did console ourselves with it, for many years. But even this wretched source of comfort received a shock, from which it has never recovered—a shock, which has been, in reality, its death-blow. We could not disguise from ourselves the fact that whole families of sweeps were regularly born of sweeps, in the rural districts of Somers Town and Camden Town—that the eldest son succeeded to the father's business; that the other branches assisted him therein, and commenced on their own account; that their children again were educated to the profession; and that about their identity there could be no mistake whatever. We could not be blind, we say, to this melancholy truth, but we could not bring ourselves to admit it, nevertheless, and we lived

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No. 5.

No. 36, Convex.

on for some years in a state of voluntary ignorance. We were roused from our pleasant slumber by certain dark insinuations thrown out by a friend of ours, to the effect that children in the lower ranks of life were beginning to choose chimney-sweeping as their particular walk; that applications had been made by various boys to the constituted authorities, to allow them to pursue the object of their ambition with the full concurrence and sanction of the law; that the affair, in short, was becoming one of mere legal contract. We turned a deaf ear to these rumours at first, but slowly and surely they stole upon us. Month after month, week after week, nay, day after day, at last, did we meet with accounts of similar applications. The veil was removed, all mystery was at an end, and chimney-sweeping had become a favourite and

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No. 6.

No. 30, Convex.

chosen pursuit. There is no longer any occasion to steal boys; for boys flock in crowds to bind themselves. The romance of the trade has fled, and the chimney-sweeper of the present day is no more like unto him of thirty years ago, than is a Fleet-street pick-pocket to a Spanish brigand, or Paul Pry to Caleb Williams. The gradual decay and disuse of the practice of leading noble youths into captivity, and compelling them to ascend chimneys, was a severe blow, if we may so speak, to the romance of chimney-sweeping, and to the romance of spring at the same time. But even this was not all, for some few years ago the dancing on May-day began to decline; small sweeps were

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No. 7.

No. 27, Convex.

observed to congregate in twos or threes, unsupported by a "green," with no "My Lord" to act as master of the ceremonies, and no "My Lady" to preside over the exchequer. Even in companies where there was a "green" it was an absolute nothing—a mere sprout; and the instrumental accompaniments rarely extended beyond the shovels and a set of Pan-pipes, better known to the many, as a "mouth-organ." These were signs of the times, portentous omens of a coming change; and what was the result which they shadowed forth? Why, the master sweeps, influenced by a restless

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No. 8.

No. 24, Convex.

spirit of innovation, actually interposed their authority, in opposition to the dancing, and substituted a dinner—an anniversary dinner at White Conduit House—where clean faces appeared in lieu of black ones smeared with rose pink; and knee cords and tops, superseded nankeen drawers and rosetted shoes. Gentlemen who were in the habit of riding shy horses; and steady-going people, who have no vagrancy in their souls, lauded this alteration to the skies, and the conduct of the master sweeps was described as beyond the reach of praise.

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No. 9.

No. 20, Convex.

But how stands the real fact? Let any man deny, if he can, that when the cloth had been removed, fresh pots and pipes laid upon the table, and the customary loyal and patriotic toasts proposed the celebrated Mr. Sluffen of Adam-and-Eve-court, whose authority not the most malignant of our opponents can call in question, expressed himself in a manner following: "That now he'd cotech the cheerman's hi, he vished he might be jolly vell blessed, if he worn't a goin' to have his innins, vich he voud say these here obserwashuns—that how some mischeevus coves as know'd

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No. 10.

No. 18, Convex.

nuffin about the con-sarn, had tried to sit people agin the mas'r swips, and take the shine out o' their bis'nes, and the bread out o' the traps o' their preshus kids, by a makin' o' this here remark, as chimblies could be as vell svept by 'sheenery as by boys; and that the makin' use o' boys for that there purpuss vos barbareous; vereas he 'ad been a chummy—he begged the cheerman's parding for usin' such a vulgar hexpression—more nor thirty year—he might say he'd been born in a chimbley, and he know'd uncommon vell as 'sheenery vos vos nor 'c

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No. 11.

No. 16, Convex.

no use; and as to ker-hewelty to the boys, every body in the chimbley line know'd as vell as he did, that they liked the climbin' better nor nuffin as voss." From this day, we date the total fall of the last lingering remnant of May-day dancing, among the elite of the profession: and from this period we commence a new era in that portion of our spring associations, which relates to the 1st of May. We are aware that the unthinking part of the population will meet us here,

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No. 12.

No. 15, Convex.

with the assertion, that dancing on May-day still continues—that “greens” are annually seen to roll along the streets—that youths in the garb of clowns, precede them, giving vent to the ebullitions of their sportive fancies; and that lords and ladies follow in their wake. Granted. We are ready to acknowledge

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No. 13.

No. 14, Convex.

Composing is a term which includes several exercises, as well of the mind as the body; for, when we are said to compose, we are at the same time engaged in reading and spelling what we are composing, as well as in taking care to space and to

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No. 14.

No. 13, Convex.

justify our matter. When copy is put into the hands of the compositor, he should receive directions respecting the width and length of the page; whether it

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No. 15.

No. 11, Convex.

lines between the breaks;  
and whether any particu-  
lar method is to be followed  
in the punctuation and in

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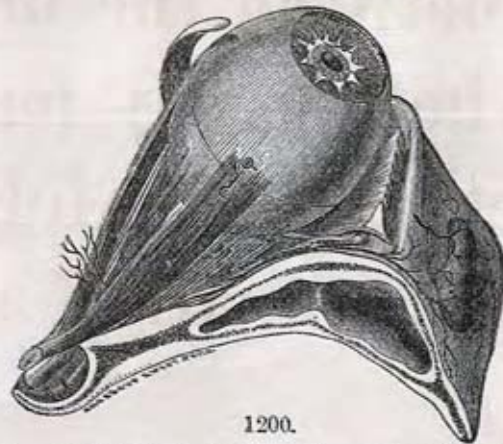
PHILADELPHIA.

No. 16.

No. 10, Convex.

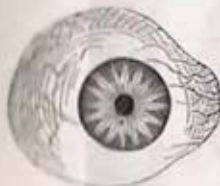
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1200.

No.		PRICE.
1200.	Auzoux's Dissected Model of the Eye; the most perfect and accurate ever made. The material is Papier-Maché, and the whole is accurately dissected so as to be taken apart, showing successively the <i>Sclerotic and Choroid coats, and Cornea, Retina, Iris, Pupil, Crystalline Lens, Aqueous and Vitreous Humors, the Muscles, Nerves, and Blood-Vessels</i> , colored as in the natural eye, with full descriptive pamphlet,	\$35 00
1201.	The same, cut vertically,	35 00
1202.	The same as 1200, but of German manufacture,	30 00
1203.	Human Eyeball, enlarged size. Can be taken to pieces, and then shows the cornea, iris, crystalline lens, vitreous humor, and the coatings, including the results of microscopic examination upon the retina,	6 50
1204.	Map or Diagram of the Eye, (22 by 15 inches,) handsomely colored, with descriptive letter-press,	1 00



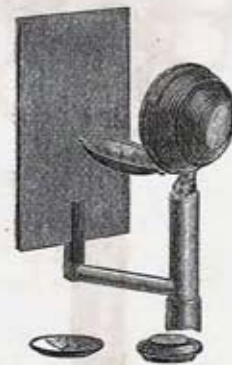
1207.



1207

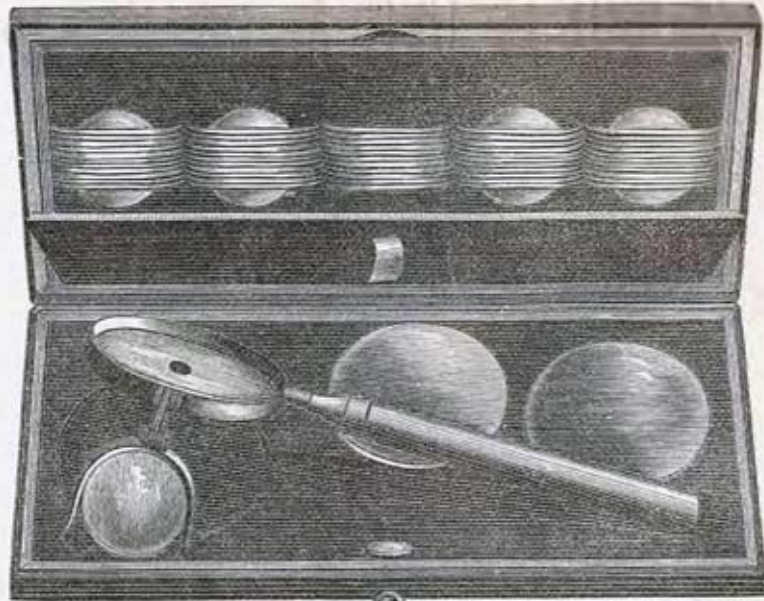


1205.



1206.

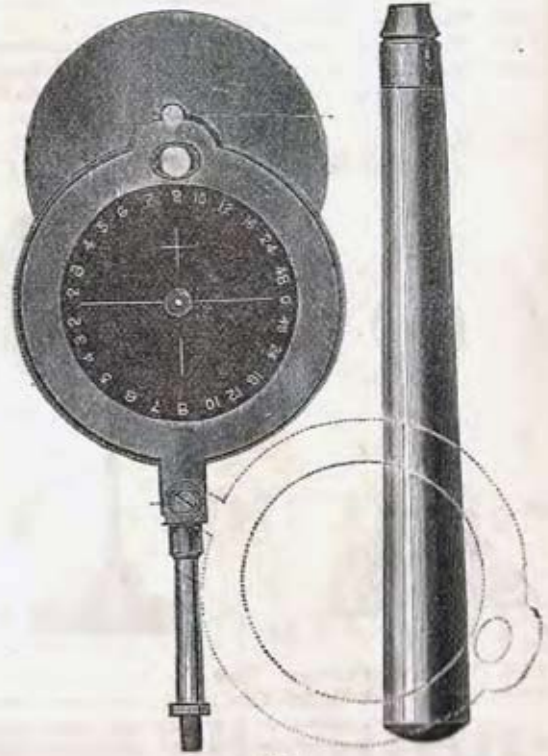
1205.	Waldau's Phantom Face for Experimental Operations of the Eye,	10 00
1206.	Dr. Ferrin's Model of the Eye for the Practice and Study of the Ophthalmoscope, packed in a wooden case, with twelve colored shells representing normal and diseased conditions of the fundus of the eyeball,	25 00
1207.	Artificial Human Eyes of all sizes and colors. Each,	12 00



1208.



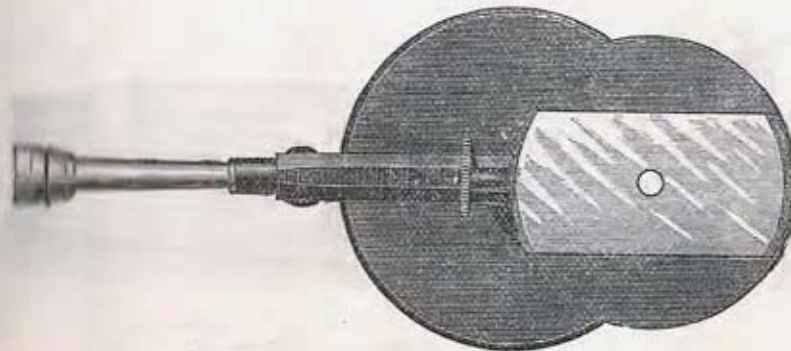
1209.



1211.



No.	Description	Price.
1208.	Liebrich's Ophthalmoscope, with two bi-convex condensing lenses, 1½ and 2 inches focus, and a series of five lenses of various foci, fitting on an arm behind the perforated mirror, in morocco case, . . . . .	\$5 00
1209.	Loring's Ophthalmoscope, mirror 1½ inches diameter, revolving disc at back of mirror containing lenses of -3, -6, -12, -24, +8, +12, +24 inches focus, double convex condensing lenses 1½ inches diameter, all packed in morocco case, . . . . .	8 00
1209½.	Loring's Ophthalmoscope, mirror 1½ inches diameter, revolving disc at back of mirror containing lenses 3, 5, 8, 12, 18, 36 inches focus both concave and convex, double convex condensing lenses 1½ inches diameter, all packed in morocco case, . . . . .	14 00
1210.	Loring's Ophthalmoscope, same as No. 1209, but the revolving disc contains fifteen lenses, seven concave and eight convex, numbered inches and dioptries, packed in morocco box, . . . . .	18 00
1211.	Loring's Ophthalmoscope, same as No. 1209, revolving disc containing twenty-four lenses, twelve convex and twelve concave, and revolving beneath a shield or cover by which the lenses are protected from injury and being soiled, packed in a morocco case, . . . . .	30 00
1212.	Loring's Ophthalmoscope, same as No. 1211, but with rectangular mirror swung on two pivots so as to tilt both ways to an angle of 20° or 25°, in morocco box, . . . . .	35 00
1213.	Dr. Knapp's Ophthalmoscope, mirror 1½ inches diameter, revolving disc back of mirror containing twelve lenses each convex and concave, revolving beneath a metal cover for protecting the lenses from injury and being soiled, two condensing lenses 1½ inches in diameter, all packed in a morocco case, . . . . .	22 00



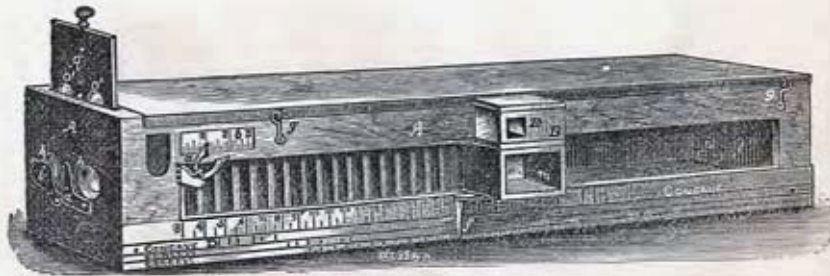
1214.

1214.	Loring's New Ophthalmoscope, . . . . .	35 00
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Consists of a single disc and a segment of a disc, as shown in the drawing Fig. 1.

The single disc contains sixteen glasses on the metric system, the plus being numbered in white, and the minus in red. The first row of numbers, or that just beneath the glass, shows the real value of the glass; the second or inner row shows the result of the combinations when the quadrant is in position. The quadrant rotates immediately over the disc and around the same centre, and contains four glasses,  $-5 -16$ , and  $+5 +16$ . When it is not used the quadrant is beneath its cover. The instrument then represents a simple Ophthalmoscope with sixteen perforations, the series running with an interval of 1 D, and extending from 1 to 7 plus, and from 1 to 8 minus. This is ample for all ordinary work, as the interval of 1 D, is as close as even an expert usually desires, and can, with a little experience, be used for even very minute discrepancies. For if in a given case the fundus is seen distinctly with 1 D and a little to spare, while 2 D blurs the picture, we know at once that the refraction must be between the two, or 1.5 D. If, however, for any reason we wish to prove this conclusion, we can bring up 0.5 D. From this glass we get successive half-dioptic from 1 to 8 plus, and from 1 to 9 minus. In this way we have, so to speak, a fine and coarse adjustment, as in the microscope. If the higher numbers are desired, these are obtained by combinations with those of the quadrant. These progress regularly up to 16 D, every dioptic being marked upon the disc; above this, up to +23 D and  $-24$  D, we have to simply add the glass which comes beneath the 16 D, turning always in the same direction.

The mirror shown in the drawing is the "tilting" mirror. If preferred, however, the "three-quarter" mirror or the common circular mirror can be employed.



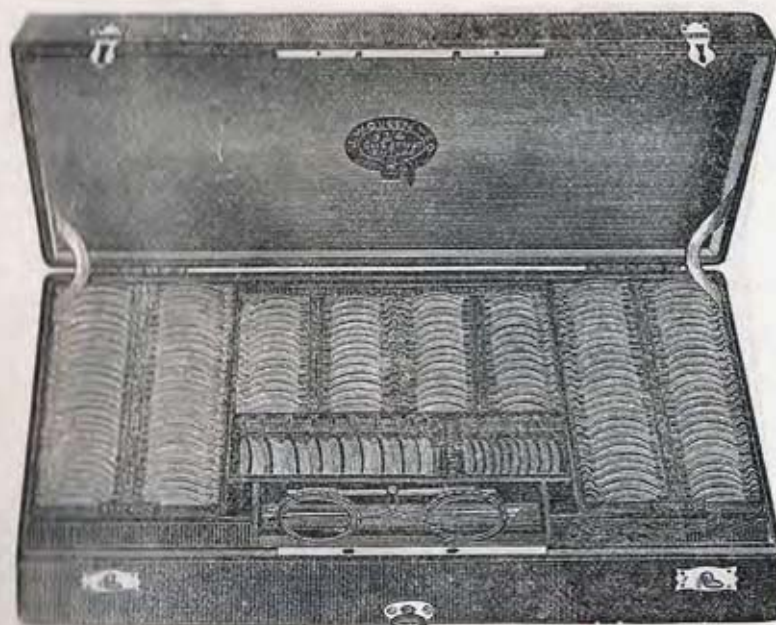
1220.

1220. Measuring Box for Optical Lenses. Patented October 9, 1877, . . . \$10 00

This is an instrument for the measurement of the focal distances of optical lenses. It consists of a camera, from which all light is excluded, except what passes through the lens or lenses which are being measured. The apparatus can therefore be used in a light room.

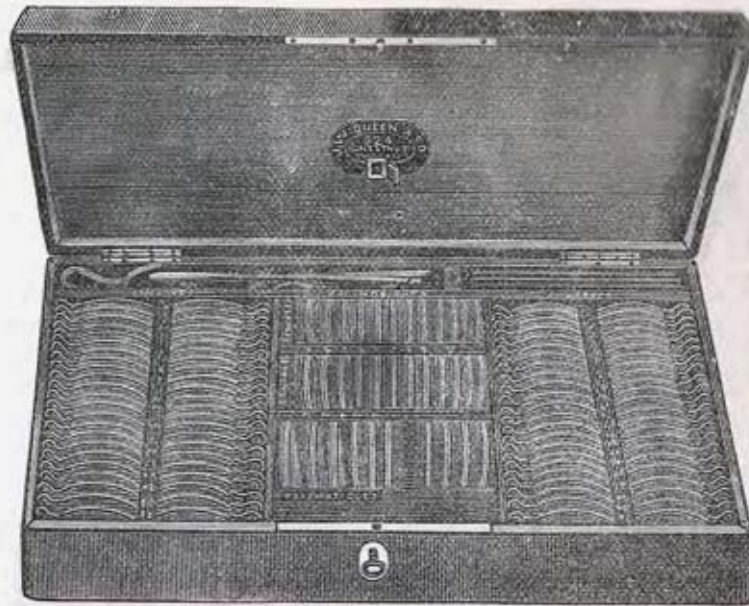
Scales graduated for the exact distance of the measuring object from the measuring instrument, and for the measurement of concave as well as convex lenses, accompany each instrument. The graduation of these scales is based upon one common and universal standard, namely, the measurement of lenses by direct rays of the sun.

In giving orders, we would ask our customers to state the distance between the object and proposed place of measurement. The scale will then be made accordingly.



1225.

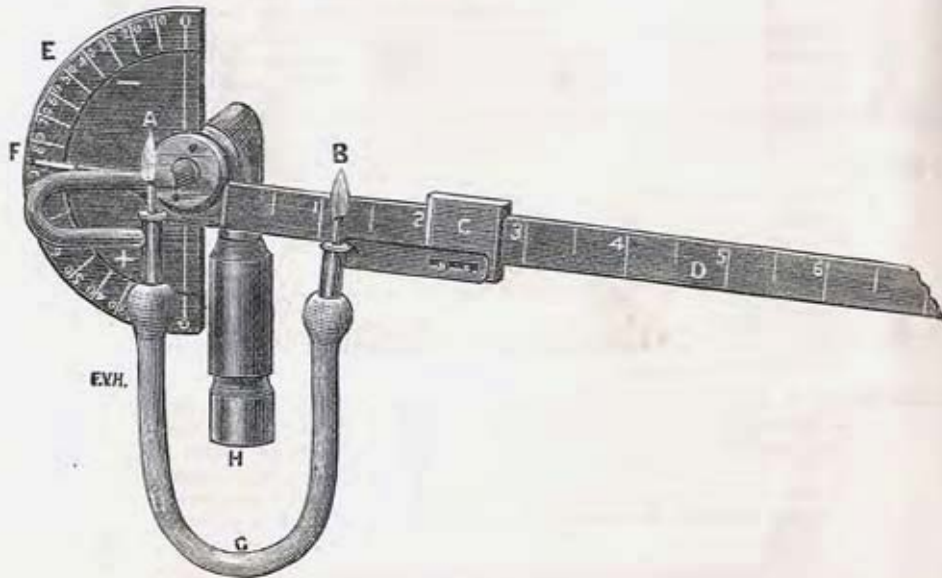
1225. Nacet's Complete Set of Trial Lenses contains 32 pairs convex lenses, 32 pairs concave lenses, from 2 to 72 inches focus; 19 plano-cylindrical convex lenses, 19 plano-cylindrical concave lenses from 6 to 60 inches focus; 9 prisms, angles from 2 to 10 degrees, 4 plain colored glasses, 1 white glass disc, 1 half ground surface, 2 metal discs with stenopaic slit, 1 metal disc with hole and 1 solid metal disc, graduated trial frame and 1 not graduated for holding the various lenses. The whole packed in a morocco covered case, with lock and key, \$100 00
1226. Nacet's Trial Set of Lenses same as No. 1225, but with the cylindrical lenses in pairs, . . . . . 125 00
1227. Nacet's Trial Set of Lenses, consisting of 23 pairs spherical convex and 23 pairs spherical concave lenses, from 2 to 72 inches focus; 12 cylindrical convex and 12 cylindrical concave, 8 to 60 inches focus; 6 prisms, 2° to 8°, 2 discs, 1 plane glass, 1 ground glass, all mounted in handsome metallic frames, 3 colored glasses, and a graduated frame for holding the various lenses, the whole packed in a morocco box, . . . . . 70 00
1228. Nacet's Set of Trial Lenses same as No. 1227, but having the cylindrical lenses in pairs, . . . . . 85 00
1229. Series of Trial Sights, consisting of 23 pairs spherical convex and 23 pairs spherical concave lenses, from 2 to 72 inches focus; 12 cylindrical convex and 12 cylindrical concave, 8 to 60 inches focus; 6 prisms, 2° to 8°, 2 discs, 1 plane glass, 1 ground glass, all mounted in handsome metallic frames, 3 colored glasses, and a graduated frame for holding the various lenses, the whole packed in a polished mahogany box, . . . . . 55 00
1230. Series of Trial Sights, consisting of 23 pairs spherical convex and 23 pairs spherical concave lenses, from 2 to 72 inches focus; 12 cylindrical convex and 12 cylindrical concave, 8 to 60 inches focus; 6 prisms, 2° to 8°, 2 discs, 1 plane glass, 1 ground glass, all unmounted, 3



1229.

colored glasses, and a graduated frame for holding the various lenses, the whole packed in a polished mahogany box, . . . \$40 00

The above described sets of trial lenses can be furnished having the lenses of the inch or of the dioptic system of numbering.



1239.

1239. Thomson's Ametrometer, in Morocco Case, . . . \$11 00

A practical and rapid method, with an instrument, for the diagnosis of the refraction, by WM. THOMPSON, M. D., Emeritus Surgeon, Wills' Oph. Hospital, Lecturer on Diseases of the Eye, Jefferson College, Philadelphia.

The instrument is shown in the woodcut, and consists of a small fixed gas-jet A, a second one B, attached to a box C, which slides upon a bar D, the jets connected by a flexible rubber tube G; the end of the bar F forms a pointer, which, by elevating or depressing the other end of the bar, can be placed at any part of the graduated half-circle E, which is fixed firmly to the thimble H, by which means the entire instrument can be attached to a common gas-burner, and the lights regulated by its stop-cock.

The jets having been lighted and turned down into two small flames about 5 mm. in diameter, the patient, placed 5 metres away, is directed to observe the flames, and to say whether he sees them as small points of light separated, or as diffused, enlarged circles which can be made to come in contact at their margins by sliding movements of the box on the bar, by the hand of the surgeon; bearing in mind that an emmetropic or corrected ametropic eye will resolve the lights into two until they pass one behind the other and become fused, whilst in ametropia the circles will seem to touch; whilst a distance, depending upon the degree of ametropia, remains between the small light points. To determine the kind of ametropia, the patient is directed to pass slowly in front of the eye under examination a slip of red glass in such a manner as to color half of each diffused circle, and if the red half seems to be on the same side with the red glass, myopia is recognized, and if on the opposite side, hypermetropia; this may be as well done by passing before the eye a card or paper in such manner as to exclude from view one-half of each circle.

To determine the degree of ametropia, the bar has been divided on one side into spaces of 2.5 cm. with a half space between, and on the other into English inch and half inches, and it will be found that each space of 2.5 cm. will indicate an ametropia of one dioptric, metric system, and each inch  $\frac{1}{8}$  of the old system. The cut represents the two flames as apart 2 d., and they would appear to a person having M. or H. of 2 D. or  $\frac{1}{8}$  as two circles of light, with their margins in contact at one point, separating on the removal of light B, and overlapping when it is placed nearer to light A.

For those who still prefer the old system to the metric, it must be remembered that the old glasses are not based upon their exact powers of refraction, but are ground on *centes* of Paris inches, and that, owing to the index of refraction of the glass commonly used, they by a happy chance correspond in focal length almost exactly with the English inch; hence, each inch of distance between the test-lights as determined by the use of the inch scale on the bar, will indicate an ametropia of very nearly  $\frac{1}{8}$ ; and the higher degrees can be found instantly by dividing 40 by the number of inches between the lights when their margins seem to have come into contact.

When astigmatism is suspected, the patient should be directed to observe whether the flames are longer in one direction than the other, and if so, by the rotation of the bar on a pivot opposite to light A, the two lights being placed some distance apart so that they do not appear to touch, we have one of the most accurate means of ascertaining the meridians of greatest and least refraction, since it will become easy for the patient to say when two elongated points or ovals of light are placed so as to have the same direction; and when this has been fixed, the pointer F will indicate on the half-circle the exact angle at which the lights are placed, and hence the position of the meridian of greatest ametropia.

On bringing the flames into contact at this angle, the real distance of the lights apart will indicate the degree of ametropia, and having thus found one meridian, the lights can be placed at right angles to it and the refraction of the second be ascertained. In difficult cases, or with poor observers, it may be an aid both in simple M. or H. and A. to color one of the flames by placing a slip of red glass in front of it, held by the surgeon.



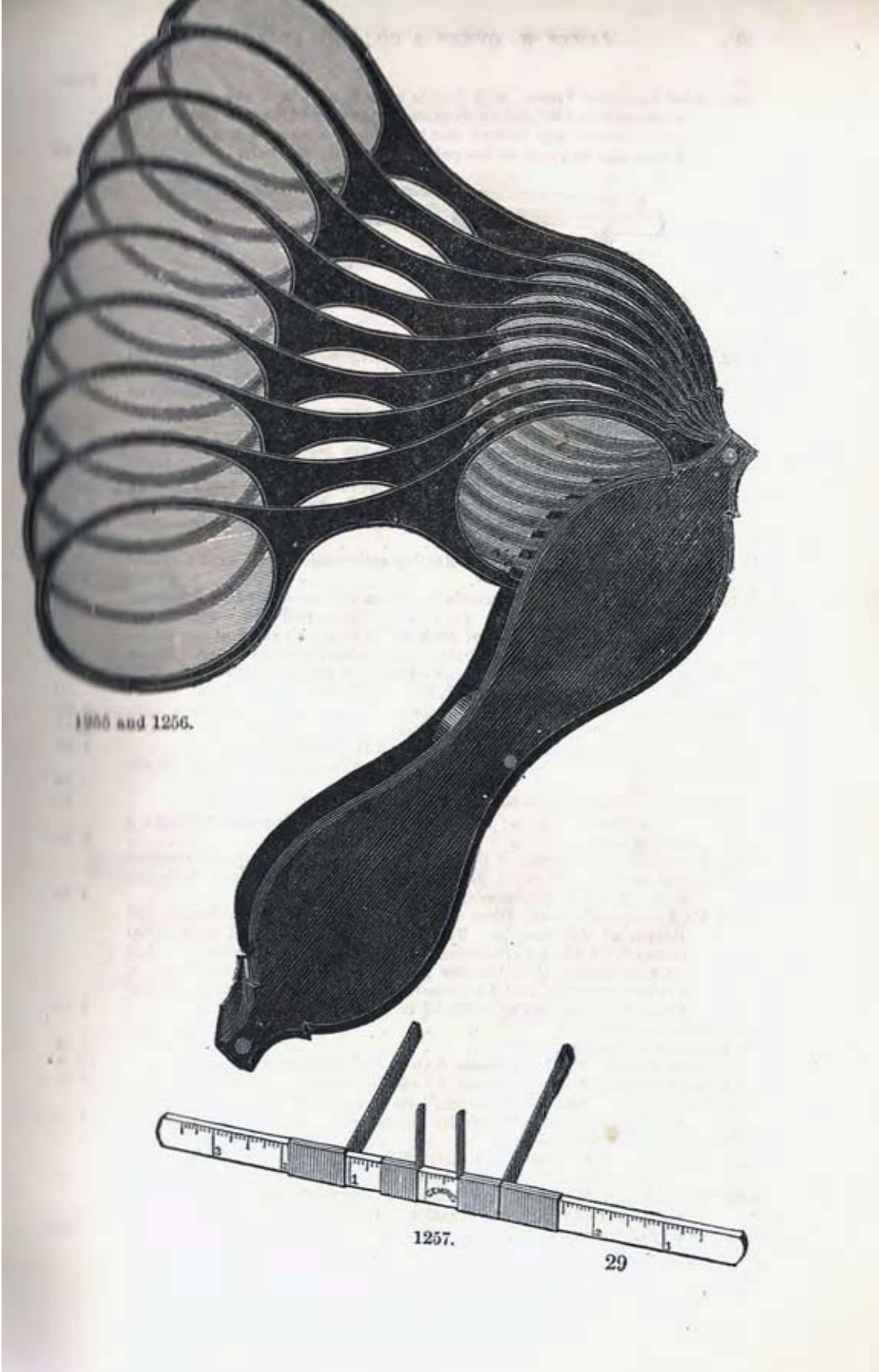
1240.

No. 1240. Dr. Risley's Optometer, with 16 various printed test-types, 8 printed diagrams, and 6 metal discs, having a great variety of perforations and slits for testing astigmatism, 1 metal stenopaic disc, etc., . \$56 00

PRICE.

This instrument was devised by Dr. S. D. Risley, of this city, for the detection and measurement of *astigmatism*, and with its aid the oculist can arrive at more accurate determinations of the defects of refraction, with much less expenditure of time, and with less fatigue both to himself and his patient, than by any other means.

The instrument consists of a stand, with solid foot, on the top of which is fixed a pair of semicircles, with their concavity upward, for the reception of trial-glasses, stenopaic slit, etc. They are graduated to correspond with the Nachet trial-frames. In front of the holders is a square horizontal bar, 20'' long, graduated in fractions of an inch. Upon this bar is adjusted a freely-moving carrier, designed to bear a series of cards containing the test-types of Snellen and Jaeger, and a large number of test-figures for astigmatism, among which is the system of radiating lines of Dr. Green, of St. Louis. The whole set is intended for use at 12'' instead of 20''. Many of the tests are cut in thin brass discs, and are to be used over an illuminated background, which is furnished by a plate of ground glass. There is a plate fitting the carrier, with central opening designed to receive these discs, and to permit their free rotation over a graduated scale corresponding to that upon the holders. One of the most valuable of this series of test-objects is a wire *optometer*, consisting of a brass rim, with two groups, each containing five wires, stretched one millimetre apart, the two groups crossing the centre at right angles. There is also an adjustable *perimeter*, which can be readily removed when not in use.



1256 and 1257.

1257.

29

No.	PRICE.
1241. Trial Spectacle Frame, with double cells to each eye, the outer ones graduated to 180°, for reading the astigmatic axis of the eyes. With these frames any desired combination of spherical and cylindric lenses can be given to the patient for trial; per pair, . . . . .	\$5 00



1241.

1242. Green's Set of Test Diagrams, for detecting astigmatic eyes. This set consists of a pasteboard dial 12 inches in diameter, divided into 12 parts as a clock dial. To this a series of 14 diagrams of lines and circles can be attached separately at pleasure and made to revolve against the face of the dial, . . . . .	5 00
1243. Astigmatic Dial. A conicular disc of tin japanned white and divided on the margin of one side to every five degrees and numbered; over this another but smaller disc revolves, having two series of black lines on it which are at right angle, though not crossing one another. The lines are adjusted for 20 feet test of astigmatism (No. 20), Snellen's, . . . . .	2 50
1244. Grafe's Wire Optometer for detecting astigmatism, with tape measure attachment, . . . . .	7 00
1244½. Dr. Pray's series of astigmatic letters on stiff cardboard for hanging. These letters are made up of black lines and white spaces, the white and black spaces of each letter being all ruled at one angle in each letter, and this angle being varied for every letter. There are 12 letters and the angles of the lines are horizontal, 15°, 30°, 45°, 60°, 75°, 90°, 105°, 120°, 135°, 150°, 165°, . . . . .	50
1245. Snellen's Test-types, bound in paper, . . . . .	2 00
1246. Snellen's Test-types bound, ½ leather, . . . . .	2 75
1247. Jaeger's Test-types, Nos. 1 to 14, bound in ½ leather, . . . . .	1 00
1248. Snellen's Test Letters Nos. VIII to C on heavy card-board, 15x23 inches, per card, . . . . .	50
1249. Snellen's Test Figures Nos. VIII to C. Per card, . . . . .	50
1250. Dr. Otto Becker's set of four diagrams for detecting and measuring astigmatism, . . . . .	3 00
1251. Dr. Burkhardt's series of dots and lines for determining and measuring degree of Myopia, Hypermetropia, Presbyopia, and Astigmatism. A set of four cards, . . . . .	4 00
1252. Dr. Thompson's Metal Discs with Perforations for Determining the Degree of Amertropia. This instrument consists of four metal discs: No. 1 has 1 perforation, 1 millimetre in diameter; No. 2 has 12 perforations ½ millimetre apart. No. 3 has 3 perforations 3 millimetres apart and ½ millimetre diameter. No. 4 has 2 perforations, 4 millimetres apart and ½ millimetre diameter, . . . . .	4 00
1253. Stenopaic Slit, . . . . .	2 50
1254. Simple Optometer, . . . . .	12 00
1255. Trial Glasses, Rubber Frames, 5 to 48 inch focus, convex, . . . . .	13 00
1256. Trial Glasses, Rubber Frames, 5 to 48 inch focus, concave, French, . . . . .	4 00
1257. Dr. Keyser's "Prosopanometer," for measuring the width of face, width and depth of bridge for spectacles, . . . . .	1 50
1258. Strabismometer of Ivory, . . . . .	50
1259. Boxwood Metric Measure, 1 metre long, divided on one side in centimetres and millimetres, on the other to inches and eighths, . . . . .	1 50
1260. Ivory Metric Measure, 16 centimetres long, divided to millimetres on one side, and inches and eighths on the other, for measuring pupillary distance, . . . . .	1 50



**GOLD SPECTACLES.**

Of either Octagon or Oval-Shaped Eyes, and fitted with either Double or Periscopic Convex or Concave or Plain Smoke or Blue Lenses.

**SINGLE TEMPLES.**



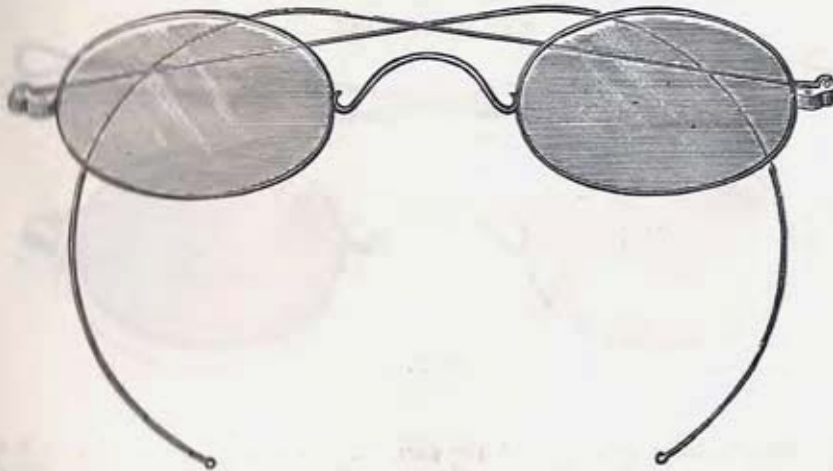
1350.

No.									PRICE.
1350.	Single	Temples,	10 carat	gold,	per pair,	.	.	.	\$6 00
1351.	Do.	12	do.	do.	.	.	.	.	7 50
1352.	Do.	14	do.	do.	.	.	.	.	9 00
1353.	Do.	16	do.	do.	.	.	.	.	11 00
1354.	Do.	18	do.	do.	.	.	.	.	13 00

**GOLD SPECTACLES.**

Oval-Shaped Eyes, and fitted with either Double or Periscopic Convex or Concave Lenses.

**HOOK TEMPLES.**



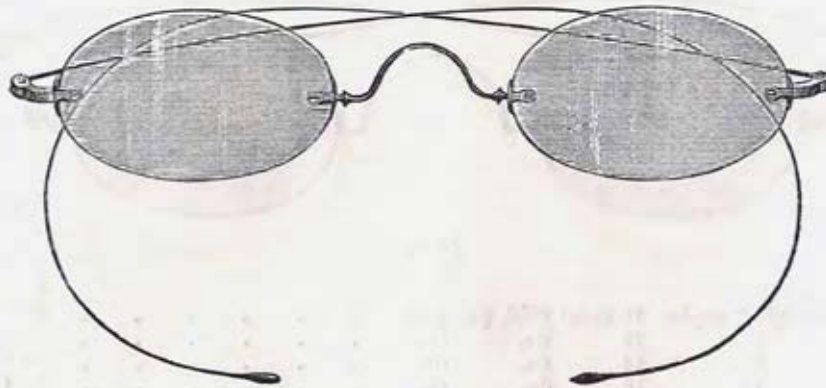
1360.

1360.	Hook	Sides,	14 carat	gold,	very light,	.	.	.	6 00
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**GOLD SPECTACLES.**

Oval-Shaped Eyes, and fitted with either Double or Periscopic Convex or Concave Lenses.

**HOOK TEMPLES, SKELETON FRAMES.**



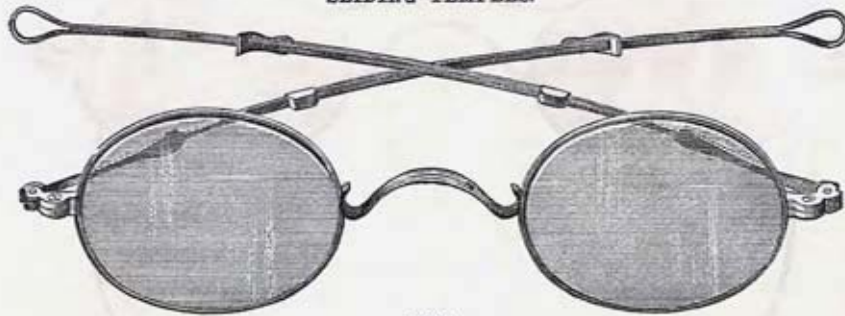
1361.

No.	PRICE.
1361 Skeleton or Frameless Spectacles, with gold hook sides, . . .	\$6 00

**GOLD SPECTACLES.**

Of either Octagon or Oval-Shaped Eyes, and fitted with either Double or Periscopic Convex or Concave Lenses.

**SLIDING TEMPLES.**



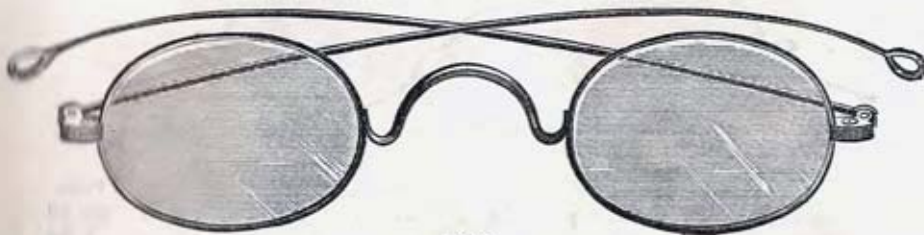
1362.

1362. Sliding Temples, 10 carat gold, per pair, . . . . .	9 00
1363. Do. 12 do. do. . . . .	10 00
1364. Do. 14 do. do. . . . .	11 00
1365. Do. 16 do. do. . . . .	13 00
1366. Do. 18 do. do. . . . .	15 00

**PURE SILVER SPECTACLES.**

Of either Octagon or Oval-Shaped Eyes, and fitted with either Double or Periscopic Convex or Concave Lenses.

**SINGLE TEMPLES.**



1875.

No.							PRICE.
1875.	Single	Temples,	octagon,	per	pair,		\$2 50
1876.	Do.	oval,	do.				2 50
1877.	Do.	octagon,	with	divided	glasses,	for far and near sights,	3 50
1878.	Do.	oval,	do.	do.	do.	do.	3 50

**PURE SILVER SPECTACLES.**

Of either Octagon or Oval-Shaped Eyes, and fitted with either Double or Periscopic Convex or Concave Lenses.

**SLIDING TEMPLES.**



1880.

1880.	Sliding	Temples,	octagon,	per	pair,		3 00
1881.	Do.	oval,	do.				3 00
1882.	Do.	octagon,	with	divided	glasses,	for far and near sights,	4 00
1883.	Do.	oval,	do.	do.	do.	do.	4 00

**ELASTIC STEEL SPECTACLES.**

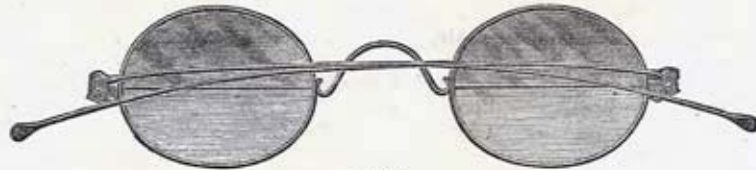
**SINGLE TEMPLES.**

Of either Octagon, Oval, or Oblong-Shaped Eyes, and fitted with either Double or Periscopic Convex or Concave Lenses.



1390.

No.	PRICE.
1390. Extra Fine-finished frames, per pair, . . . . .	\$2 50
1391. Medium do. do. do. . . . .	1 50
1392. Heavy do. do. do. . . . .	1 90



1395.

1395. Medium-finished frames, divided glasses, for far and near sight, per pair, . . . . .	2 00
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**TURN-PIN TEMPLES.**

Of either Oval or Oblong-Shaped Eyes, and fitted with either Double or Periscopic Convex or Concave Lenses.

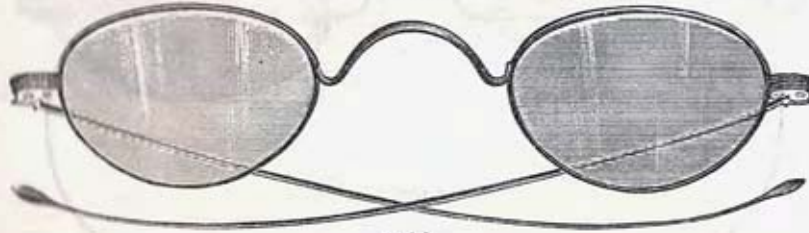


1400.

1400. Finest-finished frames, per pair, . . . . .	2 50
1401. Medium do. do. do. . . . .	1 50
1402. Heavy do. do. do. . . . .	1 00
1403. Medium do. do. divided glasses, for far and near sight, per pair.	2 00

**PULPIT SPECTACLES.**

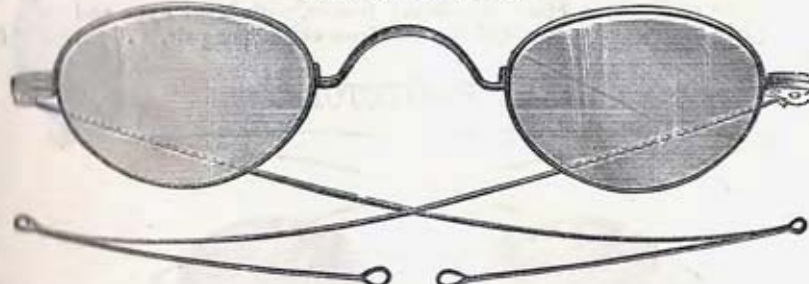
SINGLE TEMPLES.



1404.

No. 1404. Finest-finished frames, with double or periscopic convex glasses, per pair, PRICE \$1 50

TURN-PIN TEMPLES.

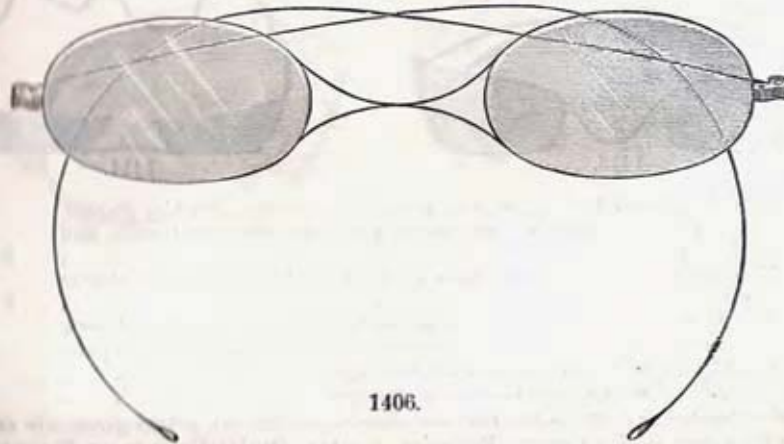


1405.

1405. Finest-finished frames, with double or periscopic convex glasses, per pair, 1 50

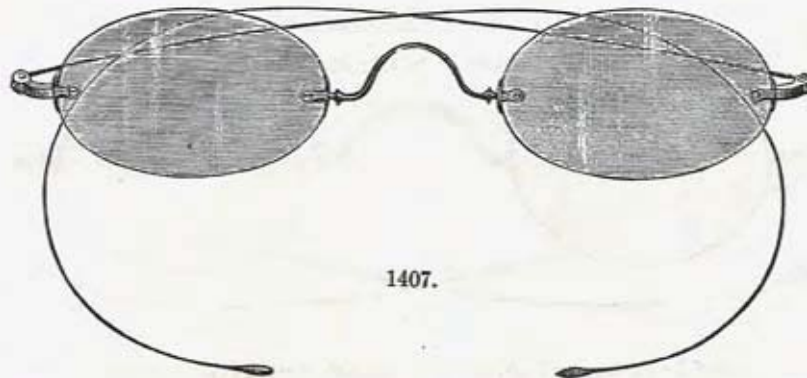
The Pulpit Spectacles are very convenient for public speakers who require spectacles to read their notes: the tops of the glasses being made straight or nearly so, allow the wearer to look over them when the eyes are directed to the audience.

**INVISIBLE SPECTACLES.**



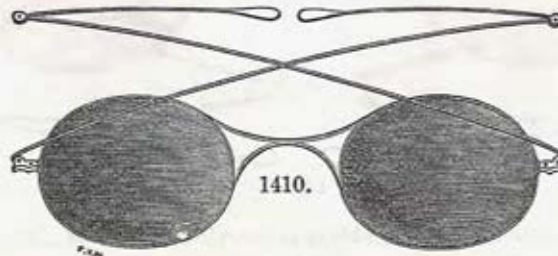
1406.

1406. Invisible Spectacles, Hook Sides, with the frames set in the glasses, that they may not be seen . . . . . 2 50  
 1406½. Hook Side Steel Spectacles, glasses not grooved, . . . . . 2 50

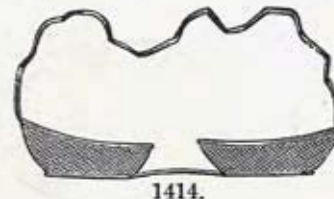


- |       |   |        |
|-------|---|--------|
| No.   |   | Price. |
| 1407. | Skeleton or Frameless Spectacles, with steel hook sides, . . . . .  | \$2 50 |
| 1408. | Miller's or Turner's Spectacles, heavy frames, with large eyes, and plain white glasses to guard the eyes from chips, per pair, . . . . . | 50     |

**EYE PROTECTORS.**



- |       |   |      |
|-------|---|------|
| 1410. | Spectacles with large, hollow glasses, either blue or smoke color, for protecting the eyes from bright light, wind, and dust. Steel frames, light hook sides, . . . . . | 2 50 |
| 1411. | Same as 1410, medium weight, straight or double sides, . . . . .  | 1 00 |
| 1412. | Do. heavy do. do. do. . . . .   | 1 00 |

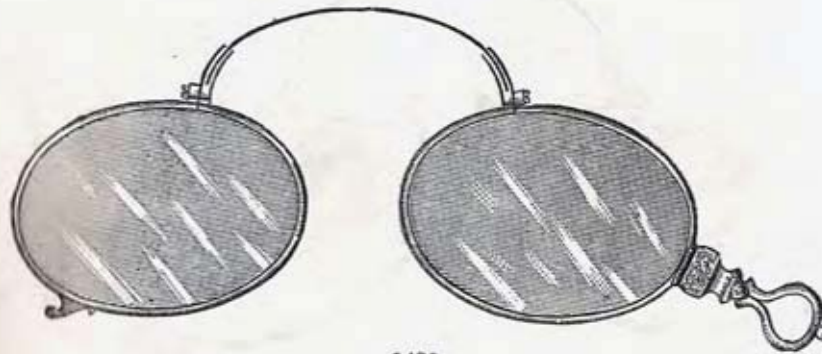


- |       |   |      |
|-------|---|------|
| 1413. | Wire Gauze Eye Protectors, with green, blue, smoke, or white glasses, and steel Temples, as spectacles, extra fine-finished frames and glass, per pair, . . . . . | 2 50 |
| 1414. | Wire Gauze Eye Protectors, same as No. 1413, but frames and glasses medium-finished, . . . . .  | 1 50 |
| 1415. | Wire Gauze Eye Protectors, with green, blue, smoke, or white glasses, and elastic band; an excellent article for railroad travelling, per pair, . . . . .         | 50   |
| 1416. | Eye Shades, with wire frames, for both eyes, . . . . .  | 35   |
| 1417. | Do. with elastic bands, for one eye, . . . . .  | 35   |

All the Spectacles described in the preceding pages, for the prices given, are each fitted with either Double Convex, Periscopic Convex, Double Concave, or Periscopic Concave Lenses, from No. 5 to No. 72, or with plain blue, green, or smoke colored lenses, and a neat, strong, leather case, like No. 1575 or No. 1576, to contain them.

**GOLD EYE-GLASSES.**

Fitted with either Double or Periscopic Convex or Concave, or Plain Blue or Smoke Colored Lenses.



1420.

No.		PRICE.
1420.	Single Spring Gold Eye-Glasses, 10 carat, . . . . .	\$5 00
1421.	Do. do. do. 14 do . . . . .	7 50

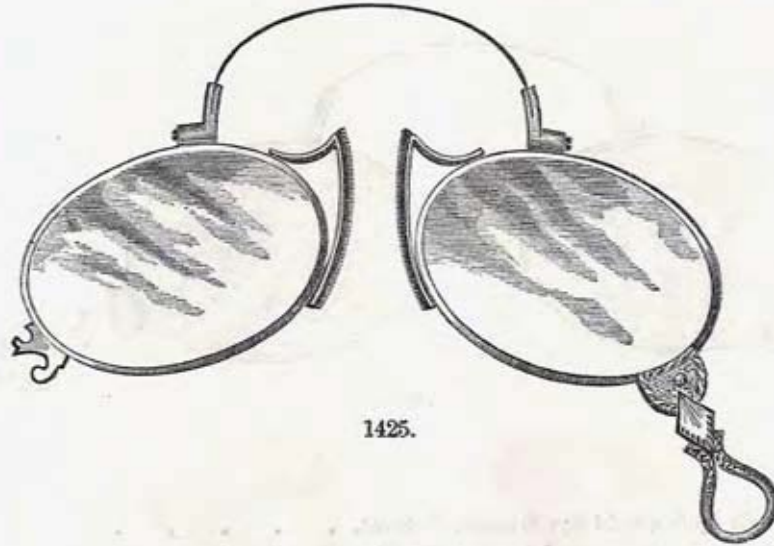


1422.

1422.	Compound Spring Gold Eye-Glasses, 10 carat, . . . . .	5 00
1423.	Do. do. do. 14 do. . . . .	8 50
1424.	Do. do. do. very light, 14 carat, . . . . .	7 50

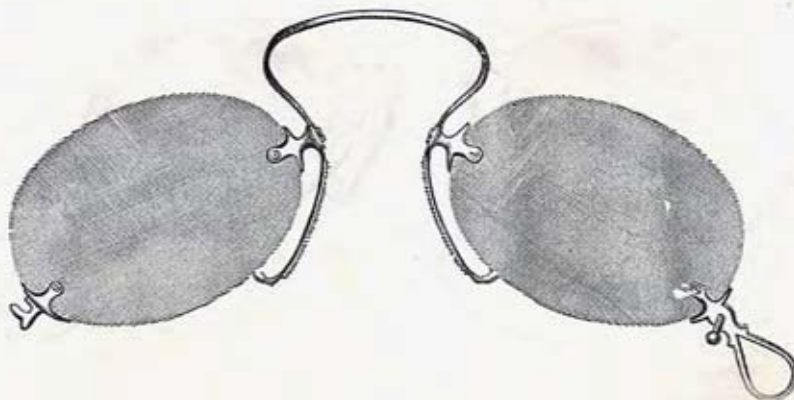
**GOLD EYE-GLASSES.**

Fitted with either Double or Periscopic Convex or Concave, or Plain Blue or Smoke Colored Lenses.



1425.

No.	Description	PRICE.
1425.	Anatomical Model Gold Eye-Glass, 10 carat, . . . . .	\$5 50
1426.	Do. do. do. 14 do. . . . .	10 00



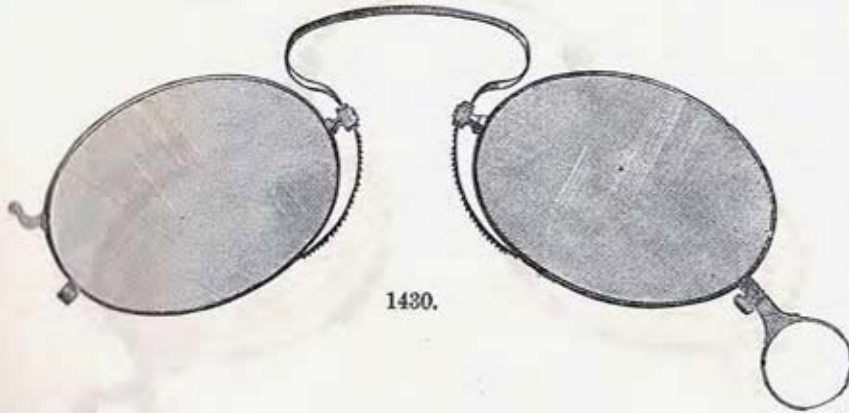
1427.

1427. Frameless Eye-glass, with 14 carat Gold Spring and Handle . . . . . 10 00

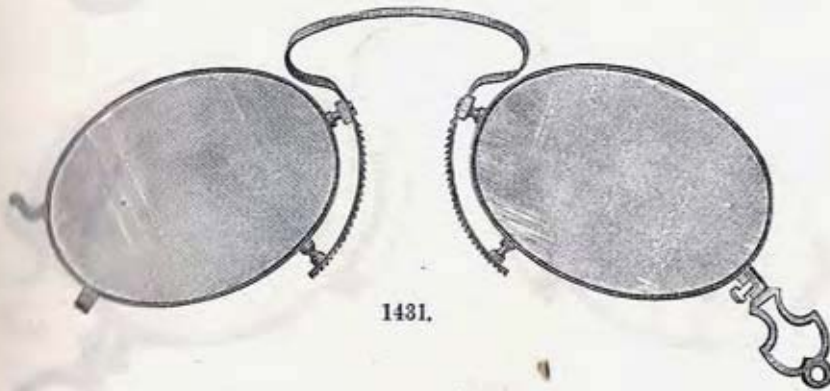


STEEL FRAMED EYE-GLASSES.

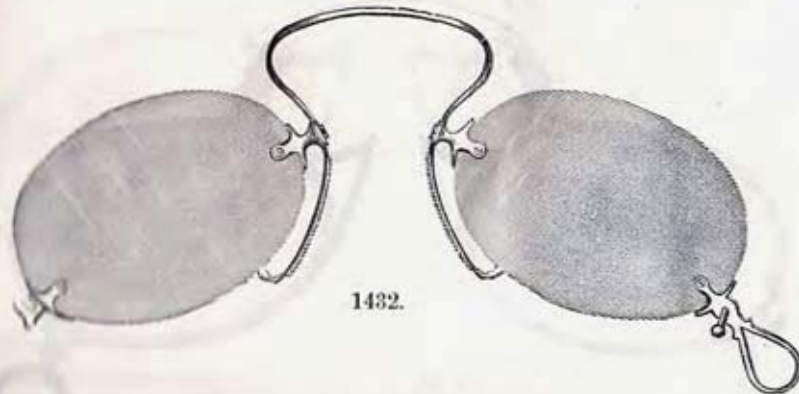
Fitted with either Double or Periscopic Convex or Concave, or plain Blue or Smoke Colored Lenses.



No. 1430. Anatomical Pattern, . . . . . Price. \$1 25



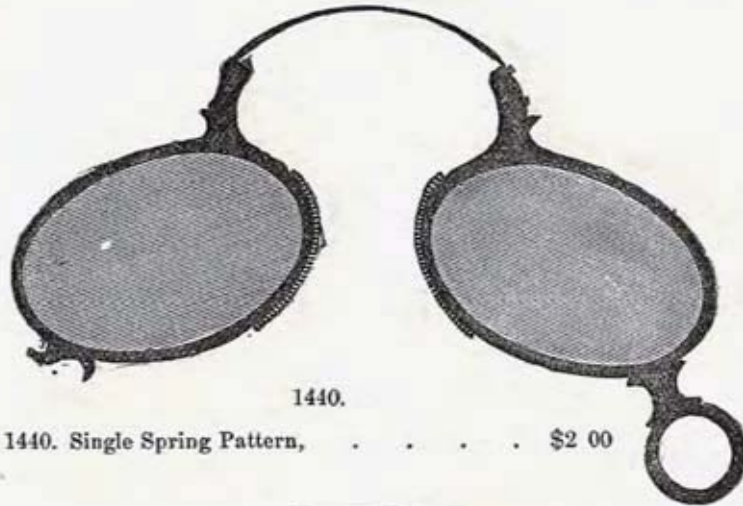
1431. Compound Spring Pattern, . . . . . 2 00  
Do. do. do. very light grooved glasses, . . . . . 3 00



1432. Frameless Pattern, with steel spring, . . . . . 2 00

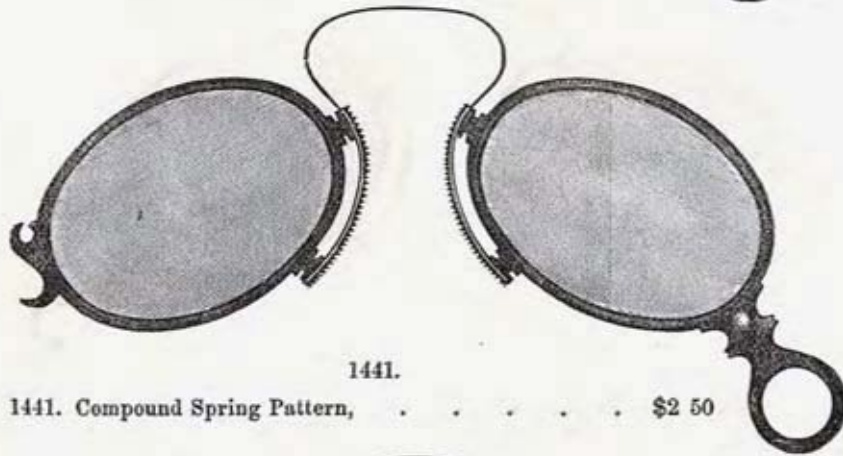
SHELL FRAME EYE-GLASSES.

Fitted with either Double or Periscopic Convex or Concave, or Plain Blue or Smoke Colored Lenses.



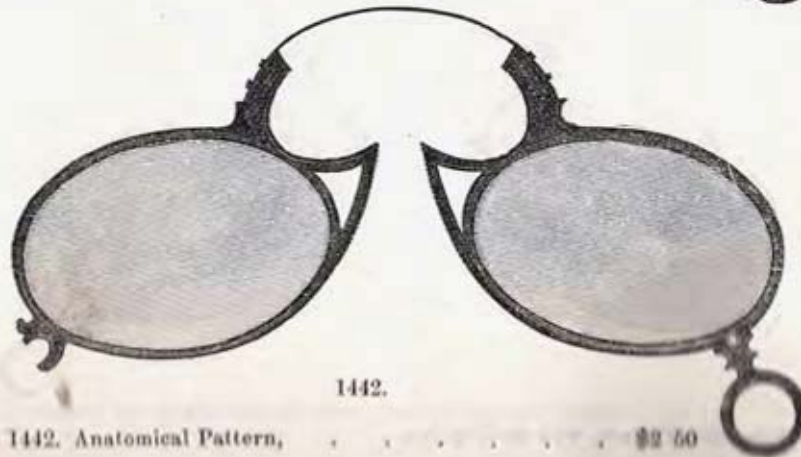
1440.

1440. Single Spring Pattern, . . . . . \$2 00



1441.

1441. Compound Spring Pattern, . . . . . \$2 50

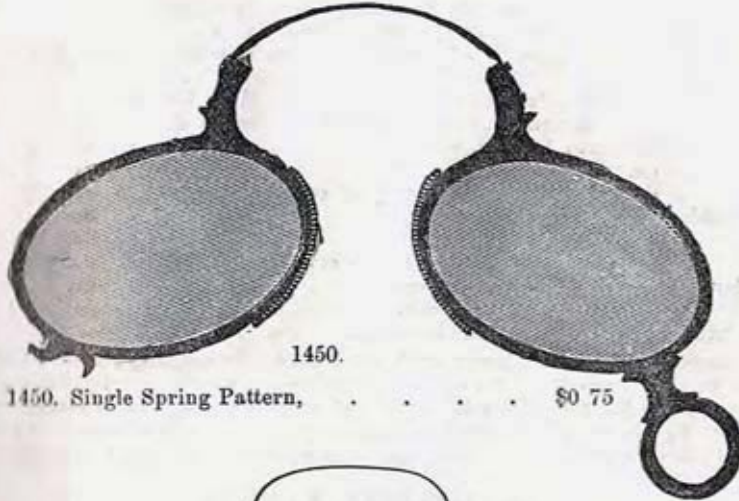


1442.

1442. Anatomical Pattern, . . . . . \$2 50

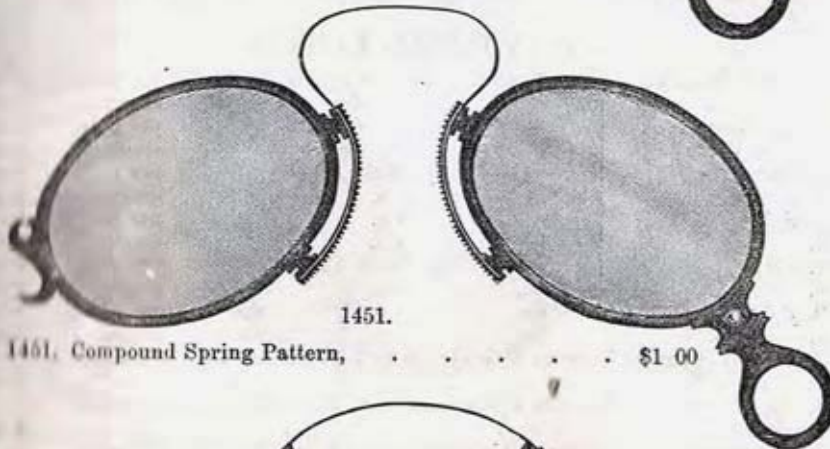
**HARD RUBBER FRAME EYE-GLASSES.**

Fitted with either Double or Periscopic Convex or Concave, or Plain Blue or Smoke Colored Lenses.



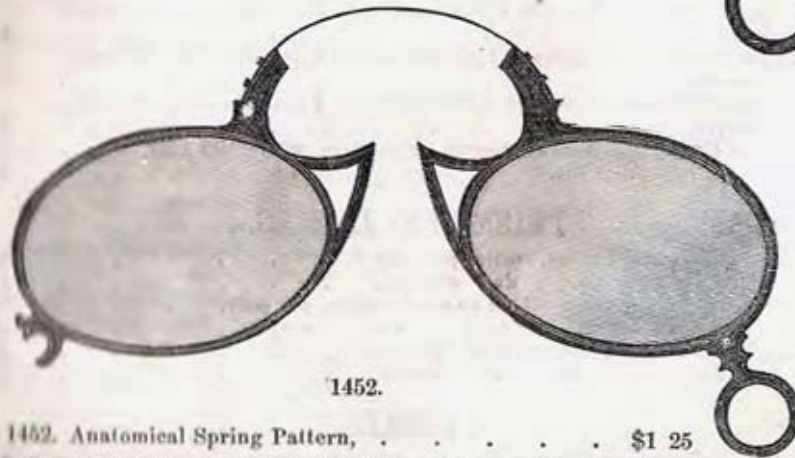
1450.

1450. Single Spring Pattern, . . . . . \$0 75



1451.

1451. Compound Spring Pattern, . . . . . \$1 00



1452.

1452. Anatomical Spring Pattern, . . . . . \$1 25

All the Eye-Glasses from No. 1420 to No. 1452 are fitted with either double or periscopic convex or concave or plain blue or smoke colored lenses, and supplied with a case and silk guard for the prices named.

## SPECTACLE LENSES.

Spectacle Glasses of the best quality, fitted to frames, at the following prices:

No.	Price.
1500. Double Convex White Lenses, from Nos. 5 to 72, per pair, . . . . .	\$0 75
1501. do. do. do. 1 to 4 $\frac{3}{4}$ , do. . . . .	1 25
1502. do. do. Davided, or Franklin Lenses, Nos. 5 to 72, per pair, . . . . .	1 50
1503. Double Convex White Lenses, two focus on one glass, 5 to 72, per pair, . . . . .	1 50
1504. do. green, blue, smoke, or pink color, do. do. . . . .	1 50
1505. Periscopic Convex White Lenses, do. do. . . . .	75
1506. do. do. from Nos. 1 to 4 $\frac{3}{4}$ , do. . . . .	1 25
1507. do. blue, smoke, or pink color, do. 5 to 72, do. . . . .	1 50
1508. Double Concave White Lenses, do. do. do. . . . .	75
1509. do. do. do. 1 to 4 $\frac{3}{4}$ , do. . . . .	1 25
1510. do. blue, green, or smoke color, do. 5 to 72, do. . . . .	1 50
1511. Periscopic Concave White Lenses, do. do. do. . . . .	75
1512. do. blue or smoke, do. do. do. . . . .	1 50
1513. Plain Blue, Green, or Smoke Lenses, . . . . .	1 00

The prices for the above Glasses apply when set to the ordinary frames which have a groove on the inner edge of the eye wire. If the eye wire is very light and without the groove, as in No. 1406, the edge of the glass must be grooved to receive the eye wire. Setting glasses in frames of this description will add seventy-five cents to any of the prices from No. 1500 to 1513, and \$3 per pair to prices from No. 1520 to 1551.

## CYLINDRICAL LENSES.

1520. Plano-Convex or Concave Cylindrical White Lenses, No. 5 to 72, per pair, . . . . .	2 00
1521. do. do. do. do. single glass, . . . . .	1 25
1522. Sphero-Convex do. do. do. do. per pair, . . . . .	4 00
1523. do. do. do. do. single, . . . . .	2 50
1524. Plano-Convex, Cylindrical, Blue, or Smoke, do. per pair, . . . . .	3 00
1525. do. do. do. do. single, . . . . .	2 00
1526. Sphero-Convex, do. do. do. do. per pair, . . . . .	5 00
1527. do. do. do. do. single, . . . . .	3 00
1528. Plano-Convex or Concave Cylindrical and Prismatic White, per pair, . . . . .	4 00
1529. do. do. do. do. single, . . . . .	2 50
1530. Sphero-Convex, do. do. do. do. per pair, . . . . .	5 50
1531. do. do. do. do. single, . . . . .	3 00
1532. Plano-Convex or Concave Cylindrical and Prismatic Blue or Smoke, per pair, . . . . .	5 00
1533. Plano-Convex or Concave Cylindrical and Prismatic Blue or Smoke, single, . . . . .	3 00
1534. Sphero-Convex or Concave Cylindrical and Prismatic Blue or Smoke, per pair, . . . . .	7 50
1535. Sphero-Convex or Concave Cylindrical and Prismatic Blue or Smoke, single, . . . . .	4 00
1536. Cross Cylindrical Lenses, convex or concave, white, per pair, . . . . .	6 50
1537. do. do. do. do. single, . . . . .	4 50

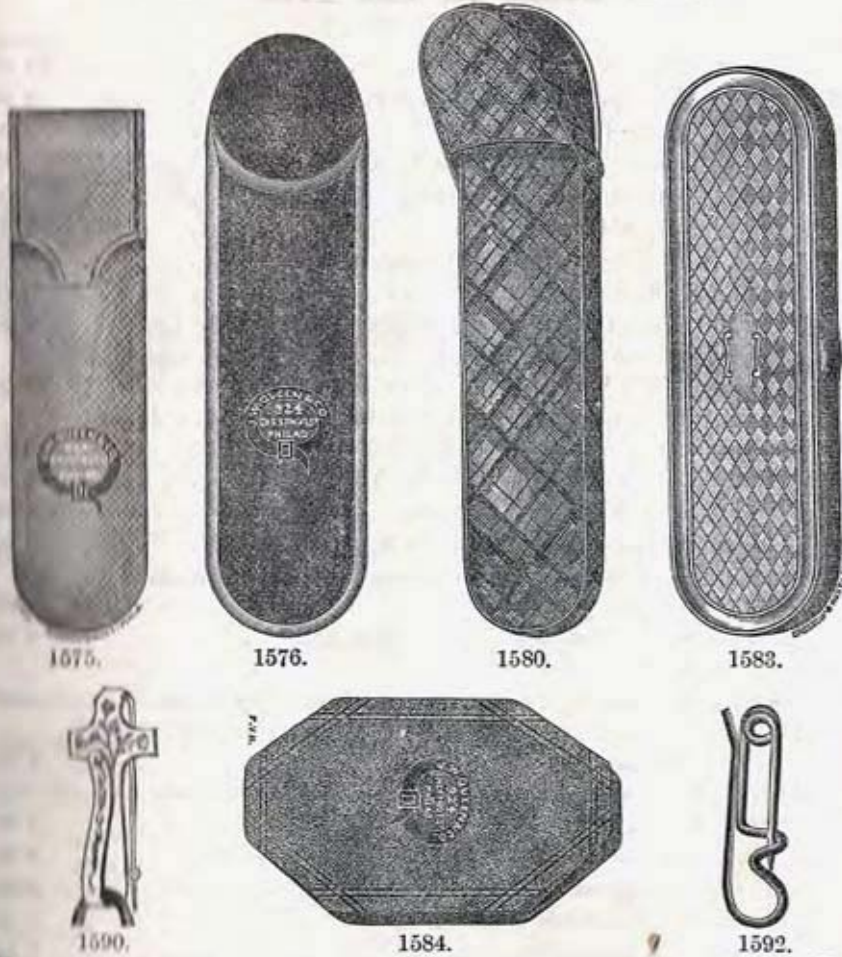
## PRISMATIC LENSES.

1538. Plain Prismatic Lenses, white, per pair, . . . . .	2 00
1539. do. do. do. single, . . . . .	1 25
1540. do. do. blue or smoke color, per pair, . . . . .	3 00
1541. do. do. do. single, . . . . .	2 00
1542. Sphero-Prismatic Lenses, white, per pair, . . . . .	4 00
1543. do. do. do. single, . . . . .	2 50

## PEBBLES.

1550. Double Convex or Concave Pebbles, per pair, . . . . .	3 00
1551. Periscopic Convex or Concave Pebbles, per pair, . . . . .	3 00

SPECTACLE AND EYE-GLASS CASES.



		PRICE.
1575.	Spectacle Case, morocco, with tuck, . . . . .	\$0 20
1576.	Do. do. open end, . . . . .	20
1577.	Do. fine English leather, . . . . .	75
1578.	Do. papier-maché, sliding top, . . . . .	75 to 1 00
1579.	Do. do. frog mouth, . . . . .	\$1 00 to 1 25
1580.	Do. Scotch plaid, do. . . . .	50 to 1 50
1581.	Do. do. sliding top, . . . . .	1 50
1582.	Do. planished tin, . . . . .	25
1583.	Do. German silver, plated, . . . . .	1 25 to 1 75
1584.	Eye-glass Case, morocco, open end, . . . . .	15
1585.	Do. do. frog mouth, . . . . .	35
1586.	Eye-glass Hook, of solid gold, . . . . .	1 50 to 5 00
1587.	Do. gilt, . . . . .	25
1588.	Do. metal, black, . . . . .	15
1589.	Eye-glass Chains, of gold, with Hook, . . . . .	4 00 to 6 50
1590.	Silk Guards for Eye-glasses, light, . . . . .	10
1591.	Do. do. medium, . . . . .	10
1592.	Do. do. heavy, . . . . .	10
1593.	Catgut Guards for Eye-glasses, light, . . . . .	10
1594.	Do. do. heavy, . . . . .	10

## BOOKS ON THE EYE.

No.		PRICE
1644.	ALLBUTT. Use of the Ophthalmoscope, . . . . .	\$4 00
1645.	ALLEN & NORTON. Ophthalmic Therapeutics, . . . . .	2 00
1646.	ANGELL. On the Eye, . . . . .	3 00
1647.	ANGELL. How to Take Care of our Eyes, . . . . .	50
1648.	Archives of Ophthalmology and Otology, . . . . .	5 00
1649.	ARLT. Injuries of the Eye. . . . .	1 25
1650.	BROWN, E. A. How to Use the Ophthalmoscope, . . . . .	1 00
1651.	CARTER. On Diseases of the Eye, . . . . .	3 75
1652.	DIXON. A Guide to the Practical Study of Diseases of the Eye, . . . . .	2 00
1653.	DONDEERS. On the Anomalies of Accommodation and Refraction of the Eye, with a Preliminary Essay on Physiological Dioptries, . . . . .	5 25
1654.	FENNER. Vision: its Optical Defects and the Adaptation of Spectacles, embracing Physical and Physiological Optics, . . . . .	3 75
1655.	GALEZOWSKI. Traité des Maladies des Yeux, . . . . .	6 50
1656.	HELMHOLTZ. Optique Physiologique, . . . . .	11 00
1657.	LAWSON. Diseases and Injuries of the Eye, . . . . .	2 00
1658.	LORING. Determination of the Refraction of the Eye by means of the Ophthalmoscope, . . . . .	50
1659.	MACNAMARA. A Manual of Diseases of the Eye, . . . . .	4 00
1660.	MONC. Space and Vision, . . . . .	. . . . .
1661.	PERRIN. Traité Pratique d'Ophthalmoscopie et d'Optométrie, . . . . .	11 00
1662.	SCHEFFLER. The Theory of Optical Defects and those of Spectacles, from the German, by Carter, . . . . .	3 75
1663.	STELLWAG. Treatise on the Diseases of the Eye, including the Anatomy of the Organ, . . . . .	7 00
1664.	WALTON. A Practical Treatise on the Diseases of the Eye, . . . . .	9 00
1665.	WELLS. A Treatise on the Diseases of the Eye, . . . . .	5 00
1666.	WELLS. Long, Short and Weak Sight, . . . . .	2 50
1667.	WHALEY. The Human Eye, . . . . .	7 50
1668.	WILLIAMS. A Practical Guide to the Study of the Diseases of the Eye, . . . . .	3 00
1669.	DE WECKER ET DE JAEGER. Traité des Maladies du Fond de l'Oeil, . . . . .	15 00
1670.	MEYER. Traité Pratique des Maladies des Yeux, . . . . .	4 00
1671.	MEYER. Leçons sur la Réfraction, . . . . .	3 00
1672.	MEYER. Traité des Opérations qui se pratiquent sur l'Oeil, . . . . .	11 00
1673.	FOLLIN. Leçons sur l'Exploration de l'Oeil, . . . . .	3 00
1674.	FANO. Traité Pratique des Maladies des Yeux. 2 Vols., . . . . .	7 50
1675.	WITKOWSKI. Anatomie Iconoclastique, Atlas Complémentaire, . . . . .	3 50
1676.	LANDOLT. Manual of Examination of the Eye, Translated by Dr. Burnett, . . . . .	3 00
1677.	LIEBREICH. Atlas of Ophthalmoscopy, with Colored Plates, . . . . .	12 00
1678.	HARLAN. The Eye-sight, and How to Care for It, . . . . .	50
1379.	SCHWEIGGER. Hand-book of Ophthalmology, . . . . .	4 50
1333.	HIGGINS. Ophthalmic Practice, . . . . .	75

REFLECTION OF LIGHT.

PLANE MIRRORS.



1690.



1691.



1703.

No.	PRICE.
1690. Plane Mirror of Plate Glass, 6 inches diameter, in wood frame, with ring and handle, . . . . .	\$1 25
1691. Plane Mirror of Plate Glass, 6 inches diameter, in wood frame, on adjustable stand, . . . . .	2 25
1692. Two Plane Mirrors of Plate Glass, each 7 by 9 inches, mounted in metal frames and hinged together so that their surfaces can be inclined to various angles, . . . . .	4 50

SPHERICAL MIRRORS.

1695. Spherical Concave Mirror of polished glass, 6 inches diameter, in wood frame, with ring and handle, . . . . .	2 50
1696. Spherical Convex Mirror of polished glass, 6 inches diameter, in wood frame, with ring and handle, . . . . .	2 75
1697. No. 1695 and No. 1696, mounted back to back, in one wood frame, . . . . .	4 75
Mirrors Nos. 1695-1696 are made of Plano-Convex lenses, and answer well to show the general effect of convex and concave mirrors.	
1700. Spherical Concave Mirror of glass, 6 inches diameter, with accurate parallel surfaces, mounted in wood frame, with ring and handle, . . . . .	10 00
1701. Spherical Convex Mirror, similar to No. 1700, . . . . .	10 00
1702. Spherical Mirrors, No. 1700 and No. 1701, mounted in one frame, . . . . .	17 00
1703. Spherical Concave Mirror of glass, 6 inches diameter, with accurately parallel surfaces, mounted on adjustable brass stand so as to be inclined or turned at any angle and elevated or depressed, . . . . .	25 00
1704. Spherical Convex Mirror of glass, 6 inches diameter, with accurately parallel surfaces and mounted as No. 1703, . . . . .	25 00
1705. Spherical, Concave and Convex Mirrors, No. 1703 and No. 1704, mounted in one frame back to back and on brass stand with motions as described for No. 1703, . . . . .	35 00

CYLINDRICAL CURVED MIRRORS.

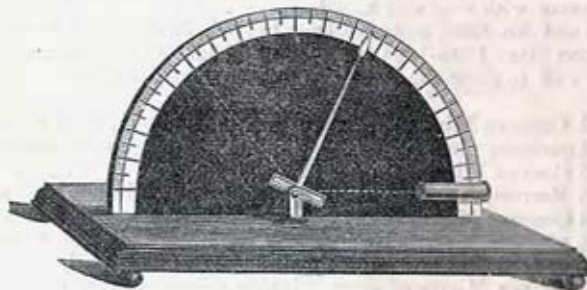
1708. Cylindrical Convex Mirror of glass, 6 inches diameter, in wood frame, with ring, . . . . .	2 50
1709. Cylindrical Concave Mirror of glass, 6 inches diameter, mounted in metal frame with base, to show caustics and aberration by reflection, . . . . .	2 50
1710. Silvered Brass Band to show Caustics by Reflection, and also the line followed by a beam of light undergoing successive reflections from its surface, . . . . .	10 00

- | No.  | Price. |
|--|--------|
| 1711. Multiplying Mirror (producing several images) of glass, 6 inches diameter, in wood frame, with ring, . . . . . | \$2 70 |



1712.

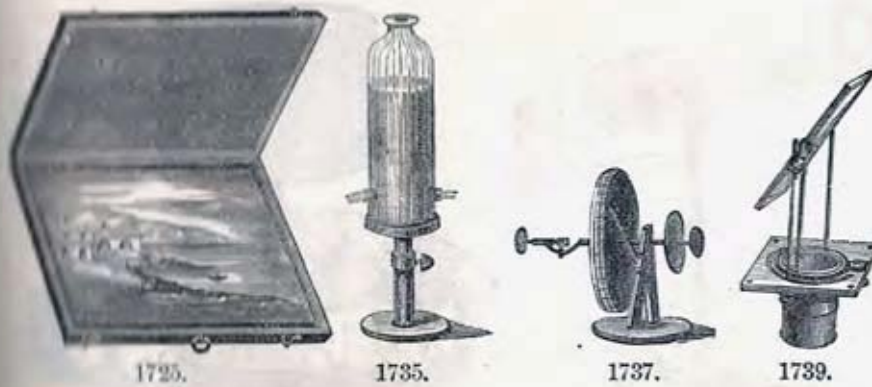
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|---|-------|
| 1712. Anamorphoscope, or Cylindrical Mirror. With distorted figures, which become perfect on being looked at in the mirror, . . . . .                             | 2 50  |
| 1713. Conical Mirror. With similar forms and for a similar purpose, . . . . .   | 10 00 |
| 1714. Pair of Parabolic Reflectors. Of copper, nickel-plated, 13 inches in diameter, mounted on neat adjusting stands of mahogany, with brass fittings, . . . . . | 35 00 |
| 1715. Pair of Parabolic Reflectors. Of copper, nickel-plated, 20 inches in diameter, mounted on neat adjusting stands of mahogany, with brass fittings, . . . . . | 60 00 |



1718.

- |   |       |
|---|-------|
| 1718. Vertical Semicircle. Thirty-six inches in diameter, graduated to degrees, with background of black velvet. A mirror at the centre is furnished with an index set exactly perpendicular to its plane, and both mirror and index can be turned in any direction desired. A ray of light from any brilliant source is allowed to enter the collimator at the base, in the direction of the centre, and by means of a little smoke from brown paper, the paths of the incident and reflected rays, as well as the relation of the latter to the plane and movement of the mirror, are easily shown to a large audience, . . . . . | 20 00 |
| 1719. Apparatus to show Plane and Diffused Reflection. Consisting of a mirror polished on the one side and left unburnished on the other. Mounted upon an adjusting stand, . . . . .  | 7 50  |

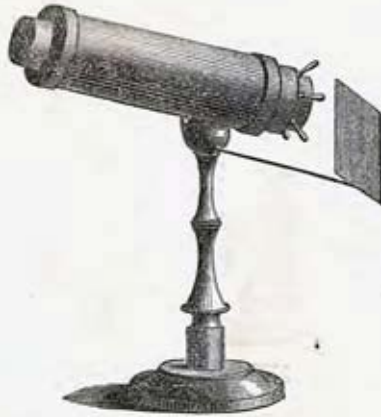




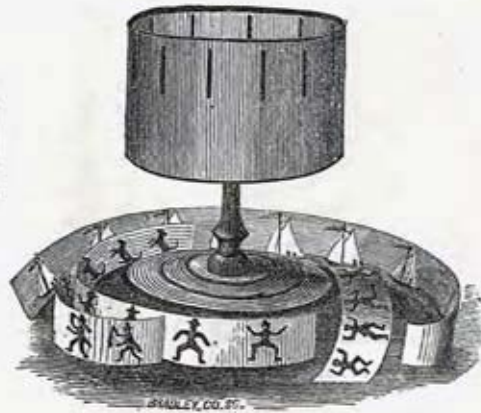
CLAUDE LORRAINE, or LANDSCAPE MIRROR.

						PRICE.
1725.	Mirror, 6	inches long by 5	inches wide, in strong morocco case, each,			\$5 50
1730.	do.	7	do. 5	do.	do.	6 00
1731.	do.	7	do. 6	do.	do.	7 50
1732.	do.	8	do. 6	do.	do.	9 00
1733.	do.	8	do. 7	do.	do.	10 00
1734.	do.	9	do. 7	do.	do.	11 00
1735.	Illuminated Fountain.	Illustrating the total reflection of light in a liquid vein. Consisting of a tank fourteen inches high, with a brass valve, and an aperture for smooth vein on one side and a condensing lens on the other,				8 50
1736.	Illuminated Fountain.	Similar to No. 1735, but much larger and made of heavy tin, neatly japanned, with apertures of two different sizes for the flow of the water,				14 00
1737.	Wollaston's Goniometer.	Small working model,				30 00
1738.	Porte Lumière.	A mirror with a rotary and an inclination movement, to be adjusted by hand, for reflecting the rays of the sun into a room. Small model of brass,				25 00
1739.	Porte Lumière.	Large model, with two mirrors; one of silvered plate-glass, the other of polished black-glass. Movements very perfect,				65 00
1741.	Kaleidoscope for Projection,	mounted in brass with lens; complete,				20 00
1742.	Parlor Kaleidoscope,	on tripod stand,				1 50
1743.	Do.	do. on fine walnut stand, with brass front,				2 00
1744.	Zootrope, or Wheel of Life,					3 00

A mechanical and optical toy, affording amusement to old and young. It is an exemplification of the persistence of vision, and is a valuable aid in illustrating the wonders of optics. The turning of the drum or cylinder brings into view the varying form or position of a figure in rapid succession, until they blend into a perfect image full of motion and natural action. By placing the apparatus in a suitable light, a number of persons can examine it at the same time.

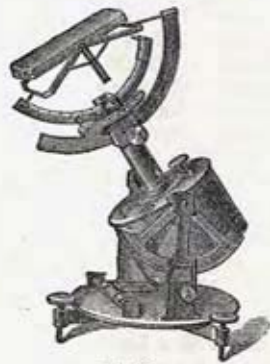


1743.



1744.

No.	PRICE.
1745. Extra views for Zoetrope, per set of six, . . . . .	\$1 00
1746. Magic Telescope to look through a brick, . . . . .	1 00



1747.



1748.

1747. Silbermann's Heliostat. For the purpose of keeping the rays of the sun always reflected in the same direction, by means of clockwork, 250 00



1753.



1750.

No.	Price.
1748. Foucault's Heliostat. For the same purpose, . . . . .	\$250 00
1749. Prof. Keith's Heliostat Mirror, 3 inches in diameter, with clockwork, very complete, . . . . .	75 00
1750. Vertical Circle of brass, 10 inches in diameter, graduated to the half of a degree, and reading by verniers to minutes, with a plane mirror at centre, a telescope attached to one vernier, and a collimator to the other. For exact experiments on the laws of reflection and refraction, and as a goniometer. Mounted upon a firm support of metal, with a joint which enables the circle to be placed in the horizontal position when desired, as in experiments on refraction and dispersion, . . . . .	125 00

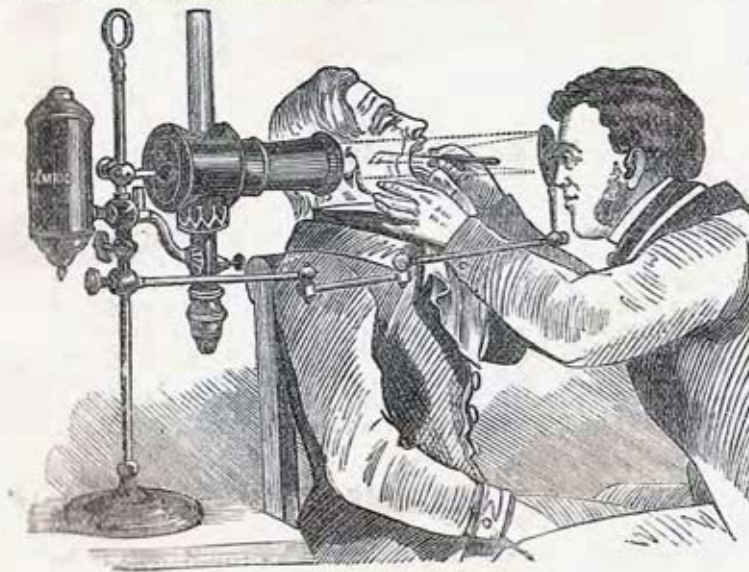


1751.



1751.

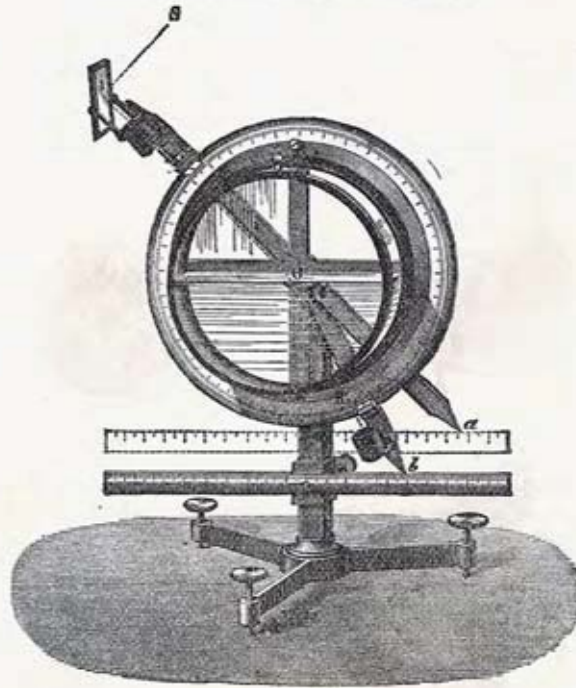
1751. Wheatstone's Photometer. A brass cylindrical case inclosing mechanism by which motion is given to a disc upon which are placed any number of polished beads, . . . . .	12 50
1752. Rumford's Photometer, small model, . . . . .	12 00
1753. Crook's Radiometer. May be used as a Photometer, . . . . .	7 50
1754. Crook's Radiometer, small size, . . . . .	3 50



1755.

1755. Tobold's large Laryngoscope without Lamp, with two Laryngeal Mirrors, complete in a case, . . . . .	22 00
1756. Tobold's small Laryngoscope without Lamp, with two Laryngeal Mirrors, complete in a case, . . . . .	14 00

## REFRACTION OF LIGHT.



1760.

## REFRACTION APPARATUS.

No.	PRICE
1760 represents a neat and accurate instrument for verifying the laws of refraction and total reflection. It consists of a vertical divided circle, to which is attached a circular glass tank, half filled with water or some other transparent liquid. The surface of the liquid must coincide exactly with the $90^\circ$ on the scale. The angles of incidence and refraction can be read off at the verniers, carried by the two arms, and the sines directly measured, by means of the graduated horizontal sliding scale, . . . . .	\$65 00
1762. Apparatus for the Accurate Measurement of the Refractive Indices of Bodies. For complete description, see No. 1750, . . . . .	125 00

## PRISMS.

1765. Hollow Prism of Glass, eight inches long, with compartments to be filled with various liquids, to demonstrate their different refractive as well as dispersive powers; on elevating stand of brass, finely finished, . . . . .	20 00
1766. Solid Flint Glass Prisms, 3 inches long, without stand, each, . . . . .	50
1767. Do. do. 4 do. do. do. . . . .	60
1768. Do. do. 5 do. do. do. . . . .	80
1769. Do. do. 6 do. do. do. . . . .	1 00



1765.

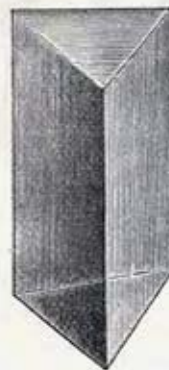


1772.

No.	PRICE.
1770. Solid Flint Glass Prisms, 7 inches long, without stand, each, . . .	\$1 25
1771. Do. do. 8 do. do. . . . .	1 50
1772. Metal Stands for Prisms, each, . . . . .	1 50



1773-1775.



1776.

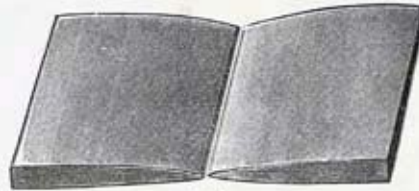


1782.

1773. Equilateral Prism mounted on brass stand, with ball and socket joint, 3 inches long, . . . . .	9 00
1774. Equilateral Prism mounted on brass stand, with ball and socket joint, 4 inches long, . . . . .	11 00
1775. Equilateral Prism mounted on brass stand, with ball and socket joint, 5 inches long, . . . . .	13 00
1776. Equilateral Prism 3 inches long, accurately ground and polished, unmounted, . . . . .	3 00
1777. Equilateral Prism 4 inches long, accurately ground and polished, unmounted, . . . . .	4 00
1778. Equilateral Prism 5 inches long, accurately ground and polished, unmounted, . . . . .	5 00
1779. Fine Rectangular Prism of Flint Glass, over two inches and a quarter on the side, for inversion and total reflection in projection, . . . . .	20 00
1780. Fine Conical Prism. Giving circular spectrum, . . . . .	6 00
1781. Conical Prism. Do. do. not as well finished . . . . .	1 00

CONVEX PRISMS.

No.	Convex Prism, 2 inches long, 16 inches focus,	PRICE.
1782.	Do. 2½ do 32 do.	\$2 00
1783.	Do. 2½ do 32 do.	4 50
1784.	Do. 3 do 32 do.	5 50



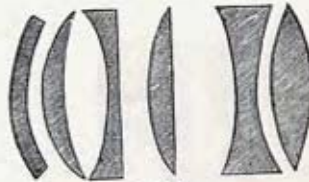
1785.



1786.

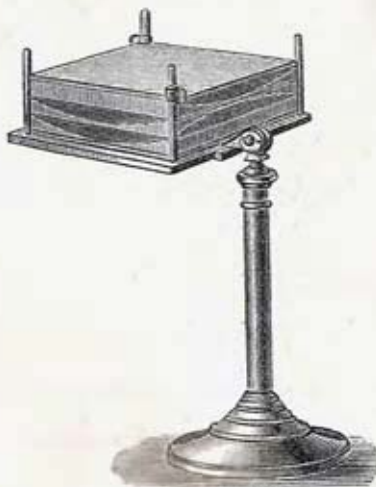
1785.	Prisms for Stereoscopes, 1½ inches square, per pair,	75
1786.	Polyprism, making many heads out of one,	25

LENSES.



1790.

1790.	Demonstration Lenses. Set of six, one and seven-eighths inches in diameter,	2 50
1791.	Demonstration Lenses. Set of six, two and a quarter inches in diameter, very superior,	7 50

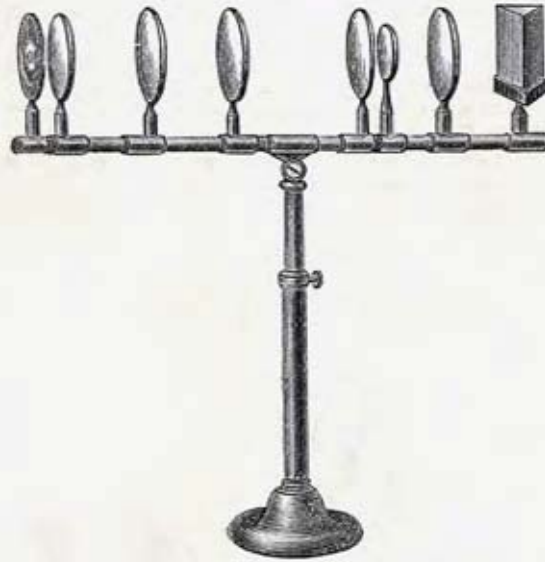


1792.



1795.

No.		PRICE.
1792.	Set of six Spherical Lenses as No. 1790, but larger size and mounted on stand,	\$35 00
1793.	Set of six Lenses with Cylindrical curves, mounted in frames as No. 1792,	60 00
1794.	Lens of Crown-glass. Four and a half inches in diameter, on brass stand,	9 00



1798.

1798. Apparatus for demonstrating reflection, refraction and dispersion. Consists of a base and column, supporting a round metal bar horizontally, on which are placed:

- Double Convex Lens  $1\frac{1}{2}$  inches diameter, 2 inches focus;
- Do. do. 3 do. 12 do.
- Double Concave Lens  $1\frac{1}{2}$  inches diameter 2 inches focus;
- Do. do.  $1\frac{1}{2}$  do. 15 do.
- Concave Mirror;
- Convex Do.
- Prism  $60^\circ$ ;
- Plane Glass;
- Object holder.

All of which are fixed on circular collars which slide on the horizontal bar, and can be turned out of the way when not in use.

With this apparatus, the principle upon which most optical instruments are constructed can be clearly and quickly demonstrated,

25 00

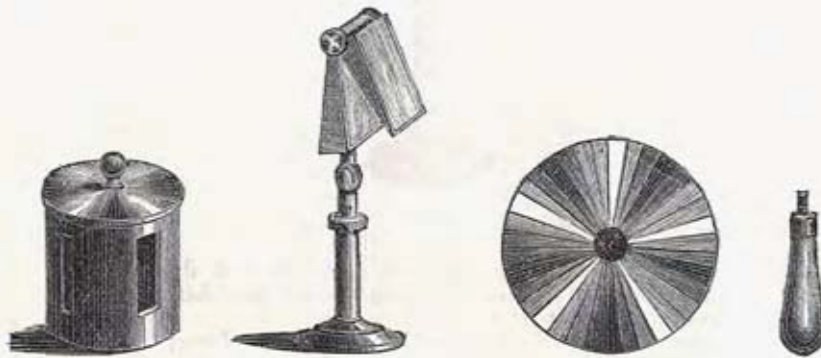
**MICROSCOPE AND TELESCOPE LENSES.**

1800.	Double or Plano-Convex Lens, 1 inch diameter, 2 inches focus, . . .	75
1801.	Do. do. do. do. $1\frac{1}{2}$ do. . . .	75
1802.	Do. do. do. do. $1\frac{1}{4}$ do. . . .	75
1803.	Do. do. do. do. 1 do. . . .	75
1804.	Do. do. do. do. do. do. . . .	75
1805.	Do. do. do. do. do. do. . . .	75
1806.	Do. do. do. do. do. do. . . .	75
1807.	Do. do. do. do. do. do. . . .	75

## COSMORAMA LENSES.

No.	PRICE.
1810. Double or Plano-Convex Lens, 8 inches diameter, and either 30, 36, 48 or 72 inches focus, each,	\$4 00
1811. Double or Plano-Convex Lens, 7 inches diameter, same foci as 1209, each,	3 00
1812. Double or Plano-Convex Lens, 6 inches diameter, of either 24, 30, 36, 48 or 72 inches focus, each,	2 25
1813. Double or Plano-Convex Lens, 5 inches diameter, of either 18, 20, 24, 30, 36, 48 or 72 inches focus, each,	1 75
1814. Double or Plano-Convex Lens, 4 inches diameter, of either 12, 14, 16, 18, 20, 24, 30, 36, 48 or 72 inches focus, each,	1 25
1815. Double or Plano-Convex Lens, 3 in. diam., any focus 6 to 36 in., each,	75
1816. Double or Plano-Convex Lens, 2 in. diam., any focus 6 to 36 in., each,	60
1817. Double or Plano-Convex Lens, 1½ in. diam., any focus 5 to 48 in., each,	50

## DISPERSION OF LIGHT.



1830

1832.

1837.

1825. Flint Glass Prism. One inch on side, very pure and of high refractive power, perfectly polished, angle of sixty degrees, for use in spectroscope,	12 00
1826. Flint Glass Prism. One and a quarter inches on a side, similar to No. 1825, but polished on two sides only,	10 00
1827. Hollow Prism for Bisulphide of Carbon. Bottle form, three inches high,	6 00
1828. Hollow Prism for Bisulphide of Carbon. Bottle form, six inches high,	7 50
1829. Hollow Prism for Bisulphide of Carbon. Globular or Spirit-Lamp form, three inches in diameter,	4 50
1830. Brass Box with two Hollow Prisms, No. 1827, arranged at the angle of minimum deviation,	22 50
1831. Brass Box with two Hollow Prisms, No. 1828, arranged at the angle of minimum deviation,	30 00
1832. Achromatic Prism. On brass stand, with joint to incline to any angle,	12 00
1833. Achromatic Lens. One and seven-eighths inches in diameter and ten inches focus, unmounted,	5 00
1834. Achromatic Lens. Same as No. 1833, but mounted on an adjustable brass stand,	10 00



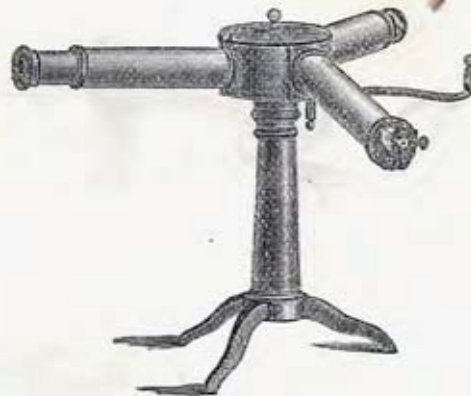
No.		PRICE.
1835.	Achromatic Lens. Three inches in diameter and twelve inches focus, unmounted,	\$20 00
1836.	Achromatic Lens. Same as No. 1835, but mounted on an adjustable brass stand,	27 50
1837.	Newton's Disc. For the recomposition of white light. A card-board disc, twelve inches in diameter, with the colors of the spectrum as rays from the centre. A brass bearing at the centre permits the whole to be supported upon a metal pin, and revolved rapidly by a cord and drum,	3 00
1838.	Newton's Disc. Similar to No. 1837, but thirty inches in diameter, and intended to be used upon a vertical whirling-table, such as No. 2144,	4 00
1839.	Brewster's Disc. Similar to 1838, but having the <i>three primary colors</i> instead of the whole seven of the spectrum,	3 50
1840.	Newton's & Brewster's Discs. Nos. 1838 and 1839 on opposite sides of the same card-circles,	6 00

**SPECTRUM ANALYSIS.**

1850.	Direct Vision Pocket Spectroscope. Three and one-half inches long, and five-eighths of an inch in diameter. Consists of a series of five prisms, on the principle of Amici, mounted in a brass tube, with an adjustable slit,	15 00
1851.	Direct Vision Pocket Spectroscope. Three inches long, and seven-tenths of an inch in diameter, with five prisms and adjustable slit,	18 00
1852.	Direct Vision Pocket Spectroscope. Same as No. 1851, but with achromatic lenses and neat morocco case,	25 00



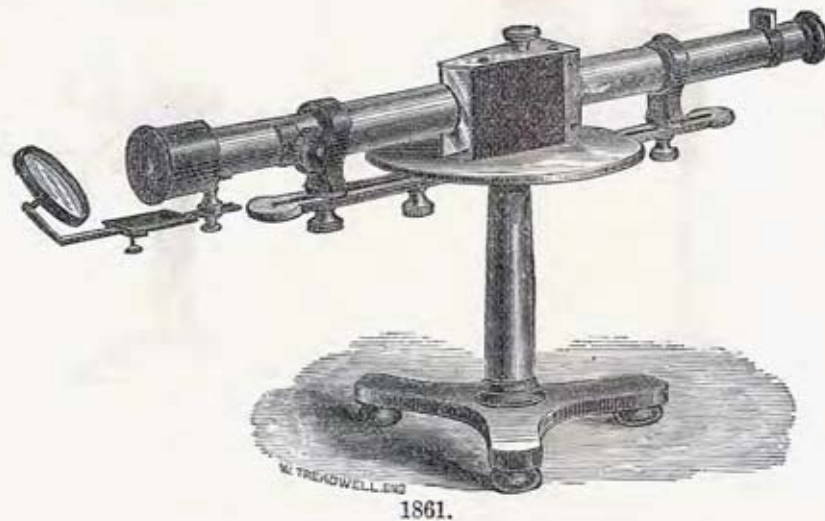
1856.



1858.

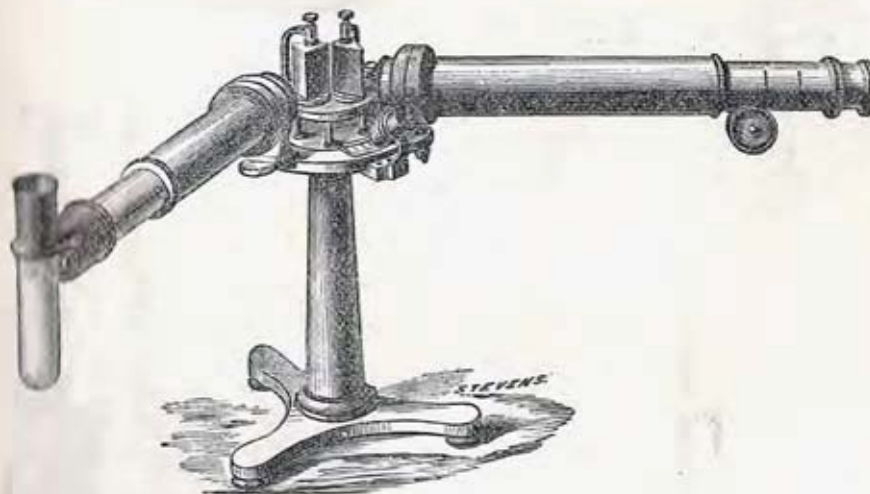
1853.	Direct Vision Spectroscope. Large model, eighteen inches long, with five prisms, adjustable slit, and neat polished mahogany case, . . . . .	90 00
1854.	Direct Vision Spectroscope. Same as No. 1853, but on neat stand, with horizontal movements,	100 00
1855.	Direct Vision Spectroscope. Twelve inches long, and seven-eighths inch in diameter, containing five prisms, with eye-piece, adjustable to different portions of the spectrum in succession. In neat morocco case,	37 50
1856.	Direct Vision Spectroscope. Same as No. 1855, but mounted on neat stand, with horizontal movement,	42 50

No.	PRICE.
1857. Direct Vision Spectroscope. Twenty inches long, and one and a quarter inches in diameter, containing five prisms, with micrometer for measuring the position of the lines, and screw movement to eye-piece, to adjust the lenses to different portions of the spectrum. A reflecting prism placed over a portion of the slit permits two spectra to be compared, . . . . .	\$125 00
1858. Bunsen's Laboratory Spectroscope. With one prism. Consists of a collimator, with adjustable slit and a prism for comparison of spectra, a second collimator, with a photographed millimeter scale, and a telescope for examining the rays from the former two. The prism, which is of flint-glass, is inclosed in a strong metal box. All mounted upon a neat stand and packed in a strong box with lock, . .	55 00
1859. Bunsen's Laboratory Spectroscope. Same as No. 1858, but with the addition of a pair of Bunsen burners, a pair of supports for the platinum loops, to hold the material for examination, a box of platinum loops in glass tubes, a set of scales for mapping spectra, and a colored chart of the spectra of the prominent alkalis and metals, compared with the solar spectrum. The instrument, but not the accessories, packed in a neat mahogany box with lock, . .	65 00
1860. Eaton's Student's Spectroscope. Consisting of a stand of japanned iron, 7 inches high, with brass plate 4 inches in diameter. It has one Bisulphide of Carbon Prism, similar to No. 1863, adjustable slit, prism for comparison, collimator with slip-tube adjustment, and reflecting mirror. The observing telescope is fitted with rack-work, for delicate focussing and horizontal movement, allowing it to be directed to different parts of the spectrum. Complete, with scale, .	75 00
This instrument is especially designed for students and laboratory use. It will readily show the Nickel line between the two D lines.	



1861. Eaton's Universal Spectroscope. The stand of this Spectroscope is 9 inches high, and the plate  $7\frac{1}{2}$  inches in diameter. The collimator and observing telescope are borne upon brass arms, with slots, enabling them to be shifted back and forth, and rotated horizontally, to accommodate them either to one or two Eaton prisms, or to a train of prisms of the usual form. The collimator is furnished with a very delicate adjustable slit, prism for comparison, reflecting mirror

No.		PRICE.
	described above, and rack-and-pinion movement, rack motion for accurate focussing, and the arm which bears it rotates by means of a delicate rack movement through nearly the whole circle; the centre of motion being the centre of the plate. A hole is drilled in the middle of the plate, which serves for centering the prism when a single one is used, or for holding a diffraction grating in position. This stand was designed specially for the Eaton prism, and is finely finished in every part. It is packed in a handsome walnut box.	
	Price with one Bisulphide of Carbon Prism, . . . . .	\$125 00
1862.	The Eaton Bisulphide of Carbon Prism. For projection of the spectrum, . . . . .	20 00
	We are prepared to furnish these prisms of flint-glass. The price will depend upon the density.	
1863.	Eaton's Duplex Direct Bisulphide of Carbon Prism, . . . . .	20 00
1864.	Eaton's Duplex Direct Glass Prism, . . . . .	17 00
	Large and finely-colored chart of spectral lines, from the original researches of Kirchoff, Bunsen and Huggins. Alkalies, . . . . .	4 00
1865.	Chart of Metals, . . . . .	4 00
1866.	Chart of Stars, . . . . .	4 00
1867.	Sodium Spoon, of German Silver, for burning sodium, . . . . .	1 50



1871.

1870.	Browning's Laboratory Spectroscope. With one prism of extra dense glass, two telescopes (one a collimator, carrying a slit and prism for comparison, the other for observing the spectrum). A graduated circle and vernier for measuring the position of the lines in the spectrum. In neat case, . . . . .	b 38 00
1871.	Model Spectroscope. With two prisms of extra dense glass. Two telescopes, graduated circle, vernier, and microscope for reading the divisions. In polished mahogany case, . . . . .	b 78 00
1872.	Model Spectroscope. As No. 1871, but with four prisms instead of two, with micrometer movement to measure accurately the distance between any lines of the spectrum, with fittings and two eye-pieces. In polished mahogany case, . . . . .	b 150 00
1873.	Millimeter Scales. For mapping spectra. Each, . . . . .	20

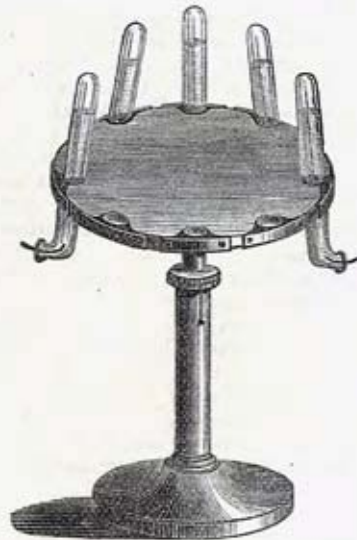
Nos. 1870, 1871 and 1872 are imported from Browning, of London; the price given is the approximate cost, to which must be added shipping expenses and duty.



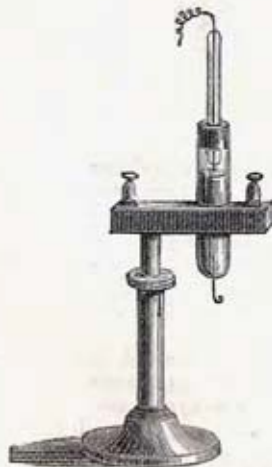
1875.



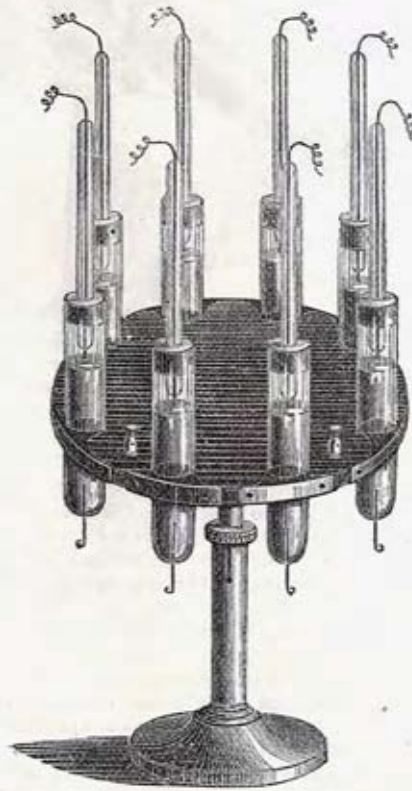
1876.



1877.



1878.



1879.

No.	PRICE.
1875. Mitscherlich's Tubes. Consisting of a glass tube, with a wick of platinum wire to give a continuous supply of material for the Bunsen burner, . . . . .	\$0 30
1876. Dr. Piffard's Mitscherlich Tube, with stopper, . . . . .	50
1877. Stand with eight Mitscherlich's Tubes. Arranged for convenient use. Consisting of a polished brass stand and pedestal, supporting a table with openings for eight tubes. The table turns horizontally, allowing any desired tube to be brought into position. See cut, . . . . .	12 00
1878. Becquerel's Apparatus. For obtaining the spectra of liquids. Single tube on neat stand, with binding-screws, . . . . .	5 50
1879. Becquerel's Apparatus. Set of eight tubes, as in No. 1878, mounted in a hard-rubber platform, on a polished brass stand, with binding-screws, . . . . .	40 00

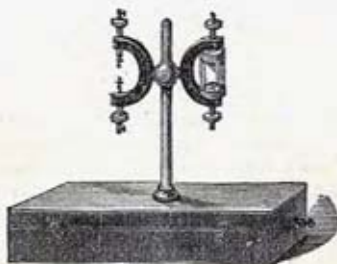


1880.



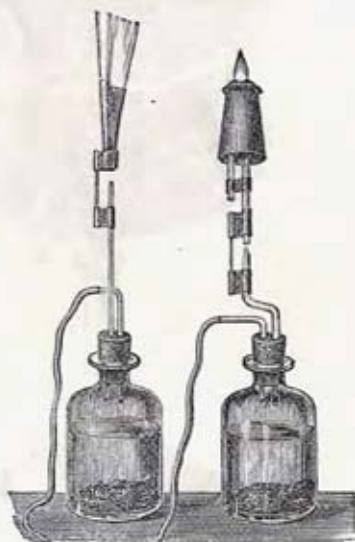
1881.

1880. Metal Holder. A pair of forceps, with clamps, in a neat brass frame, insulated by hard-rubber, and mounted on an adjustable brass stand, . . . . .	10 00
1881. Metal Holder. For eight metals. A pair of hard-rubber plates, with eight pairs of forceps, with attachments to permit the passage of the current through one pair only at a time. This instrument, by which any known metal can be at once brought into comparison with the specimen under examination, and the coincidences, if any, noted at once, without the trouble of <i>mapping</i> the spectrum, has a degree of utility not easily overestimated, . . . . .	42 00
Instruments with any number of holders furnished. Each additional holder, . . . . .	3 00



1883.

No.		PRICE.
1882.	Spark Condenser. For intensifying the spark of the induction coil, in order to volatilize the more refractory metals. Series of ten plates of glass arranged as a cascade battery, and mounted in neat wooden box,	\$12 50
1883.	Improved Spark Condenser. Packed in neat polished mahogany case, with holders for metals, etc. Very compact form,	24 00



1889.

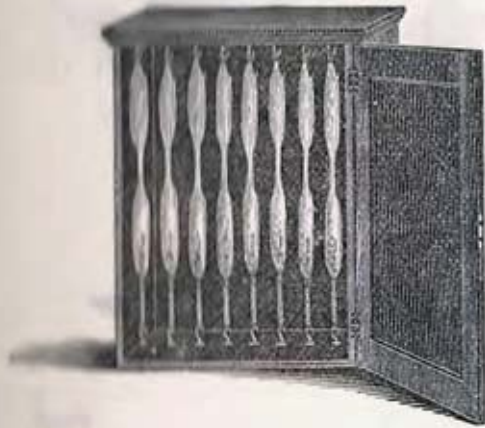


1885.



1886.

1885.	Plucker's Tubes. For obtaining the spectra of gases, each,	2 00
	For list, see page 105, Part 4th, Nos. 5850 to 5867.	
1886.	Stand. For single Plucker's tube, without tube,	2 00
1887.	Set of Eight Plucker's Tubes. With brass mountings, so as to permit the charge from the induction coil to pass through any one desired, in neat box with key. A very safe and convenient arrangement,	23 00
1888.	Stand with Eighteen Plucker's Tubes. A cylinder covered with black velvet, with the tubes arranged around it vertically and equidistant from each other, and having connections so adjusted as to permit any desired tube to be lighted by turning the cylinder, which, for this purpose, rotates upon a vertical axis. Base and top of mahogany, with binding-screws,	60 00



1887.



1888.

No.	PRICE.
1889. Bunsen's Apparatus, to show the reversal of the sodium light, . . .	\$7 50



1890.

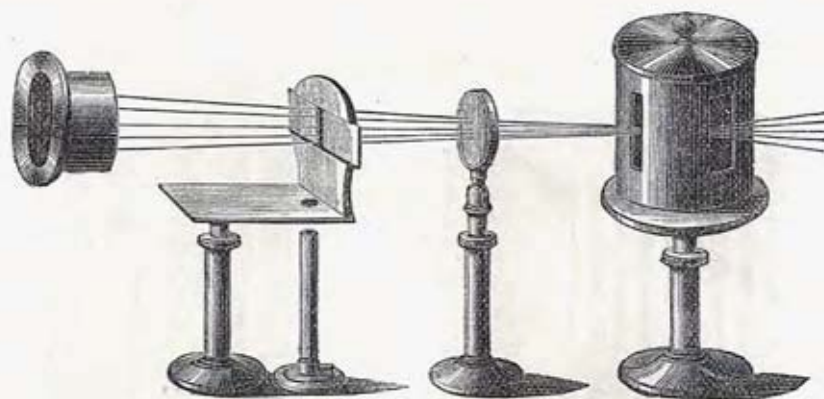


1887.



1893.

1890. Borby Micro-spectroscope. To be used as an eye-piece for the microscope, for determining the spectra of minute bodies, and of solutions. Packed in a neat case, . . .	40 00
1891. Borby Micro-spectroscope. Similar to No. 1890, but with rack motion to eye-piece, and with bright point micrometer, . . .	. . .
1892. Wedge Cells, for examining different thicknesses of a solution. Each, . . .	50
1893. Small Tubes, to hold solutions. Per dozen, . . .	1 25
1894. Specimens in Sealed Tubes, for showing the absorption bands. Each, . . .	50
List of specimens sent on application.	

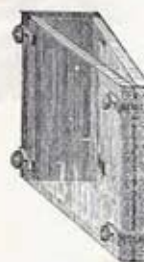


1896.

No.	PRICE.
1895. Spectroscope for Projection. Consisting of a brass stand carrying a slit, and of a pair of hollow prisms for bisulphide of carbon, in polished brass case on stand. Can be added to any lantern by using the condensers and the magnifiers of the lantern, . . . . .	\$40 00
1896. Spectroscope for Projection. Consisting of a pair of condensers, 4½ inches in diameter, in brass cell, a brass stand with adjustable slit, achromatic magnifying lens, 2 inches in diameter, on brass stand, and a pair of hollow prisms for bisulphide of carbon, mounted in a polished brass case on adjustable brass stand. This instrument is furnished with a strong flange, by which the condensers, with magnifiers, can be attached to the front of any lantern of ordinary construction, . . . . .	65 00
1897. Microscope for Projection, of latest construction, . . . . .	45 00
1898. Fine Objective, for use with microscope, . . . . .	20 00
1899. Set of Materials in Sealed Bottles, prepared expressly to be used with the hydro-oxygen blow-pipe, to obtain the spectra for projection. Consisting of sodium, strontium, calcium, lithium and rubidium; per set, . . . . .	3 00



1900.



1901.

1900. Hollow Globe, with plate-glass ends and clamps of brass, to contain iodine, bromine, hypo-nitrous acid, etc., for absorption spectra, each, . . . . .	7 00
1901. Wedge-shaped Cell, for liquids, to show absorption spectra, . . . . .	5 00
1902. Cells with parallel sides, for liquids, to show absorption spectra, . . . . .	2 50
1903. Colored Glasses for absorption. Set of seven. Each 4 inches by 3½,	1



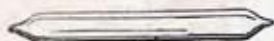
## ON THE TRANSFORMATION OF VIBRATIONS.

### PHOSPHORESCENCE.

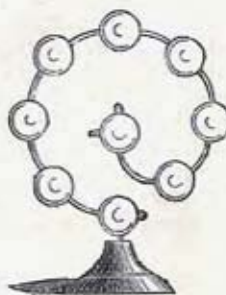
No.		PRICE.
1910.	Phosphorescent Tubes, containing sulphurets of the alkaline earths. Set of four colors, in neat mahogany frame, . . . . .	\$5 00
1911.	Phosphorescent Tubes. Same as No. 1910, but with seven tubes, giving the various tints of the spectrum, . . . . .	10 00

Nos. 1910 and 1911 are excited by placing them for a few moments in the direct rays of the sun, and then removing them quickly to a dark room.

9112.



1913.

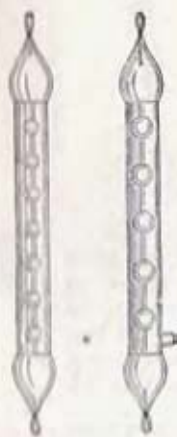


1914, 1915.

1912.	Phosphorescent Geissler Tubes. Straight tubes, seven inches long, containing quantities of the sulphurets of barium, calcium, strontium, etc., each, . . . . .	2 50
1913.	Phosphorescent Geissler Tube, curved as in No. 1913, . . . . .	8 00
1914.	Phosphorescent Geissler Tube, crown-shaped, 8 inches in diameter, . . . . .	5 00
1915.	Phosphorescent Geissler Tube, crown-shaped, 12 inches in diameter, . . . . .	7 50
1916.	Phosphorescent Geissler Tube, double-crown, 15 inches in diameter, . . . . .	20 00

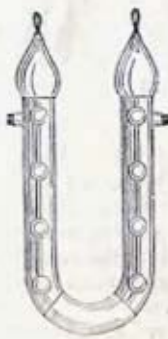
These tubes have the great advantage that they can be used at any time of day or night.

### FLUORESCENCE.

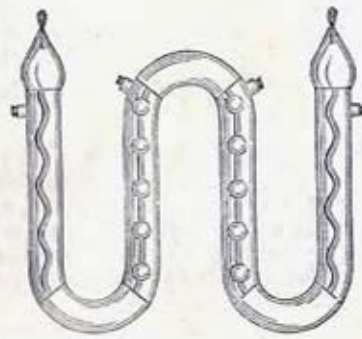


1922.

1926.



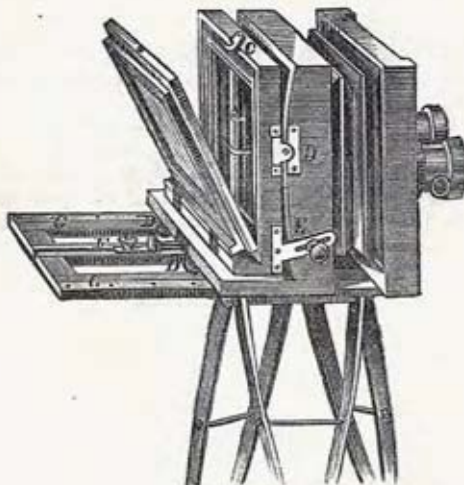
1930.



1931.

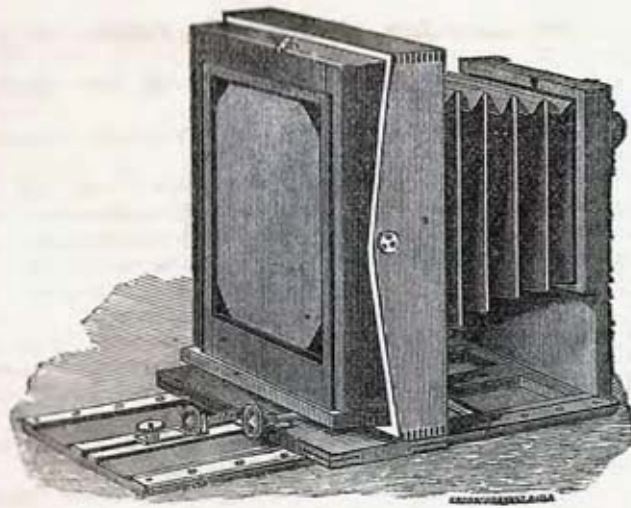
No.	PRICE.
1917. Sulphide of Quinine, in Tartaric Acid, eight-ounce bottle, . . . . .	\$1 50
1918. Chlorophyll, in Alcohol, eight-ounce bottle, . . . . .	
1919. Esculine, in Alcohol, eight-ounce bottle, . . . . .	
1920. Block of Uranium Glass. To show fluorescence when placed under an exhausted receiver upon the air-pump plate, on the passage of a strong discharge from the induction coil, . . . . .	2 50
1921. Block of Uranium Glass. Same as No. 1920, but encased in a polished walnut box, with soft lining, . . . . .	4 00
1922. Double Geissler Tube, 7 inches long, with balls or spirals of uranium glass, to show fluorescence, . . . . .	2 25
1923. Geissler Tube. Same as No. 1923, but 12 inches long, . . . . .	5 00
1924. Geissler Tube. Same as above, but 24 inches long, . . . . .	7 00
1925. Geissler Tube. Same as above, but 30 inches long, . . . . .	9 00
1926. Double Geissler Tube, 7 inches long; outer tube filled with a fluorescent solution, . . . . .	2 25
1927. Geissler Tube. Same as No. 1926, but 12 inches long, . . . . .	5 00
1928. Geissler Tube. Same as above, but 24 inches long, . . . . .	7 00
1929. Geissler Tube. Same as above, but 30 inches long, . . . . .	9 00
1930. Geissler Tube. Double tube, U form, with uranium balls or spirals on the inner tube, the outer to be filled with fluorescent solutions. Arms 9 or 10 inches long, . . . . .	5 00
1931. Geissler Tube. Double. Form of double U. Inner tube with uranium balls or spirals. The four outer to be filled with various fluorescent solutions, . . . . .	12 00

### ACTINISM.



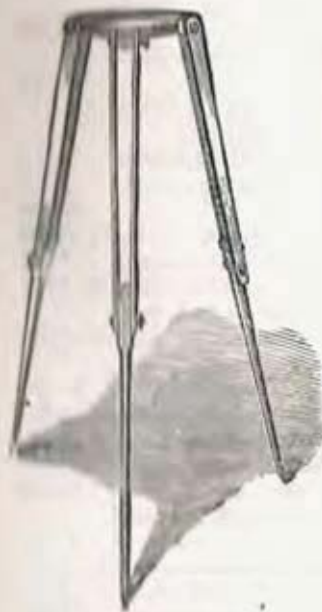
1940, 1941.

- |   |       |
|---|-------|
| 1940. Stereoscopic Camera Box. For plates 5 inches by 8, with patent glass corner-holders, so arranged that the division between the two sides of the view may be removed, and, with one tube only, a picture be made covering the whole plate. By a simple contrivance, the box may be fastened upon the tripod on the side as well as the base, and thus the plate be held with its greatest length vertically, if desired. Without swing back, . . . . . | 30 00 |
| 1941. Stereoscopic Camera Box. Same as No. 1940, but with patent single swing back, . . . . .   | 35 00 |



1942, 1943.

No.		PRICE.
1049.	Pyramidal View Camera Box. Plate 6½ inches by 8½, reversible. Of polished mahogany, with rubber bellows of pyramidal form, so as to shut closely for carrying, and with hinged base, . . . . .	\$40 00
1040.	Pyramidal View Camera Box. Same as No. 1942, but with single swing back, . . . . .	45 00
1044.	Pyramidal View Camera Box. Same as No. 1942, but with double swing back, . . . . .	50 00



1080, 1081.



1989.

No.	PRICE.
1945. Pyramidal View Camera Box. Similar to No. 1942, but for plates 10 inches by 12,	\$60 00
1946. Pyramidal View Camera Box. Same as No. 1945, but with single swing back,	65 00
1947. Pyramidal View Camera Box. Same as No. 1945, but with double swing back,	70 00
1980. Tripod Stand. For any of the foregoing camera boxes. Of light wood, with brass mountings. Firm and rigid when in use, but folding in small compass for packing. With 6-inch wooden top,	3 00
1981. Tripod Stand. Same as No. 1980, but with 12-inch wooden top,	5 00
1982. Pair of View Lenses. Suited also for copying engravings, etc., for Stereoscopic Camera box, Nos. 1940 and 1941. Per pair,	22 00
1983. View Lens. For Camera boxes Nos. 1942, 3, 4, covering the plate,	15 00
1984. View Lens. For Camera boxes Nos. 1945, 6, 7, covering the plate,	22 00
1985. Glass Bath. For nitrate of silver solution, inside measure, 7 inches by 9,	2 50
1986. Glass Bath. Same as No. 1985, but 11 inches by 13,	4 00
1987. Nitrate of Silver, Chloride of Gold, Sulphate of Iron, and all other materials for photographic use, at current market rates.	
1988. Micro-photographic Instrument. Consisting, 1st, of porte lumière, with mirror 18 inches long by 4 wide, with adjustments for directing the light, and a condensing lens 4 inches in diameter.	
2l. Of microscope body, with secondary condensers, holder for objects, and the following assortment of lenses:	
One Photographic Objective 4-inch focus.	
Do. do. 2 do.	
Do. do. 1 do.	
3d. Of a plain Camera, for plates from 4 inches square to 8 inches square,	150 00
1989. Photographic Tent for out-door work, very light, durable and portable. Suitable for plates up to 11 by 14 inches,	75 00

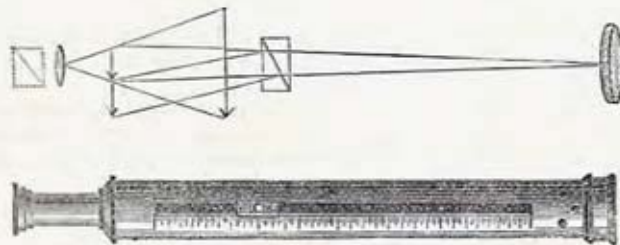
### OF INTERFERENCE AND DIFFRACTION.

2000. Two Mirrors, adjustable to any angle with each other, on a brass stand with clamp,	25 00
2001. Apparatus to permit the passage of a very narrow slit of light, adjustable, of brass,	10 00
2002. Double Prism of Mons. Pouillet, mounted in brass frame on a brass stand with clamp,	
2003. Two Rectilinear Gratings, ruled on glass, mounted in a brass frame on a brass stand, so that they can be rotated to assume any angle with each other, for projection of interferences,	30 00
2004. Circular Grating. Mounted in a brass frame on a brass stand,	25 00
2005. Mica Plates. Mounted in a brass frame, on brass stand, with clamp,	5 00
2006. Newton's Apparatus, to show interference in thin plates; consisting of a thick plate of glass, and a lens of long focus, mounted in a strong brass frame with clamps. Four inches in diameter,	6 50
2007. Newton's Apparatus. For reflection only. Similar to No. 2006, but having a plate of black glass,	10 00
2008. Jamin's Apparatus. To show interference in thick plates. A pair of thick plates of glass, mounted so as to be adjustable to any required angle with each other, and to any requisite distance apart, on a strong brass stand, with clamp,	45 00
2009. Set of Four Diffraction Slits. Of different shapes. Mounted in brass frame on stand, with clamp,	20 00
2010. Interference Bench. To hold all the above pieces of apparatus on interference and diffraction. Consisting of a graduated bar of brass, supported by a pair of posts on a frame of polished mahogany. Length of bar four feet. A telescope, with micrometer, accompanies	

No.		PRICE.
	the bench to measure the distance of the fringes. It is mounted, like the other pieces of the complete apparatus, on a brass stand, with clamp, and has a horizontal movement by means of a screw.	
	With screens, . . . . .	\$200 00

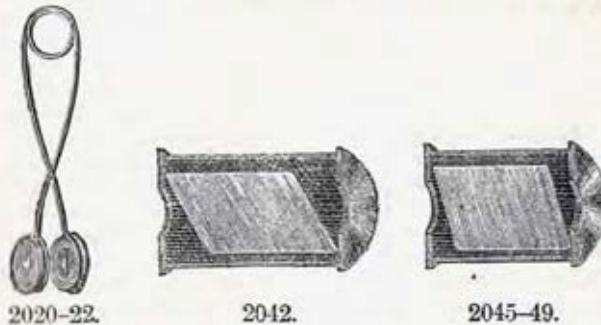
**DOUBLE REFRACTION AND POLARIZATION.**

9011.	Rhomb of Calc-Spar. According to size and transparency,	\$2 50 to 50 00
9012.	Rhomb of Calc-Spar. Cut so as to expose the axis, . . . . .	10 00
9013.	Achromatic Double Image Prism. Three-fourths inch on side, . . . . .	7 50
9014.	Achromatic Double Image Prism. One and a quarter inch on side, . . . . .	15 00
9015.	Achromatic Double Image Prism. Two inches on side, . . . . .	40 00



2016.

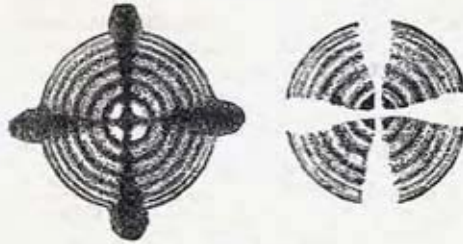
9016.	Rochon Telescope. Which serves to measure the distance of an object if its size be known, by means of a Rochon Prism of Spar, . . . . .	45 00
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9017.	Plate of Polished Black Glass. Mounted on a support so as to be inclined at any angle, . . . . .	20 00
9018.	Bundle of Glass Plates. Carefully polished. Mounted in a brass tube, at the polarizing angle, . . . . .	25 00
9019.	Bundle of Glass Plates. Carefully polished, and mounted in a brass tube. So arranged as to allow both the reflected and refracted rays to be employed, . . . . .	30 00
9020.	Pair of Tourmalines. In tongs, . . . . .	5 00
9021.	Pair of Tourmaline Tongs. Finer quality, . . . . .	10 00
9022.	Pair of Tourmaline Tongs. Three-fourths of an inch in diameter, . . . . .	20 00
9023.	Pair of Tourmaline Plates. Cut parallel to the axis, and mounted in a brass frame, so as to be rotated and crossed at will, to show the extinction of the light, . . . . .	20 00
9024.	Nicol's Prism of Iceland Spar, 8 millimetres across face, . . . . .	2 25
9025.	Do. do. 9 do. do. . . . .	2 75
9026.	Do. do. 10 do. do. . . . .	3 50
9027.	Do. do. 11 do. do. . . . .	4 00

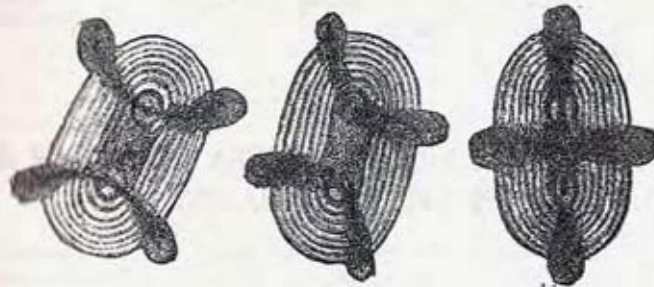
No.		PRICE
2028.	Nicol's Prism of Iceland Spar, 12 millimetres across face . . . . .	\$4 75
2029.	Do. do. 14 do. do. . . . .	6 75
2030.	Do. do. 16 do. do. . . . .	9 75
2031.	Do. do. 20 do. do. . . . .	20 00
2032.	Do. do. 8 do. do. cut perpendicular, . . . . .	4 25
2033.	Do. do. 9 do. do. do. . . . .	5 00
2034.	Do. do. 10 do. do. do. . . . .	5 50
2035.	Do. do. 11 do. do. do. . . . .	6 25
2036.	Do. do. 12 do. do. do. . . . .	7 00
2037.	Do. do. 14 do. do. do. . . . .	10 00
2038.	Do. do. 16 do. do. do. . . . .	15 00
2039.	Do. do. 20 do. do. do. . . . .	25 00
2040.	Do. Brass-mounted, 30 millimetres across the face, . . . . .	80 00
2041.	Do. do. 40 do. do. do. . . . .	125 00
2042.	Brass Mountings for Nicol's Prisms, Nos. 2024 to 2039, with cork setting and glass ends. Without prism. According to size. Each, from . . . . .	1 00 to 10 00
2043.	Pair of Nicol's Prisms, 12 millimetres in diameter. Mounted in a neat brass frame, with handle, so that each prism can be rotated at pleasure. With holder for object, and lens for giving diverging rays. Very suitable for examining the rings in crystals, . . . . .	20 00
2044.	Pair of Nicol's Prisms, 16 millimetres in diameter. Mounted same as No. 2043, . . . . .	25 00
2045.	Foucault's Prism. For polarization of parallel rays. 12 millimetres across the face. Mounted in brass cell, . . . . .	6 00
2046.	Foucault's Prism. Same as No. 2045. 16 millimetres across, . . . . .	15 00
2047.	Foucault's Prism. Same as No. 2045. 30 millimetres across, . . . . .	25 00
2048.	Foucault's Prism. Same as No. 2045. 40 millimetres across, . . . . .	35 00
2049.	Foucault's Prism. Same as No. 2045. 60 millimetres across, . . . . .	100 00
2050.	Hoffmann's New Polarizing Prism. 12 millimetres opening. Mounted in brass cell, . . . . .	10 50
2051.	Hoffmann's Prism. Same as No. 2050. 15 millimetres opening, . . . . .	15 00
2052.	Hoffmann's Prism. Same as No. 2050. 20 millimetres opening, . . . . .	36 00
2053.	Hoffmann's Prism. Same as No. 2050. 25 millimetres opening, . . . . .	50 00
2054.	Hoffmann's Prism. Same as No. 2050. 30 millimetres opening, . . . . .	75 00
2055.	Hoffmann's Prism. Same as No. 2050. 35 millimetres opening, . . . . .	90 00
2056.	Hoffmann's Prism. Same as No. 2050. 40 millimetres opening, . . . . .	135 00
2057.	Hoffmann's Prism. Same as No. 2050. 45 millimetres opening, . . . . .	180 00
2058.	Hoffmann's Prism. Same as No. 2050. 50 millimetres opening, . . . . .	250 00
2059.	Hoffmann's Prism. Same as No. 2050. 55 millimetres opening, . . . . .	315 00
2060.	Hoffmann's Prism. Same as No. 2050. 60 millimetres opening, . . . . .	375 00
2061.	Plate of Selenite, of uniform thickness; tints, red and green, . . . . .	2 50
2062.	Plate of Selenite, of uniform thickness; tints, yellow and blue, . . . . .	2 50
2063.	Plate of Selenite, in the form of a concave lens, showing the various tints of the spectrum in order, . . . . .	10 00
2064.	Plate of Mica, of uniform thickness; tints, red and green, . . . . .	2 50
2065.	Plate of Mica, of uniform thickness; tints, yellow and blue, . . . . .	2 50
2066.	Plate of Selenite, of uneven thickness, giving various tints, . . . . .	2 50
2067.	Plate of Mica, of uneven thickness, giving various tints, . . . . .	2 50
2068.	Plate of Quartz, cut parallel to the axis; thin, . . . . .	3 00
2069.	Plate of Quartz, cut parallel to the axis; thick, . . . . .	3 00
2070.	Series of seven plates of Quartz, cut parallel to the axis, giving the tints of the spectrum, . . . . .	24 00
2071.	Plate of Quartz, cut parallel to the axis, and ground into the form of a concave lens, to show the colors due to different thicknesses in a succession of rays, . . . . .	10 00
2072.	Plate of Quartz (oblique), giving hyperbolas, single, . . . . .	3 50
2073.	Plate of Quartz (oblique), giving hyperbolas, double, . . . . .	6 00
2074.	Plate of Calc-spar, giving hyperbolas, single, . . . . .	3 00
2075.	Plate of Calc-spar, giving hyperbolas, double, . . . . .	

No.	PRICE.
2076. Plate of Quartz, giving sensitive tint, . . . . .	\$3 00
2077. Plate of Mica, giving sensitive tint, . . . . .	3 00
2078. Plate of Selenite, giving sensitive tint, . . . . .	3 00



2079.

2079. Plate of Calc-spar cut perpendicular to the axis, and giving the circles and cross, . . . . .	2 00
2080. Plate of Sulphate of Nickel, cut perpendicular to the axis, . . . . .	3 50



2085.

2086. Plate of Nitre, cut perpendicular to the median line, so as to show both systems of rings, . . . . .	3 00
2086. Plate of Sugar. Perpendicular to the median line, . . . . .	2 50
2087. Plate of Arragonite. Perpendicular to the median line, . . . . .	4 00
2088. Plate of Chromate of Potash. Perpendicular to the median line, . . . . .	2 50
2089. Plate of Quartz. Cut perpendicular to the axis, left-handed, . . . . .	5 00
2090. Plate of Quartz. Cut perpendicular to the axis, right-handed, . . . . .	5 00
2091. Compound Plate of Quartz. One half left-handed and the other right-handed, . . . . .	10 00



2102.



2103.



2104.

No.	PRICE.
2092. Compound Plate of Quartz, giving the spirals of Airy, . . . . .	\$8 00
2093. Babinet's Compensating Prism, . . . . .	10 00
2094. Calc-Spar. Cut perpendicular to the axis, to show phenomena of hemitropic crystals, . . . . .	5 00
2095. Film of Mica, of one-quarter wave, for circular polarization, per pair, . . . . .	8 00
2096. Fresnel's Rhomb, for circular polarization, in brass case, per pair, . . . . .	30 00
2097. Verre Trempe. Square form, 1 inch across, . . . . .	3 00
2098. Verre Trempe. Triangular form, 1 inch on a side, . . . . .	3 00
2099. Verre Trempe. Rectangular form, 1 inch long, . . . . .	3 00
2100. Verre Trempe. Pentagonal form, 1 inch across, . . . . .	3 00
2101. Verre Trempe. Hexagonal form, 1 inch across, . . . . .	3 00
2102. Brass Frame, with handle, to show the effect of heat upon glass, . . . . .	7 50
2103. Brass Frame, with screw-press, to show the effect of transverse strain upon a bar of glass placed in it, . . . . .	12 50
2104. Brass Frame, with screw-press to show the effect of the strain upon the structure of a block of plate-glass placed in it, . . . . .	12 50
2105. Selenite Films of <i>uneven</i> thickness, figure of a star, . . . . .	\$3 00 to 10 00
2106. Selenite Films. Similar to No. 2105, figure of <i>bird</i> , . . . . .	3 00 to 12 00
2107. Selenite Film. As above, figure of <i>butterfly</i> , . . . . .	3 00 to 12 00
2108. Selenite Film. Figure of <i>bunch of grapes</i> , . . . . .	3 00 to 12 00
2109. Selenite Film. Figure of a <i>crown</i> , . . . . .	3 00 to 12 00
2110. Selenite Film. Figure of <i>tetrahedron</i> , . . . . .	3 00
2111. Selenite Film. Figure of <i>octahedron</i> , . . . . .	3 00

### ON THE PROJECTION OF THE PHENOMENA OF DOUBLE REFRACTION AND POLARIZATION.

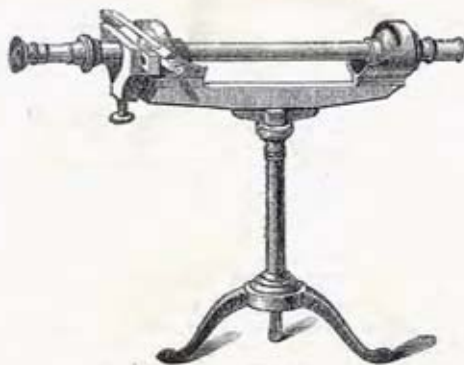
2115. Double Image Prisms for Projection. Consisting of one achromatic double image prism, $1\frac{1}{2}$ inches across the face, and one $\frac{3}{8}$ inch across the face, with a focusing lens and selenite plate, to demonstrate to a large audience the phenomena of double refraction and complementary colors. Mounted in brass, on a plain stand, . . . . .	40 00
2116. Double Image Prisms for Projection. Similar to No. 2115, but with one prism 2 inches across the face, the other, $1\frac{1}{2}$ inches, . . . . .	90 00
2117. Polariscopes for Projection. Consisting of a bundle of glass plates for polarizer, arranged to show the polarization of both the reflected and refracted rays, with a Nicol's prism, 20 millimetres across the face, for analyzer; a lens for focusing the object, and a stage for holding it. Mountings of brass, . . . . .	75 00
2118. Polariscopes for Projection. Consisting of a Foucault prism, $1\frac{1}{2}$ inches in diameter, for a polarizer; a Nicol's prism, 20 millimetres across the face, as an analyzer; a lens for focusing the object, and a stage for holding it, . . . . .	75 00
2119. Polariscopes for Projection. Consisting of a Foucault prism, $2\frac{1}{2}$ inches in diameter, as a polarizer; a Nicol's prism, $1\frac{1}{2}$ inches in diameter, as an analyzer; a lens for focusing the object, and a stage for holding it, . . . . .	200 00
2120. Polariscopes for Projection. Consisting of a Nicol's prism, 3 inches in diameter, as a polarizer; a Nicol's prism, 2 inches in diameter, as an analyzer; a lens for focusing the objects, and a stage for holding it, . . . . .	800 00
2121. Polariscopes for Projection. Consisting of a Hoffmann's prism, of 30 millimetres opening, as a polarizer; a Hoffmann's prism of 20 millimetres opening, as an analyzer; a lens for focusing the object, and a stage for holding it, . . . . .	150 00
2122. Polariscopes for Projection. Consisting of a Hoffmann's prism, of 45 millimetres opening, as a polarizer; a Hoffmann's prism, of 30 millimetres opening, as an analyzer; a lens for focusing the object, and a stage for holding it, . . . . .	315 00



No.		Price.
9123.	Polariscope for Projection. Consisting of a Hoffmann's prism, of 60 millimetres opening, as a polarizer; a Hoffmann's prism, of 45 millimetres opening, as an analyzer; a lens for focusing the object, and a stage for holding it,	\$625 00
	All the above polariscopes for projection are intended to be attached to any good hydro-oxygen or electric lantern, or to a heliostat, in case sunlight is used. They are neatly mounted, so as to admit all the needed movements, in brass fittings, upon polished mahogany bases.	

**POLARISCOPES for the STUDY of ATMOSPHERIC POLARIZATION, etc.**

9124.	Polariscope of Babinet. Consisting of a plate of "terre trempée," at one end of a brass tube 10 inches long, and a tourmaline plate or Nicol's prism at the other,	15 00
9125.	Polariscope of Savart. Consisting of a double plate of quartz, and a tourmaline plate, in a small brass cell,	10 00
9126.	Polariscope of Arago. Consisting of a double plate of quartz, and a double refracting prism, placed at opposite ends of a brass tube, 10 inches long,	24 00
9127.	Polariscope of Senarmont. Consisting of a double compound prism of right-handed and left-handed quartz, and a tourmaline or Nicol's prism set in a brass tube,	24 00



2128.

9128.	Mitscherlich's Apparatus, for investigating the laws of rotary polarization,	60 00
9129.	Moleil's Saccharimeter, with four tubes, three of brass, and one of glass, for the fluid. Full instructions for use accompany each instrument,	130 00
9130.	New Table Polariscope. Believing there is a great want felt, both by students and educators, for some better means of illustrating the polarization of light, at a moderate cost, I have designed and constructed an instrument for that end; (cut of which is given on p. 72). <i>A</i> is the black glass polarizer; <i>B</i> the analyzer, a Nicol's prism; <i>C</i> the rotating stage or object-holder; <i>D</i> and <i>E</i> the lenses for increasing the illumination and enlarging field of view. These lenses are required only in examining the rings of crystals. To use the instrument for this purpose, place it so as to receive the best illumination upon the mirror. Slide the lenses <i>D</i> and <i>E</i> to or from the stage until a clear and equal illumination is obtained. Then	

No.

PRICE.

place the specimen upon the stage and fasten it in the centre of the field of view by one of the little springs upon the stage; then by rotating the analyzer all the phases of polarization are obtained. To use the instrument for selenites, chemically prepared crystals, etc., remove the lenses and tube, put the Nicol in the short tube, place the instrument in suitable light and proceed as above, . . . \$25 00

### NEW TABLE POLARISCOPE.



2130.

2131. We have further elaborated this Polariscope so as to make it an instrument for exact measurement; it is provided with co-ordinate graduated circles for the object, and graduated azimuth circles for the analyzer, . . . . . 60 00  
 We are pleased to be able to state that a medal was awarded this instrument at the Centennial Exhibition.
2132. New Polariscope for Projection. (See new Physical Lantern). This instrument consists of a large black glass mirror, for a polarizer, and a Nicol's prism as an analyzer. The mirror is incased in solid brass, and finely finished; the selenites, etc., are placed in a holder attached to the brass case. The Nicol's prism is mounted in a tube, on an adjusting stand of brass. The object-holder and Nicol's prism, are both arranged to rotate; used in connection with any good oxy-hydrogen lantern, such as our New Physical Lantern, a finely polarized field of from 10 to 12 feet in diameter, can be obtained. Complete, with necessary lenses, . . . . . 75 00

### ACCIDENTAL COLORS.

2133. A frame of polished mahogany, two feet square, standing vertically, on a base of same material, and intended to support two pieces of heavy paper, one white, the other black. A set of ten white and

No.	brilliantly colored discs accompany the instrument, to be fastened at the middle of the former two. Full directions for use with each instrument,	PRICE \$15 00
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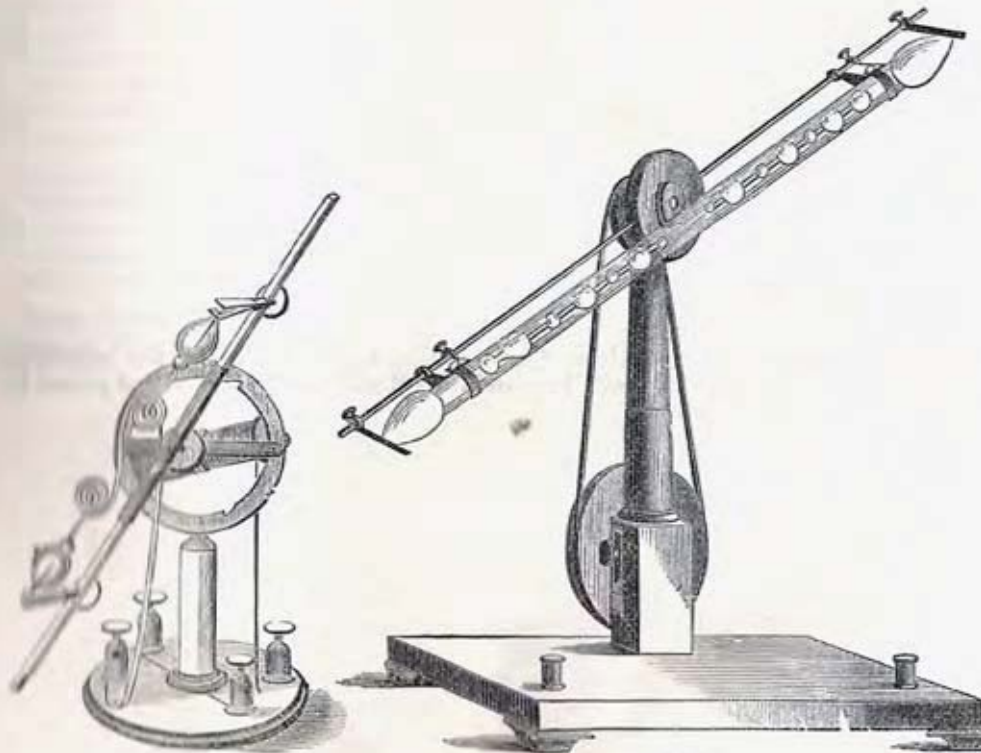
**HARMONY AND MUTUAL INFLUENCE OF COLORS.**

2104. A frame of polished mahogany, two feet square, standing vertically, intended to support in turn the following discs and squares:

No. 1. A square piece of white paper, two feet square.

2.	Do.	do.	black	do.	do.
3.	Do.	do.	gray	do.	do.
4.	Do.	do.	red	do.	do.
5.	Do.	do.	orange	do.	do.
6.	Do.	do.	yellow	do.	do.
7.	Do.	do.	green	do.	do.
8.	Do.	do.	blue	do.	do.
9.	Do.	do.	indigo	do.	do.
10.	Do.	do.	violet	do.	do.

Besides these *ground tints*, the following colored discs, each ten inches in diameter, are attached as desired at the centre. Black, gray, white, red, orange, yellow, green, blue, indigo and violet, . . . 20 00



2140.

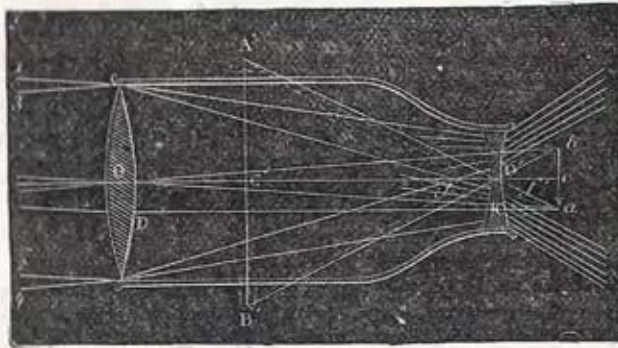
2144.

2135. Anorthoscope. Consisting of two wheels of card-board, 20 inches in diameter, to be rotated on the same axis with equal velocity in opposite directions. Each of them is cut by an equal number of the same sized rays. Mounted on a neat, firm rotating stand of polished mahogany,	20 00
2136. Thaumatrope,	5 00

No.	PRICE.
2137. Photodrome. Consisting of a strong rotator, carrying three discs of devices, each 30 inches in diameter, painted on paper; and a small rotator carrying a smaller disc of card-board, with openings in it, to allow the light from a calcium, magnesium or electric lantern to be thrown upon the first disc by flashes. Each rotator is revolved rapidly, producing the most curious effects upon the large disc, . . .	\$50 00
2138. Zeotrope, or Wheel of Life. For projection by the calcium, magnesium or electric lantern, . . . . .	15 00
2139. Automatic Rotator for Geissler's Tubes, and a set of six tubes. Selected for their special fitness for this use. Tubes, each from 7 to 9 inches long, in a neat box, . . . . .	17 50
2140. Automatic Rotator. No. 2140, <i>without</i> the tubes, . . . . .	10 00
2141. Automatic Rotator for Geissler's Tubes. Larger and more elegant model, carrying tubes from 7 to 12 inches long, <i>without</i> tubes, . . .	20 00
2142. Automatic Rotator for Geissler's Tubes. Grand model, without tubes, . . . . .	30 00
2143. Rotator for Geissler's Tubes. Of mahogany, not automatic, and carrying tubes from 12 to 30 inches long, . . . . .	30 00
2144. Grand Rotator for Geissler's Tubes. Of mahogany, with two or four arms, suitable for carrying either one tube from 20 to 48 inches long, or four tubes, each 20 inches long, as may be desired, . . . . .	75 00

Magic Lanterns and Stereopticons for projection, together with all the apparatus used in connection with them, will be found fully described, illustrated and priced in part third of our Catalogue.

OPERA-GLASSES.



The Opera-glass is a double telescope, constructed optically on the same principle as the telescope invented by Galileo, and is used for looking at objects that require to be clearly seen rather than greatly magnified—such as scenery and performances in theatres and public halls. Each tube contains a convex achromatic object lens and a double concave eye lens, which are placed at nearly the difference of their focal length apart. Thus, if the object-glass is five inches focus, and the eye-piece one inch negative focus, the length of the bodies will be about four inches, and the power will be nearly five times—that is, the objects looked at through the opera-glass will be seen as distinctly as they would be with the naked eye if brought four times nearer the observer. Opera-glasses are short and light, and can be easily managed with one hand; they have small magnifying power, say from two to four times.

The two object-glasses or large lenses are the most important ones, and upon their perfection the quality of the opera-glass depends. In the low-priced glasses, such as No. 2150, though the object-glasses are achromatic, they are not accurately corrected for chromatic and spherical aberration; the bodies also to such glasses are not as substantially made as those of the higher-priced descriptions.

These Glasses are designated and priced according to the diameter of the object-glasses in French lines, as follows:

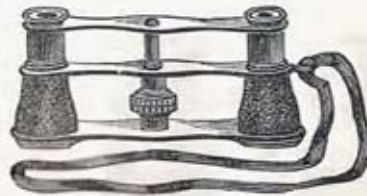
11 Lines, which is equal to 1 inch.		
13 Do.	do.	$1\frac{2}{5}$ inches.
15 Do.	do.	$1\frac{5}{8}$ do.
17 Do.	do.	$1\frac{7}{8}$ do.
19 Do.	do.	$1\frac{11}{16}$ do.
21 Do.	do.	$1\frac{1}{2}$ do.
24 Do.	do.	$2\frac{1}{8}$ do.
26 Do.	do.	$2\frac{5}{16}$ do.



2150.

2154.

No.							PRICE
Opera-Glasses, six lenses, achromatic object-glasses, metal bodies, covered with black imitation Turkey morocco, cross-pieces and tubes all black.							
2150.	Body	2½	inches	long,	object-glasses	13 lines in diameter, each, . . .	\$3 50
2151.	Do.	2½	do.	do.	15	do. do. . . . .	4 00
2152.	Do.	3	do.	do.	17	do. do. . . . .	4 50
2153.	Do.	3½	do.	do.	19	do. do. . . . .	5 00
Opera-Glasses, six lenses, achromatic object-glasses, metal bodies, covered with fancy colored morocco, cross-pieces and tubes japanned black.							
2154.	Body	2½	inches	long,	object-glasses	13 lines in diameter, each, . . .	6 50
2155.	Do.	2½	do.	do.	15	do. do. . . . .	7 00
2156.	Do.	3	do.	do.	17	do. do. . . . .	8 00
2157.	Do.	3½	do.	do.	19	do. do. . . . .	9 50
Opera-Glasses, the same as 2154, but with the tubes and cross-pieces gilt.							
2158.	Body	2½	inches	long,	object-glasses	13 lines in diameter, each, . . .	7 00
2159.	Do.	2½	do.	do.	15	do. do. . . . .	7 50
2160.	Do.	3	do.	do.	17	do. do. . . . .	8 50
2161.	Do.	3½	do.	do.	19	do. do. . . . .	10 00
Bardou's Opera-Glasses, six lenses, achromatic object-glasses, bodies, tubes and cross-pieces all black; bodies covered with best Turkey morocco; cross-pieces curved.							
2162.	Body	2½	inches	long,	object-glasses	13 lines in diameter, each, . . .	8 00
2163.	Do.	2½	do.	do.	15	do. do. . . . .	8 50
2164.	Do.	3	do.	do.	17	do. do. . . . .	9 50
2165.	Do.	3½	do.	do.	19	do. do. . . . .	11 00
Bardou's Opera-Glasses. The same as 2162, but with twelve lenses.							
2166.	Body	2½	inches	long,	object-glasses	13 lines in diameter, each, . . .	13 00
2167.	Do.	2½	do.	do.	15	do. do. . . . .	14 00
2168.	Do.	3	do.	do.	17	do. do. . . . .	16 00
2169.	Do.	3½	do.	do.	19	do. do. . . . .	18 00
Bardou's Opera-Glasses, six lenses, rock crystal, achromatic object-glasses, bodies, tubes and cross-pieces all black; bodies covered with best Turkey morocco; cross-pieces curved.							
2170.	Body	2½	inches	long,	object-glasses	13 lines in diameter, each, . . .	10 00
2171.	Do.	2½	do.	do.	15	do. do. . . . .	10 50
2172.	Do.	3	do.	do.	17	do. do. . . . .	12 00
2173.	Do.	3½	do.	do.	19	do. do. . . . .	13 50



2180.



2183.

2180. Opera-Glass, for the vest pocket, six lenses, achromatic object-glasses, black leather body, and cross-pieces, in soft leather case, . . . . . 3 50
2181. Opera-Glass, for the vest pocket, six lenses, achromatic object-glasses, white pearl body, gilt cross-pieces, in soft leather case, . . . . . 5 00

No.		PRICE.
2183.	Opera-glass, for the vest pocket, six lenses, achromatic object-glasses, colored pearl body, gilt cross-pieces, in soft leather case, . . . . .	\$10 00
2183.	Opera-glass, conical body, 5 inches long when adjusted, achromatic object-glasses 15 lines, in soft leather case, . . . . .	9 50
2184.	Opera-glass, conical body, 5½ inches long, object-glass 17 lines, . . . . .	11 50
2185.	Do. do. 6 do. do. 19 do. . . . .	13 50
2186.	Do. do. 6½ do. do. 21 do. . . . .	15 00

These Glasses, from No. 2183, on account of their length, are of very high power, and quite convenient for summer tourists' use.

**PEARL OPERA-GLASSES.**



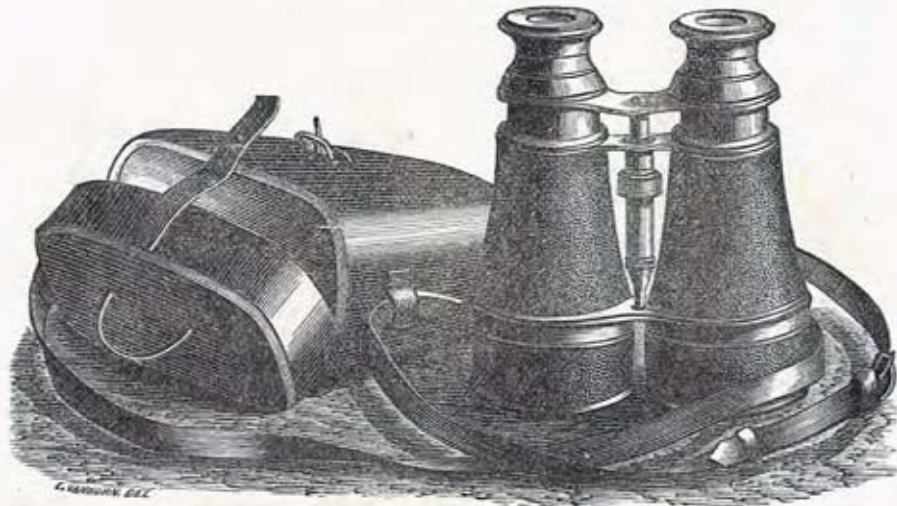
Opera-glasses, six lenses, achromatic object-glasses, white pearl bodies, gilt tubes and cross-pieces, low eye-pieces.		
2187.	Body 1½ inches long, object-glasses 13 lines in diameter, each, . . . . .	12 00
2188.	Do. 2½ do. do. 15 do. do. . . . .	13 00
2189.	Do. 2½ do. do. 17 do. do. . . . .	15 00
2190.	Do. 2½ do. do. 19 do. do. . . . .	17 00
Opera-glasses, six lenses, achromatic object-glasses, white pearl bodies, gilt tubes and cross-pieces, raised eye-pieces.		
2191.	Body 2½ inches long, object-glasses 13 lines in diameter, each, . . . . .	16 00
2192.	Do. 3 do. do. 15 do. do. . . . .	17 00
2193.	Do. 3½ do. do. 17 do. do. . . . .	19 00
2194.	Do. 3½ do. do. 19 do. do. . . . .	21 00
Opera-glasses, six lenses, achromatic object-glasses, bodies of alternate stripes, black and white pearl, pearl top, gilt cross-pieces and tubes, very beautiful.		
2195.	Body 5½ inches long, object-glasses 13 lines in diameter, each, . . . . .	16 00
2196.	Do. 2½ do. do. 15 do. do. . . . .	18 00
2197.	Do. 3 do. do. 17 do. do. . . . .	20 00

**FIELD-GLASSES.**

With the opera-glass a low magnifying power and large and clear field of view are the great objects to be desired, on account of the comparative nearness of the objects looked at; but when the objects are one or more miles distant, power becomes a more important quality than field of view. To obtain a greater magnifying power with glasses constructed upon the principle of the opera-glass, the distance between the object-glasses and eye-pieces must be increased, and the greater that distance the higher the power. In order to keep up fair proportion of light with the increase of power, the object-glasses must increase in diameter. Such glasses, as they are only intended for outdoor use, are called Field or Marine-glasses, have shades to extend beyond the object-glasses to keep off the sun or rain, and are made throughout very substantially, in order to bear rough handling of field or sea service. They are put

up in strong leather cases, with strap to sling over the shoulder. The power of field-glasses varies from five to eight times, and their clearness and efficiency depend upon the accuracy of finish of the object-glasses, and their durability to the strength and good workmanship of the body.

### MARINE AND FIELD-GLASSES.



2200.

No.		PRICE.
	Lemair U. S. Army Signal Service, Marine, or Field-Glass, six lenses, achromatic object-glasses, metal body, covered with Turkey morocco, sun-shade to extend over the object-glasses, and heavy leather case, with strap; very fine.	
2200.	Body 5 $\frac{3}{4}$ inches long, object-glasses 21 lines in diameter, . . . .	\$15 00
2201.	Do. 5 $\frac{1}{2}$ do. do. 24 do. . . . .	17 00
2202.	Do. 6 $\frac{1}{4}$ do. do. 26 do. . . . .	18 00
	Bardou's U. S. Army Signal Service, Marine, or Field-Glass, six lenses, achromatic object-glasses, metal body, covered with Turkey morocco, sun-shade to extend over the object-glasses, and heavy leather case, with strap; very superior.	
2203.	Body 6 inches long when adjusted, object-glasses 21 lines in diameter, . . . .	21 00
2204.	Do. 6 $\frac{3}{4}$ do. do. do. 24 do. do. . . . .	23 00
2205.	Do. 7 $\frac{1}{2}$ do. do. do. 26 do. do. . . . .	26 00
	Bardou's U. S. Army Signal Service, Marine, or Field-Glass, six lenses, achromatic object-glasses, body covered with Turkey morocco, with hinge adjustment for different widths of eyes, sun-slides to extend over the object-glasses, in fine leather case, with strap.	
2206.	Body 6 inches long when adjusted, object-glasses 21 lines in diameter, . . . .	24 00
2207.	Do. 6 $\frac{3}{4}$ do. do. do. 24 do. do. . . . .	26 00
2208.	Do. 7 $\frac{1}{2}$ do. do. do. 26 do. do. . . . .	28 00
	Field-Glass, six lenses, achromatic object-glasses, metal body, covered with morocco, sun-shades to extend over the object-glasses, and leather case, with strap.	
2209.	Body 4 $\frac{3}{4}$ inches long, object-glasses 21 lines in diameter, . . . .	10 00
2210.	Do. 5 $\frac{3}{4}$ do. do. 24 do. . . . .	11 00
2211.	Do. 6 $\frac{1}{4}$ do. do. 26 do. . . . .	12 00



Field, Marine, or Opera-Glass, with three sets of adjustable eye-lenses of different powers, achromatic object-glasses, metal bodies, covered with finest Turkey morocco, sun-shades to extend over the object-glasses, and fine leather cases, with strap.

2212.	Body 3½ inches long, object-glasses 17 lines in diameter,	. . .	\$16 00
2213.	Do. 4 do. do. 19 do.	. . .	18 00
2214.	Do. 5 do. do. 21 do.	. . .	20 00
2215.	Do. 6½ do. do. 24 do.	. . .	22 00

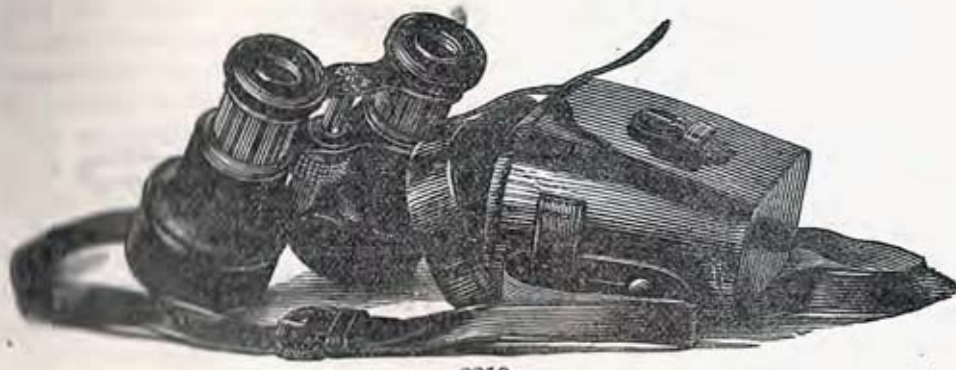


2209. 2212. 2216.

Field-Glass, Rock Crystal, achromatic object-glasses, extends at both ends in focusing, so that, when closed, the instrument can be conveniently carried in the pocket, in morocco case, without strap; very powerful.

2216.	Body 2 inches long, object-glasses 10 lines in diameter,	. . .	14 00
2217.	Do. 2½ do. do. 11 do.	. . .	16 00
2218.	Do. 3 do. do. 15 do.	. . .	18 00

**THE GEM.**



2219.

A compact Field-Glass, which is equally well adapted to the theatre or field; and for the latter purpose, as well as for the use of the race-course, is a powerful, compact and perfect instrument, being small enough to be carried in the pocket, with good power, large field of view and sharp definition.

2219.	Body 3½ inches long, object-glasses 19 lines diameter,	. . .	20 00
2220.	Do. 4 do. do. 20 do. do.	. . .	21 00

## ACHROMATIC SPY-GLASSES.



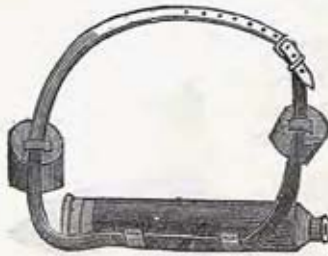
2275.



2279.

No.	PRICE.
2275. Achromatic Spy-glass, with wood body and three draws, 15 inches long when drawn out, 6 inches long when shut up; object-glass 1 inch in diameter. Power 15 times, . . . . .	\$2 50
2276. Achromatic Spy-glass, with wood body and three draws, 16 inches long when drawn out, 6 inches long when shut up; object-glass 1½ inches in diameter. Power 20 times, . . . . .	3 50
2277. Achromatic Spy-glass, with wood body and three draws, 23 inches long when drawn out, 8 inches long when shut up; object-glass 1¾ inches in diameter. Power 25 times, . . . . .	4 75
2278. Achromatic Spy-glass, with wood body and three draws, 30 inches long when drawn out, 10 inches long when shut up; object-glass 1⅝ inches in diameter. Power 30 times, . . . . .	7 00
2279. Achromatic Spy-glass, with wood body and four draws, 37 inches long when drawn out, 11 inches long when shut up; object-glass 1¾ inches in diameter; a very superior glass. Power 35 times, . . . . .	12 00
2280. Achromatic Spy-glass, with wood body and four draws, 42 inches long when drawn out, 11½ inches long when shut up; object-glass 2½ inches in diameter, with sun-glass. Power 40 times, . . . . .	20 00
2281. Achromatic Spy-glass, with wood body and four draws, 48 inches long when drawn out, 13½ inches long when shut up; object-glass 2¾ inches in diameter, with sun-glass. Power 50 times, . . . . .	30 00

## TOURISTS' SPY-GLASSES.



2290.



2291.

2290. Tourists' Achromatic Spy-glass, with brass body, covered with black Turkey morocco; three draws, 17 inches long when drawn out, 6 inches long when shut up; object-glass 1½ inches in diameter; sunshade to slip beyond the object-glass; heavy leather caps to cover both the eye-glass and object-glass; strong leather strap to sling over the shoulder. Power 20 times, . . . . .	9 00
2291. Same as No. 2290, but is 21 inches long when drawn out, 7 inches long when shut up; object-glass 1⅝ inches diameter. Power 25 times, . . . . .	13 00

No.		Price.
2202	Same as No. 2200, but is 24 inches long when drawn out, 9 inches long when shut up; object-glass $1\frac{1}{2}$ inches in diameter. Power 30 times,	\$18 00
2203	Same as No. 2200, but has four draws, and is 36 inches long when drawn out, 10 inches long when shut up; object-glass 2 inches in diameter. Power 35 times,	25 00
2204	Wife spy-glass, $10\frac{1}{2}$ inches long, body covered with black leather; achromatic object-glass $\frac{1}{2}$ inch in diameter. Power 10 times,	2 50

**OPTICAL PRINCIPLES OF THE SPY-GLASS.**

In order that the advantages gained by the use of the spy-glass may be more fully understood, we shall here briefly consider the optical principles involved in its construction.

The object-glass, receiving the rays of light which proceed from all the points of a visible object, converges them to a focus, and there forms a minute, inverted and very bright image, which may be seen by placing a piece of ground glass to receive it at that point.

The eye-piece, acting as a compound microscope, magnifies this image, restores it to its natural position, and conveys it to the eye.

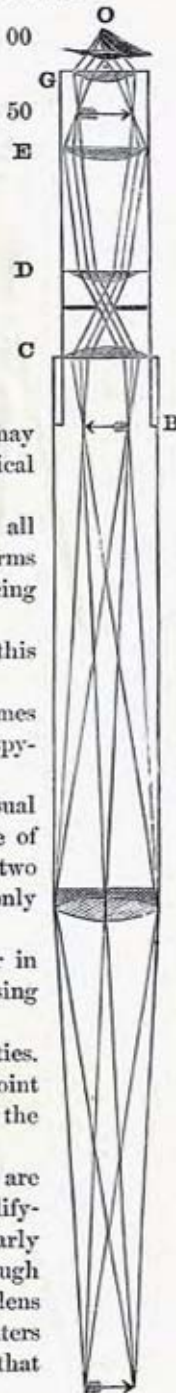
The visual angle which the image there subtends, is as many times greater than that which would be formed without the use of the spy-glass as the number which expresses its magnifying power.

Thus, a spy-glass which magnifies twenty times increases the visual angle just as much, and therefore diminishes the apparent distance of the object twenty times; or, in other words, it will show an object two hundred feet distant, with the same distinctness as if it was distant only ten feet from the naked eye.

The accompanying cut will give a correct idea of the manner in which the rays of light coming from an object are affected by passing through the several glasses of a spy-glass.

We shall only consider the rays which proceed from the extremities. These, after passing through the object-glass are converged to the point *B*, the common focus of the object and eye-glasses. At this place the rays cross each other, and the image is inverted.

The rays next come to the object-lens *C*, and passing through it are refracted so as again to cross each other, and come thus to the amplifying lens *D*. By this they are again refracted, made more nearly parallel, and thus reach the large field-lens *E*. After passing through this, they form a magnified and erect image in the focus of the eye-lens *G*. By the eye-lens the image is still further magnified, and at last enters the eye of the observer, subtending an angle as much greater than that at the point *O*, as is the magnifying power of the spy-glass.





2300.



2301.



2302.



2303.

No.		PRICE.
2300.	Wooden Tripod Stand, with vertical and horizontal motion, upon which to place a spy-glass; an exceedingly useful article, as a glass of much power cannot be held in the hand with sufficient steadiness to produce the best effect, . . . . .	\$5 00
2301.	Wooden Tripod Stand. Stronger and more steady than No. 2300, . . . . .	7 50
2302.	Tripod Stand. Mahogany legs, which, when closed together, form a round rod 2 inches in diameter and 35 inches long; brass head with adjustable clamp, to surround body and hold spy-glass. This is a very light, portable, convenient and handsomely made spy-glass stand, . . . . .	10 50
2303.	Adjustable Clamp, of brass, with steel gimlet-screw, for spy-glass No. 2277 to 2279, . . . . .	3 25
2304.	Adjustable Clamp. Same as No. 2303, but to fit spy-glass No. 2280, . . . . .	3 75
2305.	Adjustable Clamp. Same as No. 2303, but to fit spy-glass No. 2281, . . . . .	4 25

These Clamps consist of a brass collar, or ring, which is cut in half horizontally and hinged together on one side, and provided with a thumb-screw and nut on the opposite side, to keep the two securely in place when in use. A steel gimlet-screw is hinged to the under side of one half, and can be turned into the ring when not in use. To use the clamp, screw the gimlet into a post or tree and put the slide of spy-glass nearest its body between the two halves of the collar, and clamp it tightly there by the thumb-screw.

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## ASTRONOMICAL TELESCOPES.

When we look at a luminous point—a star, for instance—without a telescope, we see it by the aid of the cone of light which enters the pupil of the eye. The diameter of the pupil being about one-fifth of an inch, as much light from the star as falls on a circle of this diameter is brought to a focus on the retina, and unless this quantity of light is sufficient to be perceptible, the star will not be seen. Now, we may liken the telescope to a “Cyclopean eye,” of which the object-glass is the pupil, because, by its aid all the light which falls on the object-glass is brought to a focus on the retina, provided that a sufficiently small eye-piece is used; of course, we must expect that a portion of the light is lost in passing through the glasses.

Since the quantity of light which falls on a surface is proportional to the extent of the surface, and therefore to the square of its diameter, it follows that because a telescope of 1-inch clear aperture has five times the diameter of the pupil it will admit twenty-five times the light; a 6-inch will admit nine hundred times the light which the pupil will; and so with any other aperture. A star viewed with the telescope will, therefore, appear brighter than to the naked eye in proportion to the square of the aperture of the instrument.

But the star will not be magnified to the form of a planet, because a point is only a point, no matter how often we multiply it. It is true that a bright star in the telescope sometimes appears to have a perceptible disc, but this is owing to various imperfections of the image, having their origin in the air, the instrument and the eye, all of which have the effect of slightly scattering a portion of the light which comes from the star.

But, in order that all the light which falls on the object-glass or mirror of a telescope may enter the pupil of the eye, it is necessary that the magnifying power

be at least equal to the ratio which the aperture of the telescope bears to that of the pupil. The latter is generally about one-fifth of an inch. We must, therefore, employ a magnifying power of at least five for every inch of aperture, or we will not get the full advantage of our object-glasses. For instance, if to a 24-inch telescope we attach an eye-piece so large that the magnifying power was only forty-eight, and pointed it at a bright star, the "emergent pencil" of rays from the eye-piece would be half an inch in diameter, and the whole of them could not possibly enter the pupil.

All this supposes that we are viewing a star or other luminous point. If the object has a sensible surface, like the moon, or a large nebula, and we consider its apparent superficial brilliancy, the case will be in part reversed. The object will then appear equally illuminated, with all powers below five for each inch of aperture, but will begin to grow darker when we pass above that limit. The reason of this is, that as we increase the magnifying power, the light is spread over a larger surface of the retina, and is thus enfeebled. So long as our magnifying power is below the limit, the increased quantity of light which enters the pupil by an increase of magnifying power just compensates for the greater surface over which it is spread, so that the brilliancy is constant. Above the limit of five to the inch, the surface over which the light is spread, or the apparent magnitude of the object, still increases with the magnifying power, but there is no increase of light; hence, the object looks fainter. What may at first sight seem paradoxical is, that the degree of illumination to which we now refer can never be increased by the use of the telescope, but, at the best, will be the same as to the naked eye. Indeed, as some light is necessarily lost in passing through any telescope, the illumination is always less with the telescope. With the best reflectors of speculum metal, the illumination will be reduced to one-half, or less, if the polish is not perfect; and with refractors it will be reduced to seven or eight-tenths. As example of these conclusions, the sky can never be made to appear as bright through a telescope as to the naked eye.

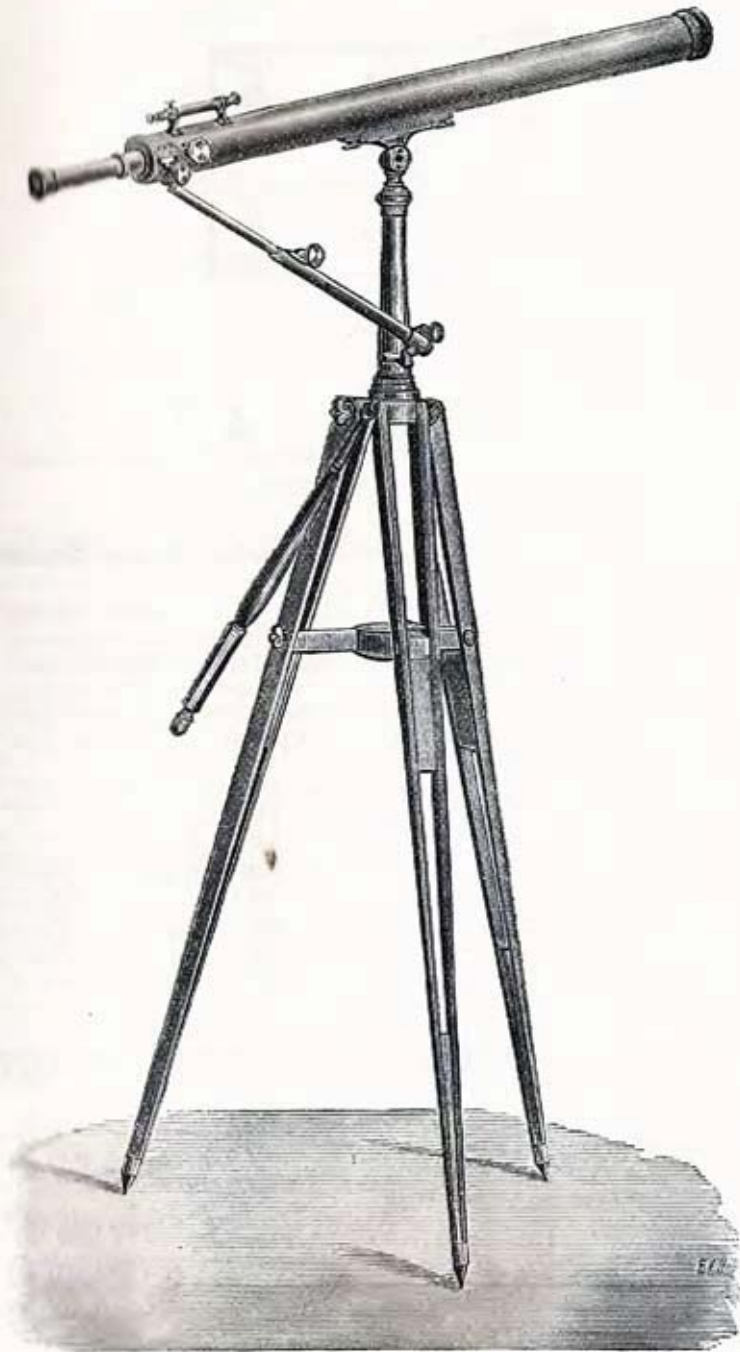
The great foe to astronomical observation is one which people seldom take into account, namely, the atmosphere. When we look at a distant object along the surface of the ground on a hot summer day, we notice a certain waviness of outline, accompanied by a slight trembling. If we look with a telescope, we shall find this waving and trembling magnified as much as the object is, so that we can see little better with the most powerful telescope than with the naked eye. The cause of this appearance is the mixing of the hot air near the ground with the cooler air above, which causes an irregular and constantly changing refraction, and the result is that astronomical observations requiring high magnifying power can very rarely be advantageously made in the day-time. By the night the air is not so much disturbed, yet there are always currents of air of slightly different temperatures, the crossing and mixing of which produce the same effects in a small degree. To such currents is due the twinkling of the stars; and we may lay it down as a rule, that when a star twinkles the finest observation of it cannot be made with a telescope of high power. Instead of presenting the appearance of a bright, well-defined point, it will look like a blaze of light flaring about in every direction, or like a pot of molten, boiling metal; and the higher the magnifying power, the more it will flare and boil. The amount of this atmospheric disturbance varies greatly from night to night, but it is never entirely absent.



2310.

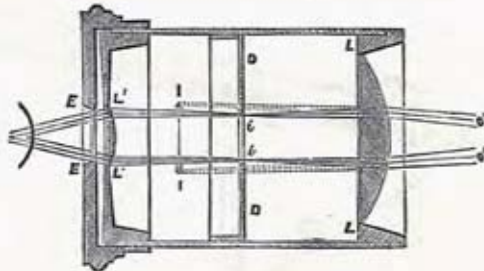
No.	Price
2310. Astronomical Telescope. Polished wood body, 47 inches long, mounted on firm tripod stand, achromatic object-glass 3 inches in diameter, one terrestrial eye-piece, rack and pinion for adjusting the focus. Power 50 times, . . . . .	\$65 00
2311. Astronomical Telescope. Same as No. 2310, with one terrestrial eye-piece giving power of 50 times, and one celestial eye-piece giving power of 100 times, . . . . .	70 00
2312. Astronomical Telescope. Body of brass, 35 inches long, has rack and pinion for focusing, achromatic object-glass 2½ inches in diameter, terrestrial eye-piece, power 40 times; celestial eye-piece, with black sun-glass, power 80 times; firm tripod stand of walnut, having horizontal and vertical movements, walnut case, with lock and key, for receiving the body and eye-pieces, . . . . .	70 00
2313. Astronomical Telescope. Same as No. 2312, but with body 40 inches long, achromatic object-glass 3 inches in diameter, terrestrial eye-piece, power 50 times; celestial eye-piece, with black sun-glass, power 100 times, with walnut case, . . . . .	100 00
2314. Astronomical Telescope. Same as No. 2312, but with body 50 inches long, achromatic object-glass 3½ inches in diameter, terrestrial eye-piece, power 60 times; celestial eye-piece, with sun-glass, power 125 times; in walnut case, . . . . .	160 00
2320. Astronomical Telescope. Brass body, 40 inches long, rack and pinion for focusing, achromatic object-glass 3 inches in diameter, terrestrial eye-piece, power 50 times; one celestial eye-piece, with black sun-glass, power 80 times; one celestial eye-piece, with black sun-glass, power 100 times; achromatic finder on side of body, firm tripod stand of walnut, having rack-and-pinion adjustment for vertical motions, and endless thread with screw and long handle for horizontal motions. By these two adjustments the object can be kept in field of view with great ease; walnut case for containing brass body and eye-pieces, . . . . .	175 00
2321. Astronomical Telescope. Same as No. 2320, but with brass body 50 inches long, achromatic object-glass 3½ inches in diameter, terrestrial eye-piece, power 60 times; one celestial eye-piece, with black sun-glass, power 100 times; one celestial eye-piece, with black sun-glass, power 125 times; stand same as No. 2320; walnut case for containing brass body and eye-pieces, . . . . .	275 00
2322. Astronomical Telescope. Same as No. 2320, but with brass body 60 inches long, achromatic object-glass 4 inches in diameter, terrestrial eye-piece, power 75 times; one celestial eye-piece, with black sun-glass, power 110 times; one celestial eye-piece, with black sun-glass, power 150 times; stand same as No. 2320; walnut case for containing brass body and eye-pieces, . . . . .	300 00
2323. Astronomical Telescope. Same as No. 2320, but with brass body 70 inches long, achromatic object-glass 4½ inches in diameter, terrestrial eye-piece, power 80 times; celestial eye-piece, power 140 times; celestial eye-piece, power 175 times; stand same as No. 2320; walnut case for containing brass body and eye-pieces, . . . . .	400 00





2320.

## NEGATIVE EYE-PIECE.



2331.

No.		PRICE.
2330.	Terrestrial eye-pieces for telescopes, . . . . .	\$7 50
2331.	Celestial eye-pieces with black sun-glass, . . . . .	5 50
2332.	Diagonal eye-pieces to be used when the telescope is nearly vertical, . . . . .	17 50
2333.	Barlow lens to increase the power of a telescope, . . . . .	10 00

## ACHROMATIC OBJECT-GLASSES for SPY-GLASSES and TELESCOPES.

Achromatic lenses are formed by a combination of a double convex lens of crown glass and a plano-concave or a concavo-convex lens of flint glass. The advantages of a lens formed in this manner are freedom from spherical aberration or distortion, and the rays of light are not decomposed into the primary colors; in other words, the light passes through the lens and suffers no change thereby.

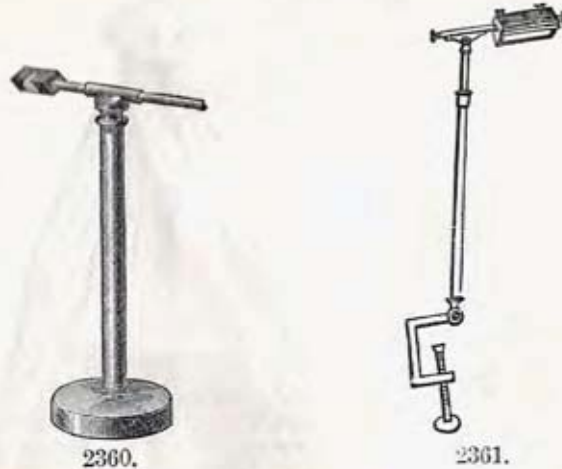


2340.	Achromatic Object-glass, $1\frac{1}{2}$ inches diameter, 18 to 30 inches focus, . . . . .	2 00
2341.	Do. do. $1\frac{3}{4}$ do. 18 to 30 do. . . . .	3 50
2342.	Do. do. 2 do. 18 to 30 do. . . . .	4 50
2343.	Do. do. fine finish, 2 inches diameter, 36 inches focus, . . . . .	7 00
2344.	Do. do. do. $2\frac{1}{2}$ do. 44 do. . . . .	9 00
2345.	Do. do. do. 3 do. 48 do. . . . .	24 00
2346.	Do. do. do. $3\frac{1}{2}$ do. 54 do. . . . .	50 00
2347.	Do. do. do. 4 do. 60 do. . . . .	75 00

## ACHROMATIC OBJECT-GLASSES OF SUPERIOR QUALITY.

2348.	Achromatic Object-glass, extra fine quality, mounted in brass cell, $2\frac{1}{2}$ inches aperture, 36 inches focus, . . . . .	30 00
2348 $\frac{1}{2}$ .	Achromatic Object-glass, extra fine quality, mounted in brass cell, 3 inches aperture, 45 inches focus, . . . . .	60 00
2349.	Achromatic Object-glass, extra fine quality, mounted in brass cell, $3\frac{1}{2}$ inches aperture, 50 inches focus, . . . . .	100 00
2350.	Achromatic Object-glass, extra fine quality, mounted in brass cell, 4 inches aperture, 60 inches focus, . . . . .	150 00
2351.	Achromatic Object-glass, extra fine quality, mounted in brass cell, $4\frac{1}{2}$ inches aperture, 66 inches focus, . . . . .	220 00
2352.	Achromatic Object-glass, extra fine quality, mounted in brass cell, 5 inches aperture, 80 inches focus, . . . . .	320 00
2353.	Achromatic Object-glass, extra fine quality, mounted in brass cell, 6 inches aperture, 120 inches focus, . . . . .	550 00

CAMERA LUCIDA.



No.		PRICE.
2360.	Camera Lucida, with circular base, in box, . . . . .	\$7 50
2361.	Camera Lucida, with clamp for edge of table, . . . . .	12 00
2362.	Camera Lucida, with clamp for edge of table, two tinted glasses, one spherical convex and one spherical concave lens, . . . . .	20 00

DIRECTIONS FOR USING THE CAMERA LUCIDA.

The instrument being fixed by the screw and clamp to the table and paper on which the drawing is to be made, its stem should be inclined so as to bring the prism nearly over the centre of the paper, and the pin, on which the prism turns, placed truly horizontal.

The prism is next to be turned upon its pin, till the transparent rectangular face be placed opposite to the objects to be delineated, when the upper black surface of the eye-piece will be on the top of the instrument; and through the aperture in this the artist is to look perpendicularly downwards at his paper.

The black eye-piece is movable, and in ordinary circumstances, is to be in such a position that the edge of the small transparent part at the back of the prism shall intercept about half the eye-hole. The artist then, looking through the eye-hole, directly downwards at his paper, should see the objects he wishes to draw, apparently distributed over the paper. For, since the eye is larger than the eye-hole, he sees through both halves of the hole at the same time without moving his head. He sees the paper through the nearer half, and sees the objects at the same time through the farther half, apparently in the same direction, by means of reflection, through the prism.

The position of the EYE-HOLE is the circumstance, above all others, necessary to be attended to in adjusting the *Camera Lucida* for use; for, on the due position of this hole depends the possibility of seeing both the pencil and the objects distinctly at the same time.

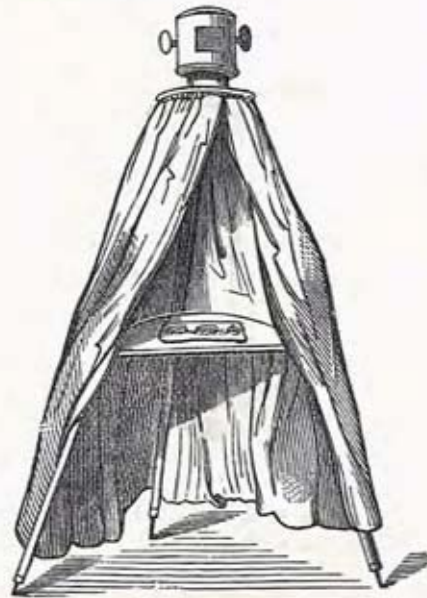
If the eye-hole be moved, so that nearly the whole of its aperture be over the paper, and a very small portion over the prism, then the pencil and paper will be very distinctly seen; but the objects to be delineated very dimly. If, on the other hand, the aperture be mostly over the prism, and but a small portion over the paper, then the objects will be seen distinctly, but the pencil and paper will be very faint. But there will always be an intermediate position (varying according as the objects or the paper happen to be most illuminated) in which both will be sufficiently visible for the purpose of delineation, though not quite so clear as to the naked eye. This intermediate position is easily found, with a little practice.

The farther the prism is removed from the paper, that is, the longer the stem is drawn out the larger the objects will be represented in the drawing, and accordingly the less extensive the view.

## CAMERA OBSCURAS.



2364.

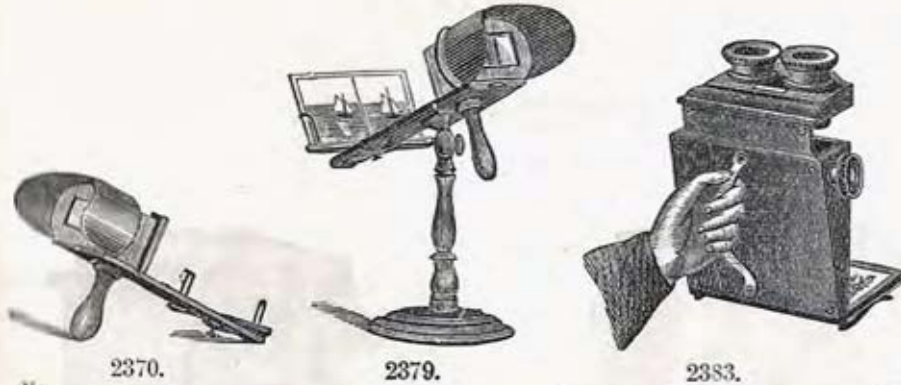


2367.

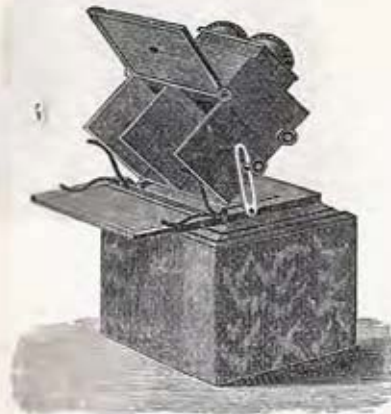
No.	PRICE.
2363. Plain Camera Obscura. In this the object is beautifully represented on a piece of ground glass about 6 inches square, affording a pleasing amusement to young persons, as representing a moving panorama of animated nature; neat walnut box, . . . . .	\$1 50
2364. Camera Obscura Head or Lens, without box; a prismatic lens, mounted with brass. This is the best kind of lens for a Camera Obscura, as it forms both lens and mirror, prism $1\frac{3}{8}$ inches long, . . . . .	5 00
2365. Camera Obscura Head, prism $1\frac{1}{2}$ inches long, . . . . .	7 50
2366. Do. do. $2\frac{1}{4}$ do. . . . .	10 00
2367. Improved Camera Obscura. This is recommended as the best drawing apparatus yet introduced; it is light and portable, and can be used to satisfaction by persons entirely unacquainted with drawing, each, . . . . .	20 00

## STEREOSCOPIES.

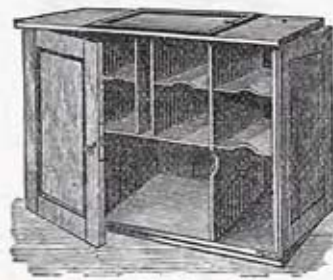
2370. Holmes' Stereoscope, Walnut Frame, Imitation Mahogany Hood, . . . . .	75
2371. Do. do. Round Walnut Hood, . . . . .	1 00
2372. Do. do. Rose Wood Hood, . . . . .	1 00
2373. Holmes' Stereoscope, Walnut Frame, Round Rose Wood Hood (Larger Lenses), . . . . .	1 25
2374. Holmes' Stereoscope, Full Mahogany, Round Hood, Patent Handle, (Larger Lenses), . . . . .	2 00
2375. Holmes' Stereoscope, Full Satin Wood, Round Hood, Patent Handle, (Larger Lenses), . . . . .	2 00
2376. Holmes' Stereoscope, Full Rose Wood, Round Hood, Patent Handle, (Larger Lenses), . . . . .	2 25
2377. Holmes' Stereoscope, Full Hungarian Ash, Round Hood, Patent Handle, (Larger Lenses), . . . . .	2 50
2378. Holmes' Stereoscope, Ebony Frame, French Walnut Hood, . . . . .	3 00
2379. Holmes' Stereoscope, Walnut Frame, Imitation Mahogany Hood, on Stand, . . . . .	1 00



No.		PRICE.
2380.	Holmes' Stereoscope, Walnut Frame, Round Walnut Hood, on Stand,	\$1 25
2381.	Holmes' Stereoscope, Full Mahogany, on Stand,	3 00
2382.	Holmes' Stereoscope, Full Rose Wood, on Stand,	3 50
2383.	Patent Achromatic Mirror Stereoscope, Walnut,	10 00



2384.



2386.

2384.	Patent Achromatic Table Stereoscope, Mahogany,	15 00
2385.	Do. do. do. do. Walnut,	15 00
2386.	Cabinet Stand for Table Stereoscope, fitted up to hold the instrument and slides; in mahogany or walnut,	15 00

### STEREOSCOPIC PICTURES.

We have constantly on hand, and are receiving daily, an endless variety of views of all the most important cities and public buildings in the world, with every variety of landscape views in all regions. Statuary, monuments, colored groups from life, and celebrities, male and female. These range in price from 50 cents to \$6.00 per dozen for paper pictures, and from 75 cents to \$3.00 each for glass. The former can be sent safely by mail. American Views range from 75 cents to \$3.00 per dozen, according to size, locality, or artist. Foreign Views range from 75 cents to \$6.00 per dozen. We have over 1000 different views in Germany, Holland, Switzerland, on the Rhine, Belgium, France, Italy, Egypt, etc., by the celebrated artist, Braun of Dornach, which are at least equal to any ever made, at the very low price of \$1.00 per dozen. Any quantity will be forwarded to parties giving satisfactory references for selection, and ample time allowed for the same.

## CABINET STEREOSCOPES.



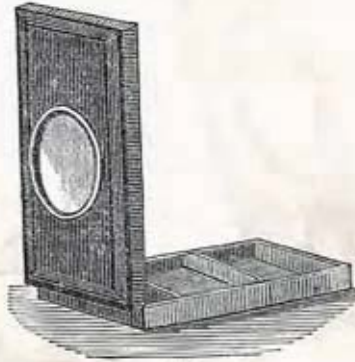
2400.



2405.

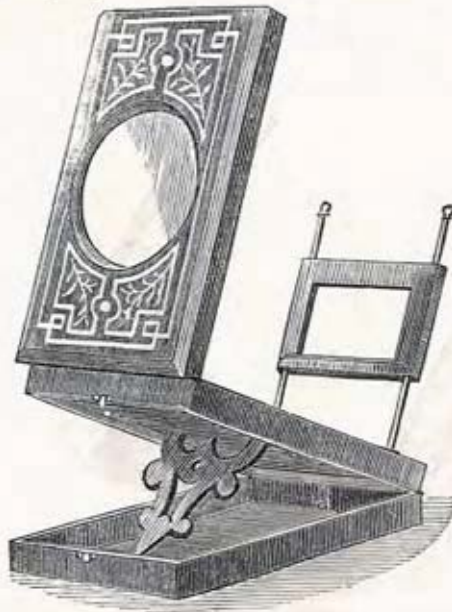
No.	PRICE.
2400. Cabinet Stereoscope, of well finished mahogany, holding fifty paper or fifty glass. Price, without pictures, . . . . .	\$15 00
2401. Cabinet Stereoscope, same as No. 2400, but holding 100 glass or 100 paper pictures. Price, without pictures, . . . . .	30 00
2402. Cabinet Stereoscope, of handsomely finished black walnut, holding 36 glass pictures or 72 paper pictures; two sets of lenses. Price, without pictures, . . . . .	25 00
2403. Cabinet Stereoscope, of black walnut, very beautifully finished, holding 36 glass pictures or 72 paper pictures; two sets of lenses. Price, without pictures, . . . . .	35 00
2404. Cabinet Stereoscope, same as No. 2400, but to hold 100 glass pictures or 100 paper pictures; one set of lenses. Price, without pictures, . . . . .	40 00
2405. Cabinet Stereoscope, of elegantly finished rosewood, arched top, gilt, inlaid and ornamented, holding 100 paper or glass pictures. Price, without pictures, . . . . .	50 00
2406. Cabinet Stereoscope, same as No 2405, mounted on a beautiful rosewood table with castors; will hold 150 glass pictures or 300 paper pictures. Price, without pictures, . . . . .	100 00

GRAPHOSCOPES.



2410.

No.		PRICE.
2410.	Graphoscope for card de visite pictures, mahogany case, lens 2 inches diameter,	\$1 00
2411.	Graphoscope for card de visite pictures, black wood case, ornamented, lens 2½ inches diameter,	2 00
2412.	Graphoscope for album pictures, large size, mahogany frame, lens 3 inches diameter,	2 00
2413.	Graphoscope, same as No. 2412, but with frame of black wood, ornamented,	3 00

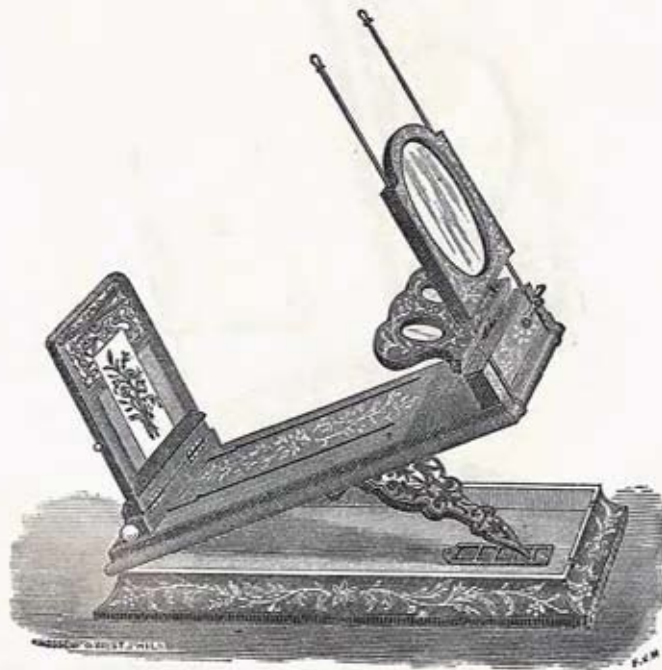


2420.

2420.	Graphoscope, mahogany frame, lens 4 inches diameter,	4 00
2421.	Graphoscope, same as No. 2420, black wood, ornamented frame, lens 4 inches diameter,	5 00



2425.



2430.



JAMES W. QUEEN & CO., PHILADELPHIA.

95

No.	PRICE.
2425. Grapho-Stereoscope, mahogany frame, large lens 4 inches diameter,	\$4 50
2426. Grapho-Stereoscope, same as No. 2425, black wood frame, ornamented, large lens 4 inches diameter, . . . . .	5 50
2427. Grapho-Stereoscope, same as No. 2425, frame mahogany, large lens 5½ inches diameter, . . . . .	7 50
2428. Grapho-Stereoscope, same as No. 2425, frame of black wood, orna- mented, lens 5½ inches diameter, . . . . .	10 00
2430. Grapho-Stereoscope, polished walnut wood frame, large lens 3½ inches diameter, . . . . .	5 50
2431. Grapho-Stereoscope, same as No. 2430, but with large lens 4 inches diameter, . . . . .	7 50
2432. Grapho-Stereoscope, same as No. 2430, but with large lens 4½ inches diameter, . . . . .	10 00
2433. Grapho-Stereoscope, same as No. 2430, but with large lens 5 inches diameter, . . . . .	15 00
2434. Grapho-Stereoscope, same as No. 2430, but with large lens 6 inches diameter, . . . . .	25 00

## MICROSCOPES.

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Within the last few years, the Microscope has become so firmly rooted among us, that little need be said in its praise. The time has long passed away when it was held in no higher estimation than an ingenious toy; but it is now acknowledged that no one can attain even a moderate knowledge of any physical science without a considerable acquaintance with the Microscope and the marvelous phenomena which it reveals. The geologist, the chemist, the mineralogist, the anatomist, or the botanist, all find the Microscope a useful companion and indispensable aid in their interesting and all-absorbing researches, and, with every improvement in its construction, have discovered a corresponding enlargement and enlightenment of the field displayed by the particular science which they cultivate.

But even to those who aspire to no scientific eminence, the Microscope is more than an amusing companion, revealing many of the hidden secrets of nature, and unveiling endless beauties which were heretofore enveloped in the impenetrable obscurity of their own minuteness.

No one who possesses even a pocket-microscope of the most limited powers can fail to find amusement and instruction even though he was in the midst of the Sahara itself. There is this great advantage in the Microscope, that no one need feel in want of objects as long as he possesses his instrument and a sufficiency of light.

Many persons who are gifted with a thorough appreciation of nature in all her vivid forms are debarred by the peculiarity of their position from following out the impulses of their beings, and are equally unable to range the sea-shore in search of marine creatures or to traverse the fields and woods in the course of their investigations into the manifold forms of life and beauty which teem in every nook and corner of the country. Some are confined to their chambers by bodily ailments, some are forced to reside within the very heart of some great city, without opportunities of breathing the fresh country air more than a few times in the course of the year; and yet there is not one who may not find an endless series of common objects for his Microscope within the limits of the tiniest city chamber. So richly does nature teem with beauty and living marvels, that even within the closest dungeon-walls a never-failing treasury of science may be found by any one who knows how and where to seek for it.

There is little doubt but that if any one with an observant mind were to set himself to work determinedly merely at the study of the commonest weed or the most familiar insect, he would, in the course of some years' patient labor, produce a work that would be most valuable to science and enroll the name of the investigator among the most honored sons of knowledge. There is not a mote that dances in the sunbeam, not a particle of dust that we tread heedlessly under our feet, that does not contain within its form mines of knowledge as yet unworked. For if we could only read them rightly, all the records of the animated past are written in the rocks and dust of the present.

Microscopes may be divided into two classes, simple and compound. The former class may contain several lenses or glasses, but generally consists of a single lens; but the Compound Microscope must consist of at least two glasses, the one near the object to be examined, and commonly called the objective, the other near the eye, and called the eye-piece. This class is subdivided into Monocular and Binocular instruments, in which the object is viewed with one or both eyes, as their names imply. The following remarks on the principles involved in the construction of the Microscope are taken from the article contributed by Andrew Ross to the "Penny Cyclopaedia."\*

\* This article has since been published separately, in book form, price 75 cents (No. 3957½ of this Catalogue.)

The use of the term *magnifying* has led many into a misconception of the nature of the effect produced by convex lenses. It is not always understood that the so-called magnifying power of a lens applied to the eye, as in a microscope, is derived from its enabling the eye to approach more nearly to its object than would otherwise be compatible with distinct vision. The common occurrence of walking across the street to read a bill, is, in fact, magnifying the bill by approach; and the observer, at every step he takes, makes a change in the optical arrangement of his eye, to adapt it to the lessening distance between himself and the object of his inquiry. This power of spontaneous adjustment is so unconsciously exerted, that, unless the attention be called to it by circumstances, we are totally unaware of its exercise.

In the case just mentioned, the bill would be read with eyes in a very different state of adjustment from that in which it was discovered on the opposite side of the street, but no conviction of this fact would be impressed upon the mind. If, however, the supposed individual should perceive on some part of the paper a small speck, which he suspects to be a minute insect, and if he should attempt a very close approach of his eye for the purpose of verifying his suspicion, he would presently find that the power of natural adjustment has a limit; for when his eye has arrived within about ten inches, he will discover that a further approach produces only confusion. But if, as he continues to approach, he were to place before his eye a series of properly arranged convex lenses, he would see the object gradually and distinctly increase in apparent size by the mere continuance of the operation of approaching. Yet the glasses applied to the eye during the approach from ten inches to one inch, would have done nothing more than had been previously done by the eye itself during the approach from fifty feet to one foot. In both cases the magnifying is effected really by the approach, the lenses merely rendering the latter periods of the approach compatible with distinct vision.

In saying that an object appears larger at one time, or to one person, than another, it is necessary to guard against misconception. By the apparent size of an object, we mean the angle it subtends at the eye, or the angle formed by two lines drawn from the centre of the eye to the extremities of the object. In Fig. 1, the lines A E and B E, drawn from the arrow to the eye, form the angle A E B, which, when the angle is small, is nearly twice as great as the angle C E D, formed by lines drawn from a similar arrow at twice the distance. The arrow A B will therefore appear nearly twice as long as C D, being seen under twice the angle, and in the same proportion for any greater or lesser difference in distance. The angle in question is called the angle of vision, or the visual angle.

The magnifying power of a single lens depends upon its focal length, the object being, in fact, placed nearly in its principal focus, or so that the light which diverges from each point may, after refraction by the lens, proceed in parallel lines to the eye, or as nearly so as requisite for distinct vision. In Fig. 2, A B is a double convex lens, near which is a small arrow to represent the object under examination, and the cones drawn from its extremities are portions of the rays of light, diverging from those

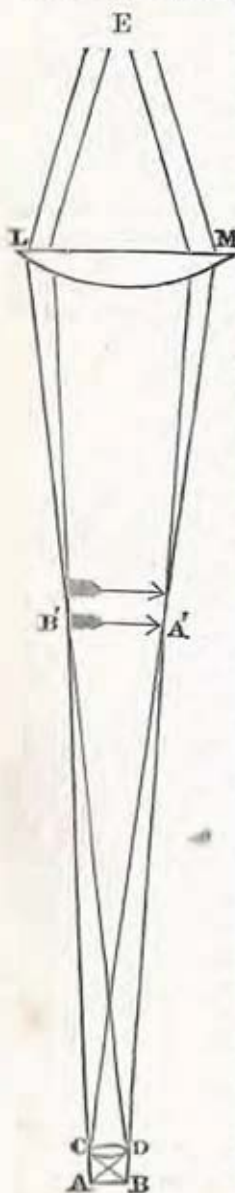


Fig. 3.  
See page 98.

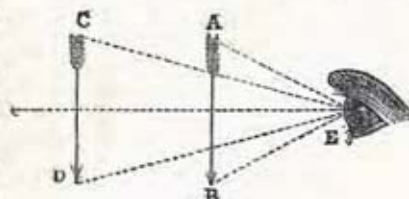


Fig. 1.

points and falling upon the lens. These rays, if suffered to fall at once upon the pupil, would be too divergent to permit their being brought to a focus upon the retina by the optical arrangements of the eye. But being first passed through the lens, they are bent into nearly parallel lines, or into lines diverging from some points within the limits of distinct vision, as from C and D. Thus altered, the eye receives them precisely as if they emanated from a larger arrow placed at C D, which we may suppose to be ten inches from the eye, and then the difference between the real and the imaginary arrow is called the magnifying power of the lens in question. The focal length of the eye usually ranges from six to twelve or fourteen inches, so that the distance we first assumed of ten inches is very near the true average, and is a convenient number, inasmuch as a cipher added to the denominator of the fraction which expresses the focal length of a lens gives its magnifying power. Thus a lens whose focal length is one-sixteenth of an inch, is said to magnify 160 times.

The annexed Fig. 3, shows the course of the rays through a compound microscope of two lenses. The rays proceeding from the object A B are so acted upon by the lens C D, near it, and thence called the object-glass, that they are converged to foci in A' B', where they form an enlarged image of the object, as would be evident if a piece of oiled paper or ground glass were placed there to receive them. They are not so

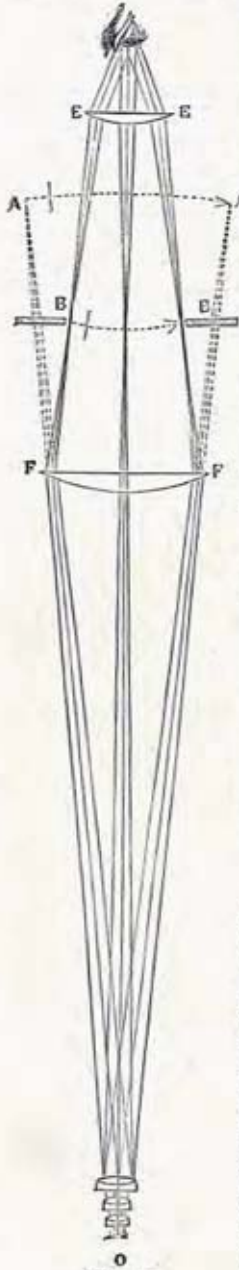


Fig. 4.  
See page 99.

intercepted, and therefore the image is not rendered visible at that place; but their further progress is similar to what it would have been had they really proceeded from an object at A' B'. They are at length received by the eye-lens L M, which acts upon them as the simple microscope has been described to act on the light proceeding from its objects. They are bent so that they may enter the eye at E in parallel lines, or as nearly so as is requisite for distinct vision. When we say that the rays enter the eye in nearly parallel lines, we mean only those which proceed from one point of the original object. Thus the two parallel rays M E have proceeded from and are part of the cone of rays C A D, emanating from the point A of the arrow; but they do not form two pictures in the eye, because any number of parallel rays which the pupil can receive will be converged to a point by the eye, and will convey the impression of one point to the mind. In like manner the rays L E are part of the cone of rays emanating from B, and the angle L E M is that under which the eye will see the magnified image of the arrow, which is evidently many times greater than the arrow could be made to occupy in the naked eye at any distance within the

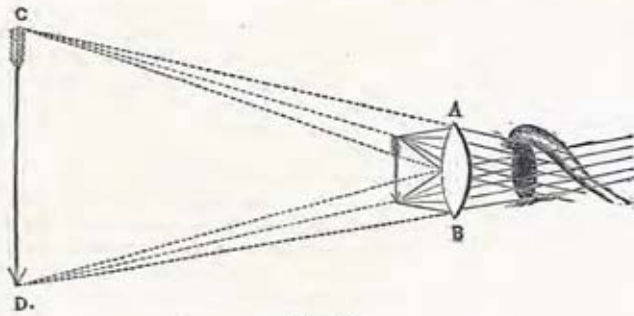


Fig. 2.

limits of distinct vision. The magnifying power depends on two circumstances: First, on the ratio between the anterior distance  $AC$  or  $BD$  and the posterior focal length  $CB'$  or  $DA'$ ; and Secondly, on the power of the eye-lens  $LM$ . The first ratio is the same as that between the object  $AB$  and the image  $A'B'$ ; this and the focal length or power of the eye-lens are both easily obtained, and their product is the power of the compound instrument.

Since the power depends on the ratio between the anterior and posterior foci of the object-glass, it is evident that by increasing that ratio any power may be obtained, the same eye-glass being used; or having determined the first, any further power may be obtained by increasing that of the eye-glass; and thus, by a pre-arrangement of the relative proportions in which the magnifying power shall be divided between the object-glass and the eye-glass, almost any given distance (within certain limits) between the first and its object may be secured. This is one valuable peculiarity of the compound instrument; and another is the large field, or large angle of view, which may be obtained, every part of which will be nearly equally good; whereas with the best simple microscopes the field is small, and is good only in the centre. The field of the compound instrument is further increased by using two glasses at the eye-end; the first being called, from its purpose, the field-glass, and the two constituting what is called the eye-piece.

In the annexed engraving, Fig. 4, we have shown the triple achromatic object-glass in connection with the eye-piece, consisting of the field-glass  $FF$ , and the eye-glass  $EE$ , forming together the modern achromatic microscope. The course of the light is shown by drawing three rays from the centre and three from each end of the object  $O$ . These rays would, if left to themselves, form an image of the object at  $AA$ , but being bent and converged by the field-glass  $FF$ , they form the image at  $BB$ , where a stop is placed to intercept all light except what is required for the formation of the image. From  $BB$ , therefore, the rays proceed to the eye-glass exactly as has been described in reference to the simple microscope and to the compound of two glasses.

### THE SELECTION OF A MICROSCOPE.

A few hints as to the *selection* of a Microscope may not be amiss in this connection. Those who fortunately have unlimited means at their command, will find no difficulty in deciding this important question, since it was long ago settled that the highest grade of Binoculars are very near perfection, and leave little or nothing to be desired. But to the far larger class of intending purchasers, the question of cost is an important one; and for the benefit of these we beg to offer the following suggestions.

A common mistake with novices is to appreciate the excellence of a Microscope by the amount of its magnifying power. Now, in truth, no object should be viewed with a power greater than sufficient to clearly show its structure, and if this can be done with twenty diameters, it is folly to apply a hundred. And this is especially the case with low-priced instruments, where the actual and angular apertures of the objectives are small, and the corrections not so exact as in those of higher grade, rendering them more liable to give false impressions of the object under examination. And it is impossible to view an opaque object by reflected light, satisfactorily, with any of the cheapest forms of *Compound* Microscopes; the lenses approach the object too nearly, and are far too small to admit of a proper illumination of the object. For a child, just learning the use of a Microscope, and who will naturally desire to examine the surface of any object he may pick up, or for those of riper years, who may possess or contemplate purchasing a *compound* instrument, but who will be obliged to dissect flowers, insects, etc., for minute examination, a *Simple* Microscope is the best form.

After becoming familiar with the use of the *Simple* Microscope, and of the objects suited to its powers, the young student may properly supply himself with a *Compound* instrument, wherewith to penetrate more deeply the structures of which he has until now viewed merely the surface.

In making the selection of a Microscope, the following points are important to bear in mind:—*First*, in regard to the optical part: it is essential that the lenses

should give good *definition*, *i. e.*, should show objects clearly and well defined. *Secondly*, the *stand* should be of good material and workmanship; there should be no "shake" or lateral motion in the adjustments for focus; there should be no "lost motion," *i. e.*, the focus should be instantly changed by the slightest motion of the milled heads; in all except the *very cheapest* instruments there should be a joint for inclination, for convenience of observation. The above are, perhaps, the most essential points, but for those who wish to go into this question more thoroughly than can be done in this limited space, we would recommend the perusal of an excellent little work, "Hints on the Selection and Use of the Microscope," by John Phin, No. 3955 of this Catalogue. This is intended for beginners, and is a thoroughly good and practical treatise; and even those who are further advanced in the art can derive much instruction and profit from it.

We shall make it our aim to keep only such instruments as will give satisfaction in the above important points, as well as in others perhaps not so essential, but adding greatly to the convenience and usefulness of a Microscope; and we guarantee all our instruments to be as represented.

### PREPARATION OF OBJECTS.

Having thus briefly given some hints as to the selection of a Microscope, it may not be amiss to add a few on the preparation of objects for permanent observation. We cannot, of course, in the limited space at our disposal, do more than give a few general directions; for further details the student is referred to almost any of the elaborate works on the subject, named in this Catalogue at page 176. The *indispensable* requisites are neither numerous nor costly. Forceps, 3729; Scissors, 3734 and 3735; Knives, 3733-3742; Needles, 3745 and 3746; Turn-table, 3763; Brass Table and Lamp, 3758; Glass Slips, 3381; Thin Circles, 3697; Ebonite Cells, 3692; Dropping Tubes, 3717; Bell Glass, 3723; Canada Balsam, 3701 and 3702; the latter, contained in Capped Bottle, 3718; Glycerine, 3704; Ditto Jelly, 3705; Goadby's Fluid; Asphalt, 3709; Gold Size, 3710; White Zinc Cement, 3714; Dropping Bottle, 3719; Labels, 3776, with a few camel's-hair pencils, a soft linen cloth, chamois-skin, and three or four ounces of Liquor Potassa, will constitute a very respectable outfit, and be quite sufficient for mounting all the ordinary specimens which the beginner or more advanced student may desire to preserve.

All objects must be mounted in one of three ways: *dry* in Air, *ditto* in Balsam or other resinous material, or *moist* in some preservative fluid or gelatinous medium. For the first method, if the object be thin, make a circle with the Turn-table and Zinc cement on the centre of a glass slip, the inner diameter of which shall be slightly smaller, and the outer diameter as much larger, than the covering glass you wish to use. When thoroughly hard, which will take a few hours, run a second thin coating of the cement on top of the first, place the object (previously thoroughly dried) in the centre of the circle, put on the covering glass which will adhere to the fresh cement, and finish with one or two thin coats of the same. If the object be thick, proceed as above, using Asphalt instead of Zinc cement, and an Ebonite ring of proper depth, in place of the covering glass at the second operation. This will give you a convenient cell in which the object must be placed and secured to the glass slip; a minute portion of Gold Size is the best cement for this purpose in most cases. The whole should be placed under a bell glass until thoroughly dry, when a fresh coating of Asphalt must be applied to the upper surface of the ring, a thin cover applied and pressed down, finishing with successive thin coats of Asphalt. Do not use paper cells in dry mountings; they always admit moisture, and the object is soon spoiled. Always apply your cement in thin layers. Have your glass slips and covers thoroughly clean.

For mounting in Balsam, the specimen must be entirely free from moisture, either by drying or by being passed through Absolute Alcohol and turpentine; in the latter case it is to be transferred directly from the turpentine to the slide. If pure Balsam 3701 is used, a drop must be pressed from the collapsible tube upon the centre of a glass slide, and the latter placed on the hot table 3758 until the Balsam spreads out, taking care not to overheat it. The object must now be placed on the Balsam, a fresh drop

of the latter pressed on top of it, and a slightly warm cover laid upon it, in such a manner that the excess of Balsam will be forced out beyond the opposite edge of the cover from that which first comes in contact with the slide. The whole must then be laid in a warm place to harden, which may take some days or even weeks. Do not be annoyed by the presence of air-bubbles, they will all disappear before the Balsam becomes hard. If the *prepared* Balsam 3702 is used, place the object on the slide and arrange it properly, then drop a small quantity of the Balsam upon it, and apply the cover as before. A little practice will enable the young beginner to use the exact quantity of Balsam necessary to make a neat mounting. If any excess exudes from the edges of the covering-glass, it may be cleaned off when hard, and the slide finished with a layer of Prepared Balsam 3702, applied with a camel's-hair pencil. Never use colored cements on Balsam mountings. They are certain to run in and spoil the slide.

For *fluid* mountings, almost the same operations as in *dry* mountings are necessary. After the second coating of cement is applied, however, the cell must be filled with the preservative fluid, the object (previously soaked in the same) laid in it and the cover applied at one edge, so as to drive out the excess of fluid as it comes down; this excess must then be soaked dry with blotting-paper or a soft towel, and a thin coating of cement at once applied, to be followed by others until the slide is quite finished. For mounting in Glycerine Jelly the same rules will apply, the jelly being first liquefied by gentle heat.

Do not be discouraged by failures at first; a little practice will make perfect. Be cleanly in all your operations. Dust and moisture are the microscopist's worst foes. Persevere, and success will speedily crown your efforts.

#### GENERAL HINTS IN REGARD TO THE USE OF THE MICROSCOPE.

In using the Binocular as a Monocular Instrument, it is only necessary to withdraw the prism about  $\frac{1}{4}$  inch, thus leaving the field of the direct tube entirely clear where required.

The objectives and eye-pieces may all be taken apart for the convenience of cleaning, care being taken to replace each lens as cleansed to prevent mis-matching.

Till some experience is gained in working with the higher powers, it will be found convenient to use a lower power objective as a *finder* for the more minute objects; when found and placed in the centre of the field, then replace the objective by the one required.

In using *immersion* objectives, first find the object as above, and then *before* screwing the objective on to the Microscope, apply just sufficient water to form a small bead *only large enough* to cover the *surface* of the *lens*, then screw on the objective and focus till the *water unites objective and object*, when a perfect result will be obtained, and without the slightest difficulty. The principal advantages possessed by an immersion objective, are the greater working distance obtained, thus allowing the examination of objects under the thicker covering glass, and greater brilliancy with more light.

The highest power giving both fields fully and equally illuminated with the Binocular Microscope (without the use of the Achromatic Condenser) is the  $\frac{1}{4}$  inch of  $40^\circ$ , or higher aperture. It is also the highest power by which an *opaque-covered* object can be *conveniently* illuminated under ordinary conditions.

Should the coarse adjustment be found in course of time to work too easily, it may usually be remedied by tightening the two small screws acting upon the bearings of the pinion.

The accessories applied under the stage are often found to accumulate dirt upon the *fittings*, making them slide uncomfortably. This is best remedied by carefully wiping off all accumulation with a clean rag *slightly oiled*, and also in the same manner cleaning out the fitting under the stage, taking care to wipe them finally with a perfectly dry cloth.

Ball and socket joints may readily be tightened by unscrewing the cap and adding a little packing *behind* the ball, taking care to screw up again sufficiently tight.

## READING AND PICTURE LENSES.



2800.



2816.

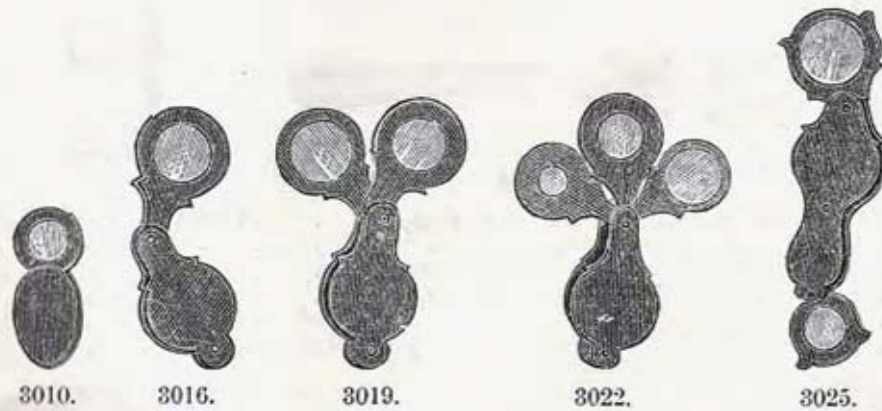
No.							PRICE
2800.	Reading Glass,	German silver frame,	double convex lens,	2 inch diameter,			\$ 75
2801.	Do.	do.	do.	do.	2½	do.	1 25
2802.	Do.	do.	do.	do.	3	do.	1 50
2803.	Do.	do.	do.	do.	3½	do.	2 00
2804.	Do.	do.	do.	do.	4	do.	3 00
2805.	Do.	do.	do.	do.	4½	do.	4 00
2806.	Do.	do.	two plano-convex lenses,	2½	do.		1 50
2807.	Do.	do.	do.	do.	3	do.	2 25
2808.	Do.	do.	do.	do.	3½	do.	3 25
2809.	Do.	do.	do.	do.	4	do.	4 00
2810.	Reading Glass,	gilt metal frame,	ivory handle,	one double convex lens,	2 inches diameter,		1 50
2811.	Reading Glass,	gilt metal frame,	ivory handle,	one double convex lens,	2½ inches diameter,		2 25
2812.	Reading Glass,	gilt metal frame,	ivory handle,	one double convex lens,	3 inches diameter,		3 00
2813.	Reading Glass,	gilt metal frame,	ivory handle,	double convex lens,	4 inches diameter,		5 00
2814.	Reading Glass,	gilt metal frame,	ivory handle,	double convex lens,	4½ inches diameter,		7 00
2815.	Reading Glass,	gilt metal frame,	ivory handle,	double convex lens,	5 inches diameter,		8 50
2816.	Reading Glass,	black metal frame,	wood handle,	double convex lens,	3 inches long by 1½ inches wide,		1 50
2817.	Reading Glass,	black metal frame,	wood handle,	double convex lens,	3½ inches long by 1¾ inches wide,		1 75
2818.	Reading Glass,	black metal frame,	wood handle,	double convex lens,	4 inches long by 2 inches wide,		2 00
2819.	Picture Glasses,	wood frames and handle,	double convex lens,	5 inches diameter,			5 00
2820.	Picture Glasses,	wood frame and handle,	double convex lens,	6 inches diameter,			7 00



SIMPLE MICROSCOPES.



No.	DESCRIPTION	PRICE.
3000.	Watchmaker's Glass, hard rubber frame, 1 double convex lens, $\frac{3}{8}$ inch to $\frac{1}{2}$ inch diameter, various powers, . . . . .	\$ 50
3001.	Watchmaker's Glass, hard rubber frame, 2 double convex lenses, $\frac{3}{4}$ inch diameter, very high power, . . . . .	1 00
3002.	Engraver's Glass, horn frame, 1 double convex lens, $\frac{3}{4}$ to 1 in. diameter, . . . . .	40
3003.	Engraver's Glass, horn frame, 2 plano-convex lenses, 1 inch diameter, . . . . .	1 00
3004.	Engraver's Glass, hard rubber frame, 2 plano-convex lenses, $1\frac{1}{2}$ inches diameter, . . . . .	1 50



3010.	Hard rubber case and frame, round form, 1 double convex lens, $\frac{3}{4}$ in. diam.	30
3011.	Do. do. do. 1 do. 1 do.	40
3012.	Do. do. do. 1 do. $1\frac{1}{4}$ do.	60
3013.	Do. do. do. 1 do. $1\frac{3}{4}$ do.	90
3014.	Do. do. do. 2 do. 1 do.	80
3015.	Do. do. do. 2 do. $1\frac{1}{2}$ do.	90
3016.	Do. do. bellows form, 1 do. $\frac{3}{4}$ do.	40
3017.	Do. do. do. 1 do. 1 do.	60
3019.	Do. do. do. 2 do. $\frac{3}{4}$ do.	60
3020.	Do. do. do. 2 do. 1 do.	90
3022.	Do. do. do. 3 do. $\frac{3}{4}$ do.	90
3023.	Do. do. do. 3 do. 1 do.	1 25
3025.	Rubber case and frame, 1 double convex lens, $\frac{1}{2}$ inch diameter, of high power at one end, and 1 double convex lens $\frac{3}{4}$ inch diameter of medium power at the other end, . . . . .	1 25
3026.	Combination of Three Lenses, mounted in tortoise-shell, for the pocket, with ring for attaching to watch-guard. A fine article, . . . . .	4 50
3027.	Achromatic Triplet, in strong tortoise-shell case; gives large, flat field, and fine, clear definition; 1 inch focus, $1\frac{1}{2}$ inch diameter, . . . . .	10 00
3027 $\frac{1}{2}$	Achromatic Triplet, do. do. . . . .	9 00
3028.	Do. do. do. do. do. . . . .	8 00
3028 $\frac{1}{2}$	Do. do. do. do. in gold case, for watch guard, . . . . .	20 00

No.	PRICE.
3030. Linen Prover or Microscope, to count the threads in linen fabrics, brass frame,	\$ 50
3031. The same, German silver frame,	75
3032. Do. do. do. and achromatic lens,	1 00
3033. Do. with large lens and 1-inch opening, brass frame,	1 50
3034. Collector's Pocket Microscope. Consisting of a Stanhope lens, with cap to screw over the front surface, in nickel-plated frame. This is a very useful article in collecting excursions; a drop of water, for example, containing animalculæ, diatoms, algæ, or other objects, being placed on the flat surface of the lens, the cover is screwed in place and the object examined by simply holding the instrument up to the light,	75



3035.



3037.



3039.



3034.

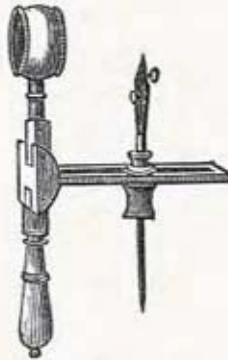


3030.

3035. Coddington Lens, brass frame, three sizes,	\$1 00, 1 50 and 2 00
3036. Do. silver frame,	2 50
3037. Do. do. with cover,	2 75
3038. Do. large size, with cover, plated,	3 75
3039. Do. do. do. and engraved,	5 00
3040. Do. do. do. gilt and engraved,	6 00



3042.



3044.



3041.



3047.

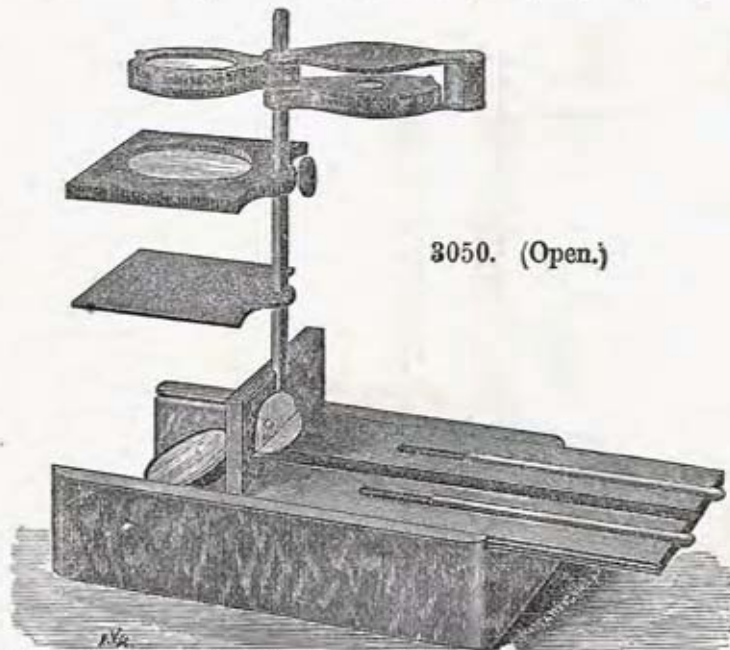


3045.

3041. Microscope, with glass cage for seeds or live insects; new pattern,	50
3042. Do. do. do. in brass box, small size,	75
3043. Do. do. do. do. large size,	1 50
3044. Jointed Microscope, for flowers and insects. Folds to carry in the pocket,	2 00
3045. Microscope on Three Legs, all brass, with screw adjustment for focus,	75
3046. Do. do. nickel-plated,	1 00
3047. Do. do. hard rubber frame,	1 00

SIMPLE MICROSCOPES WITH STANDS.

No.					PRICE.
3050.	The Excelsior Microscope,	with Three Lenses,	. . . . .		\$2 75
3051.	Do.	do.	with Two Lenses,	. . . . .	2 50



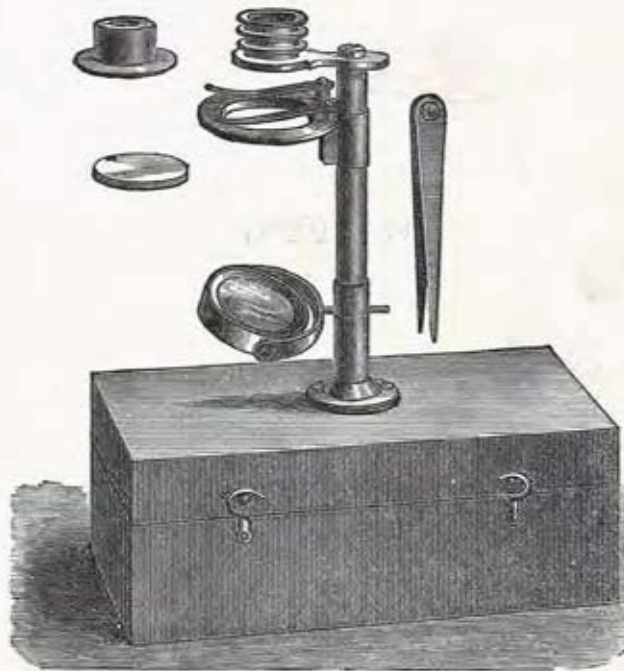
3050. (Open.)

The construction and method of using this Microscope is very simple, and will be readily understood from an inspection of the engravings. It consists primarily of a small wooden case, the exact size of that 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 shown in Fig. 3050. (Open.) The lenses and stage are supported by a steel rod, 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 figure, it is held very securely in place by means of a button; and this button also serves to retain it in the groove when it is turned down. The glass stage, which is fitted into a frame of hard rubber, slides easily on the stem, 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 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, which is also carried by the stem, and may be turned under the stage, so as to cut off all transmitted light. Dissecting needles, with neat handles, fit into appropriate grooves.

The glass plate is fitted into the stage so as to form a cell capable of holding water, so that dissections 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; the stem is then turned down and held in its groove by the button; the lid is drawn out of the groove, turned over, and replaced so that the vertical piece, to which the button is attached, closes the open end of the box, and the whole thing is packed into a compass which readily admits of its being carried in the vest-pocket.

## THE CHILD'S MICROSCOPE.

No.	PRICE.
3055. The Child's Microscope, . . . . .	\$3 00



3055.

This simple, compact and perfect little instrument meets a want long felt, namely, that of a really good and efficient Microscope, at an extremely low price, and adapted by its simplicity to the understanding of a child, as well as to the wants of the more advanced scholar or naturalist. The magnifiers or lenses are three in number, and can be used separately or combined. With the lowest power, or largest single lens, a large insect, such as a bee or fly, can be examined without any further preparation than placing it in the insect-box, which accompanies the instrument. With the three lenses combined, a power of 33 diameters can be obtained, which is quite sufficient to show many of the larger animalculæ in pond or ditch water, the

scales from a butterfly's wing, pollen grains of plants, and thousands of other interesting and easily obtained objects requiring considerable magnifying power.

The illustration gives a very good general idea of the instrument, which consists of a neat, flat walnut box, as a base, into which the Microscope packs when not in use; an upright brass stem, which screws into the lid of the box, and which carries the stage on a sliding tube, and at its top, firmly fixed, the arm which holds the lenses. The focus is adjusted by sliding the stage up or down, so that the eye is not obliged to move its position, as is the case with all instruments in which the focusing is effected by moving the lens. The mirror for reflecting the light through transparent objects is mounted on a universal joint, so as to be readily turned in any direction toward the source of light.

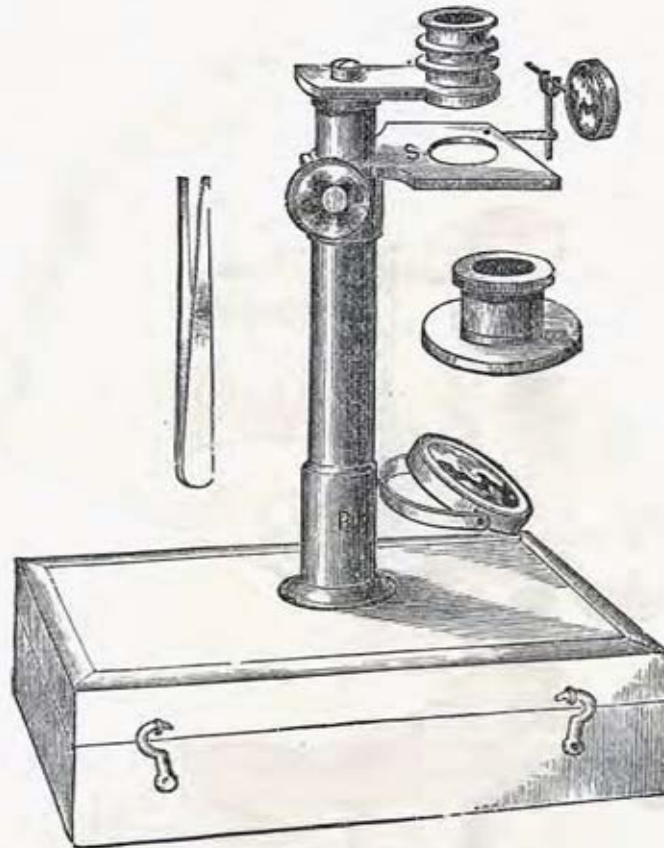
The accessories are as follows:

- Animalcule Cage or Live-box for confining insects, etc.
- Pair of brass Forceps.
- Watch-glass and two plain glass Slips.
- One prepared object.

It is much more readily managed by a novice than a Compound Microscope, and has, with the three lenses combined, almost as much magnifying power as the cheapest of the latter; whilst unlike it, "The Child's Microscope" is equally well adapted to the examination of large opaque objects, such as beetles, flies or flowers. It cannot be put out of order, excepting by considerable violence sufficient to break it, and any ordinary child can be trusted with its use.

Rev. Mr. Wood's excellent little work, "The Common Objects of the Microscope," No. 3962 of this Catalogue, is an excellent companion to the "Child's Microscope," giving full directions as to its use, and the collection and preparation of objects for examination.

## THE SCHOOL MICROSCOPE.

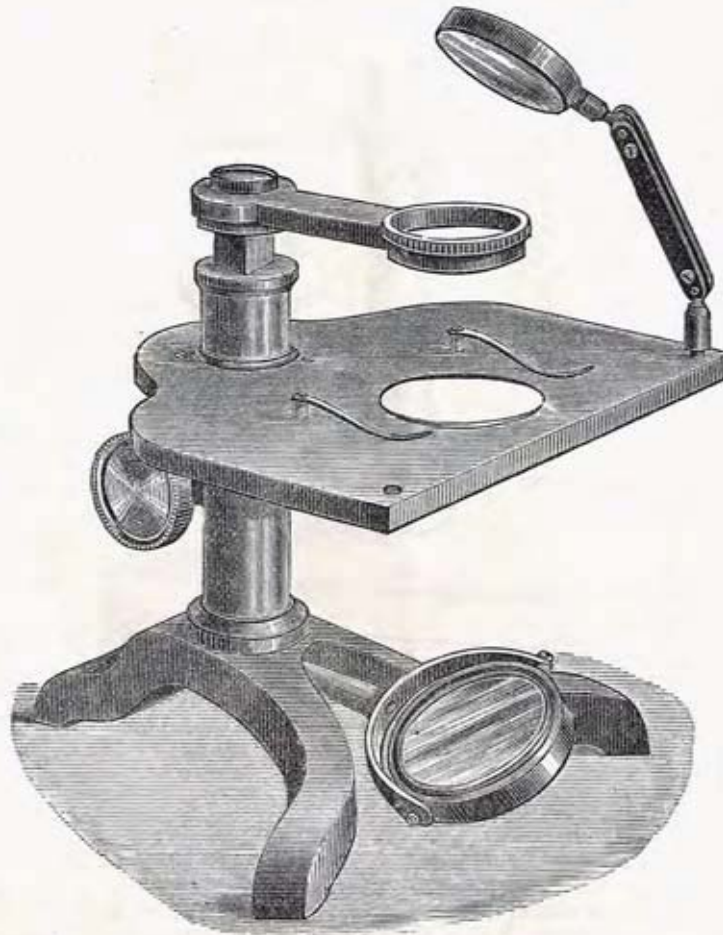


3056.

No.	PRICE.
3056. The School Microscope, . . . . .	\$6 00

This instrument consists of a tubular stem about five inches high, the lower end of which screws firmly into the lid of the box wherein the instrument is packed when not in use. To the upper end of this stem the stage is firmly fixed; while the lower end carries a concave mirror. Within the tubular stem is a round pillar having a rack cut into it, against which a pinion works that is turned by a milled head; and the upper part of this pillar carries a horizontal arm which bears the lenses, so that by turning the milled head the arm may be raised or lowered, and the requisite focal adjustment obtained. Three magnifiers are supplied, and by using them either separately or in combination, a considerable range of powers from about five to forty diameters is obtained. A condensing lens for opaque objects, a pair of brass forceps, and pliers, and an aquatic box for the examination of objects in water, are also supplied. This instrument is peculiarly adapted for educational purposes, being fitted in every particular for the examination of botanical specimens, small insects or parts of insects, water-fleas, the larger animalcules, and other such objects as young people may readily collect and examine for themselves: and those who have trained themselves in the application of it to the study of nature are well prepared for the advantageous use of the Compound Microscope. But it also affords to the scientific inquirer all that is essential to the pursuit of such investigations as are best followed out by the concurrent employment of a Simple and a Compound Microscope, the former being most fitted for the preparation, and the latter for the examination of many kinds of objects; and it may be easily adapted to the purposes of dissection by placing it between arm-rests or blocks of wood, or books piled one on another so as to give a support for the hand on either side, at or near the level of the stage.

## QUEEN'S DISSECTING MICROSCOPE.



3057.

- | No.   |  | PRICE.  |
|-------|--|---------|
| 3057. | Queen's Dissecting Microscope. Stand 5 inches in height, with new pattern <i>tripod</i> base, which is much superior in steadiness to the circular form. Large, firm stage, with central aperture of $1\frac{3}{4}$ inches, into which fits neatly a circular glass plate. For cases in which it is desirable to work directly on the slide, a pair of spring clips are provided to hold the latter in place; these may be entirely removed when not in use. One lens of $1\frac{1}{4}$ -inch focus, carried by an arm which may be shifted to one side, leaving the stage entirely clear. Rack and pinion adjustment for focus; plane mirror with all adjustments, condensing lens for opaque objects.<br>In design and workmanship, this instrument is believed to be superior to any in the market. In neat walnut case, with drawer, . | \$15 00 |
| 3058. | Single Lens, of $\frac{3}{4}$ -inch focus, . . . . .   | 1 50    |
| 3059. | Coddington Lens, $\frac{1}{4}$ -inch focus, . . . . .  | 6 00    |

BOYS' COMPOUND MICROSCOPE.



3060.

No.		PL. CR.
	3060. Boys' Compound Microscope, . . . . .	\$2.50

This instrument is a well-made and substantial one, and well adapted to the study of objects requiring rather more power than can be conveniently obtained with a simple microscope. It will show satisfactorily the larger animalculæ in pond-water, the scales from a butterfly's wing, and similar minute objects. The stand is of polished brass handsomely lacquered, with one eye-piece and one object-glass, magnifying when combined about 40 diameters or 1600 times. One prepared object, two glass slips, and a pair of brass forceps, are furnished with it, and the whole is packed in a neat, polished walnut wood case.

*The magnifying power, as understood by microscopists, is in diameters. A popular way is to give the area or superficies; and, as the object is magnified equally in all directions, this power is obtained by squaring the diameter.*

The Rev. Mr. Wood's little work, entitled "*Common Objects of the Microscope*" (No. 3962 of this Catalogue), is highly recommended for the use of beginners in the study. It contains full directions in the use of the instrument, and for the collection and preservation of specimens; is illustrated with 400 engravings, printed in colors, and costs the trifling sum of 50 cents.

We have a great variety of popular objects, well prepared, and mounted on papered glass slides (No. 3914 of this Catalogue), which are specially suited to the capacity of this and other cheap Microscopes. They cost \$1.25 per dozen, or 15 cents each.

## QUEEN'S UNIVERSAL HOUSEHOLD MICROSCOPE.



3061.

No.

PRICE.

3061. QUEEN'S UNIVERSAL HOUSEHOLD MICROSCOPE, . . . . . \$4 75

This admirable instrument is the most complete, convenient, and powerful Microscope ever produced for so low a cost. It has all the important parts of a first-class instrument, is readily adjusted for the examination of all classes of objects, and is well calculated not only to amuse but instruct young persons, and thereby foster a taste for the study of Natural History.

The Stand is ten inches in height, with hinged joint, allowing it to be inclined to any angle for convenience of observation. The base is of cast-iron, handsomely bronzed, the compound body of finely lacquered brass, with draw-tube for increasing the power of the object-glasses. These are two in number, and give, in connection with the draw-tube, a range of powers from 20 to 100 diameters, or from 400 to 10,000 times. The stage is of ample size, and is provided with spring clips for holding the object whilst under observation; beneath is a concave mirror, conveniently jointed, for the illumination of all transparent objects. All the ordinary animalculæ found in pond-water can be satisfactorily shown with this Microscope. One prepared object, two glass slips, and a pair of brass forceps, are furnished with it, and the whole is packed in a neat and strong walnut wood case.

3062. QUEEN'S UNIVERSAL HOUSEHOLD MICROSCOPE, the same as 3061. with the addition of an *Achromatic* object-glass of three powers (from 40 to 200 diameters), will exhibit satisfactorily blood and pus corpuscles, . . . . . \$8 00



QUEEN'S UNIVERSAL HOUSEHOLD MICROSCOPE.

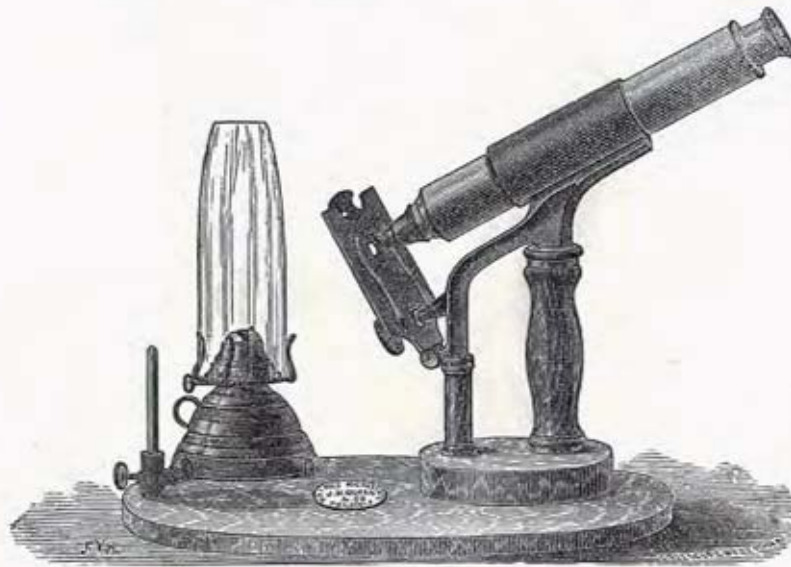


3063.

No.		Price
3063.	QUEEN'S UNIVERSAL HOUSEHOLD MICROSCOPE, similar to 3061, with additions of Rack and Pinion for adjustment of focus, and a condensing lens for the illumination of opaque objects. These additions render this instrument as near perfect as possible, for so small a cost, and leave but little to be desired. One prepared object, two glass slips, and a pair of brass forceps, accompany each one, and the whole is contained in a neat polished mahogany case, . . . . .	\$7 50
3064.	QUEEN'S UNIVERSAL HOUSEHOLD MICROSCOPE, same as 3063, with addition of an <i>Achromatic triplet</i> object-glass, giving powers from 40 to 290 diameters, . . . . .	11 00

We believe these Microscopes — from 3061 to 3064 — cover the entire field possible for such cheap instruments, and that in all essentials they are far in advance of anything heretofore offered the public. In the ten years that have elapsed since we first introduced No. 3061, we have sold several thousands of the same, and always with satisfaction to the purchasers.

## QUEEN'S "HOLMES'S" CLASS MICROSCOPE.

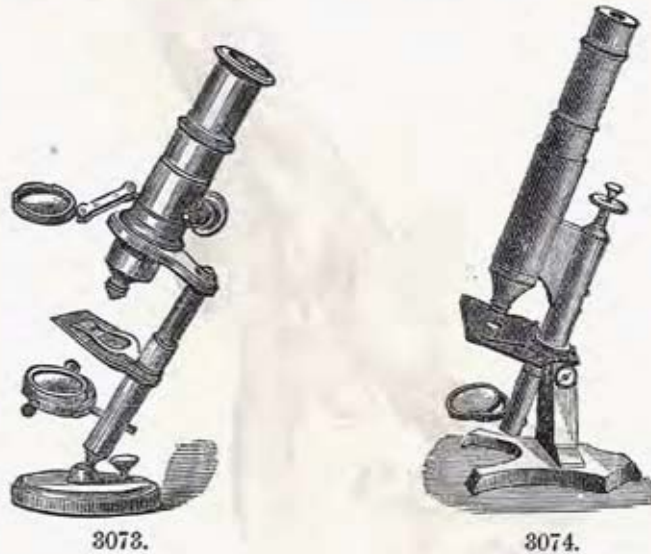


3070.

No.		Price.
3070.	QUEEN'S "HOLMES'S" CLASS MICROSCOPE. Stand, with one eye-piece, condenser for illumination of opaque objects, and lamp, . . . . .	\$15 00
3071.	QUEEN'S "HOLMES'S" CLASS MICROSCOPE. Stand as above, with addition of <i>mirror</i> beneath stage, . . . . .	20 00
3072.	Portable Case for 3070 or 3071, in black walnut, polished, with brass handle and lock and key, and fittings for eye-piece and object-glass, . . . . .	6 00

The "Holmes's" Class Microscope was originally designed by Dr. O. W. Holmes, of Boston, for use in his own class. By slight modifications of his original plan, we have succeeded in producing the instrument in a somewhat improved form, and feel assured it exactly fills a long-felt want, combining as it does a *perfect Class* microscope, with a very excellent and practical stand for all ordinary table use. Supported on a base of polished walnut by a column of the same wood (which forms the handle for class use), is a light frame of bronzed iron, bearing upon its upper surface, at an angle most convenient for observation, a short, split tube, through which the compound body slides with perfect smoothness, forming the coarse adjustment for focus. The fine adjustment is effected by a micrometer screw and lever beneath the stage. The latter is furnished with light spring clips, for holding the object, and a revolving diaphragm with different-sized openings. The compound body is furnished with a first-class eye-piece (A or B, as desired); and the "*Society Screw*," whereby any objective of standard English or American make can be used on it. A coal-oil lamp on adjustable stand, firmly secured to the base of the instrument, furnishes the illumination. For transparent objects, the light from the edge or width of the flame is allowed to fall directly upon the object, through the central aperture of the stage. For opaque objects, the lamp is raised to the top of its stand, and its rays allowed to fall upon a small concave mirror attached to the iron frame by a universal joint, whence they are reflected upon the object. The entire height of the instrument is about twelve inches, size of base twelve by four inches, weight three and a quarter pounds.

FRENCH ACHROMATIC MICROSCOPES.



- | No.   |   | PRICE.  |
|-------|---|---------|
| 3073. | <p>ACHROMATIC MICROSCOPE. Nine inches in height, with broad circular base of bronzed iron; body and stand of brass, finished in the best possible manner, and attached to the base by a ball-and-socket joint, allowing any angle of inclination. The adjustment of focus is effected by an excellent rack and pinion; the stage is of a large size, with delicate spring clips for confining the object under examination. The illumination of transparent objects is effected by means of a concave mirror beneath the stage; that of opaque objects by a condensing lens attached to the compound body. One eye-piece, and an achromatic objective of three powers, 50 to 150 diameters, are furnished with the stand, also two prepared objects, two glass slips, and a pair of brass forceps, all packed in a neat mahogany case, . . . . .</p>  | \$13 00 |
| 3074. | <p>ACHROMATIC MICROSCOPE. Ten inches in height, stand of brass, with iron base, handsomely finished and of the best workmanship. The body is supported on an upright pillar of brass, is furnished with draw-tube, and hinged so as to allow of any angle of inclination. The coarse adjustment of focus is made by sliding the compound body within an outer tube, moving very smoothly; the fine adjustment by means of a delicate micrometer screw. There are two eye-pieces, and two sets of achromatic object-glasses, giving a range of powers from 50 to 330 diameters. Beneath the stage is a revolving diaphragm, with different-sized apertures, and the mirror is hung so as to allow the utmost obliquity of illumination. A condensing lens for illuminating opaque objects is also furnished, together with knife, needle, and forceps, and the whole is packed in a neat, upright mahogany cabinet, with good lock and brass handle, . . . . .</p> | 25 00   |

## QUEEN'S STUDENT'S MICROSCOPE.



3096.

- | No.   |   | Price.  |
|-------|---|---------|
| 3096. | QUEEN'S STUDENT'S MICROSCOPE, MONOCULAR, 14 inches high, of highly finished brass; Stage of Glass, with perfectly smooth motions in all directions; Plane and Concave Mirrors; Revolving Diaphragm, which may be entirely removed when extremely oblique illumination is required; Draw-Tube; Rack and Pinion and Fine Screw Adjustments for focus; with<br>Two Eye-pieces, Nos. 1 and 2;<br>$\frac{3}{8}$ -inch Objective, 30 degrees angle of aperture;<br>$\frac{1}{2}$ do. 95 do. do. ;<br>Condensing Lens;<br>Upright Walnut Case, with brass handle and lock and key, | \$75 00 |
| 3097. | QUEEN'S STUDENT'S MICROSCOPE, MONOCULAR, same as above, but with Glass Rotating Stage,  | 80 00   |

QUEEN'S STUDENT'S MICROSCOPE,



3098.

No. 3098. QUEEN'S STUDENT'S MICROSCOPE, BINOCULAR, 14 inches high, of brass throughout, handsomely finished; Glass Stage; Plane and Concave Mirrors; Removable Diaphragm, of three apertures; Rack and Pinion Adjustment to Draw-Tubes for distance between eyes; Rack and Pinion and Fine Lever Adjustments for focus; with  
 Two pair of Eye-pieces, Nos. 1 and 2;  
 $\frac{3}{8}$ -inch Objective, 30 degrees angle of aperture;  
 $\frac{1}{2}$  do. 95 do. do.  
 Condensing Lens;  
 Upright Walnut Case, with brass handle and lock and key, . \$100 6

Fig. 107.

## CENTENNIAL INTERNATIONAL EXHIBITION.

PHILADELPHIA, 1876.



## JUDGES' REPORT



ON THE

## MICROSCOPES (BINOCULAR and MONOCULAR), MICROSCOPE OBJECTIVES, AND ACCESSORY APPARATUS,

EXHIBITED BY HENRY CROUCH.

**JAMES W. QUEEN & CO., Agents.**

PHILADELPHIA, November 8, 1876.

The undersigned, having examined the products herein described, respectfully recommend the same to the "United States Centennial Commission" for award, for the following reasons, viz.:

A series of Microscope Stands is exhibited, all constructed upon a common plan, which combines simplicity of design with all desirable stability and remarkable lightness. The simplest form, called the "Histological Microscope," with rack work, and with and without fine lever adjustments, is believed to be the cheapest form of Microscope capable of real work in the market. The "Student's Microscope," Monocular and Binocular, with rack and lever adjustments, rotating glass stage, and various appliances for aiding manipulation and illumination, possesses nearly all the advantages desirable in a Microscope for investigation, and is also remarkably cheap. The "First Class Microscopes," Monocular and Binocular, embrace mechanical adjustments of the stage in co-ordinate directions, complete rotation of the stage, rack and lever adjustments, graduated stage and draw tube, improved sub-stage, and every other desirable appliance for a complete instrument, and is furnished at prices similarly moderate. It is an extremely convenient feature of these stands, that the sub-stage may be removed by a lateral slide, by which is secured a great saving of time and trouble over the ordinary arrangements. The "Student's Binocular" was the first instrument of the kind introduced to meet the wants of the working student. An important peculiarity of the first-class rotating stages is the newly-introduced centring adjustment, by means of which, rotation about the optic axis is perfectly and instantaneously secured. A centring arrangement of the diaphragm is also provided.

The Objectives exhibited range from 3-inch to  $\frac{1}{4}$ -inch. For sharpness of definition and freedom from distortion of image, they leave nothing to be desired. They are admirably adapted to all the ordinary work of the Microscope.

The Polariscopes exhibited deserve especial commendation for their excellent mounting and large field.

F. A. P. BARNARD, *Judge.*

Approved by Group Judges

H. K. OLIVER,  
E. LEVASSEUR,  
P. F. KUPKA,  
ED. FAVRE PERRET,

JAMES C. WATSON,  
J. SCHIEDMAYER,  
JOSEPH HENRY,  
GEORGE F. BRISTOW.

A true copy of the Record.

FRANCIS A. WALKER, *Chief of the Bureau of Awards.*

Given by authority of the United States Centennial Commission.

A. F. GOSHORN, *Director-General.*  
J. R. HAWLEY, *President.*

J. L. CAMPBELL, *Secretary.*

The Objectives of higher power were tendered for examination, but were not officially reported upon, other exhibitors objecting, upon the ground of their being entered too late for competition.

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“UNIVERSITY COLLEGE, *January, 1870.*

“I am very much pleased with the Stands (Student's Monocular) which Mr. Crouch has constructed for the use of my class. Strong, simple, and cheap, they are the best working instruments I have yet met with. The adjustments are true, and have already stood a considerable amount of hard work without injury. The stage movement, with ordinary attention, works admirably; for class purposes it is better than a mechanical stage. I find by experience that by means of it I can run very rapidly over a very large field, and yet bring the smallest object into just what position I please. Moreover, it is so simple that it does not readily get out of order, and when out of order can be very easily repaired.

“Of the new  $\frac{1}{3}$ th Objectives, I have not as yet had so large an experience as of the Stands. So far, however, I have found them excellent for histological purposes. They possess the particular qualities useful for investigating the structure of the tissues generally, and are exceedingly cheap.

“The Stand works very well with a  $\frac{1}{2}$ th, and even with  $\frac{1}{3}$ th, Objective; and on the addition of a Condenser, for which the Stand is fitted, almost any investigation might be carried on with the instrument. M. FOSTER, M. D.”

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### CROUCH'S NEW HISTOLOGICAL MICROSCOPE.

“This instrument may be recommended to those who think it well to provide themselves, in the first instance, with a microscope that is capable of being improved by progressive additions. It is not only very light and portable, but very free from tremor. The rack movement is so good, that a  $\frac{1}{3}$  Objective may be focussed by it with great exactness. This instrument is provided with two Objectives, each consisting of a good triplet combination of a 2-inch and 1-inch focus respectively; and when to these is added a  $\frac{1}{4}$ -inch Objective of moderate angular aperture, it is rendered a very serviceable Student's Microscope. The aperture of the Stage being carefully centred to the axis of the body, a tube is screwed into it which will carry a Polariscopes or Paraboloid, &c.; and by additions, which may be made *at any time*, this instrument may be rendered quite complete enough for the ordinary want of the scientific investigator.”—*Dr. Carpenter on the Microscope*, last edition.

### CROUCH'S NEW STUDENT'S MICROSCOPE.

“This instrument had the great merit of first bringing within reach of the student a convenient and well-constructed Binocular, at a cost not greater than that usually charged for the Wenham prism and the secondary body alone. With the improvements it has since received, it still remains one of the best instruments of its class; and the author, after considerable use of it, can strongly recommend it to such as desire a Binocular at once cheap, good, and portable.”—*Carpenter on the Microscope*, last edition.

## CROUCH'S NEW HISTOLOGICAL MICROSCOPE.



3100.

The Stand (as figured) is 13 inches high, made entirely of brass, neatly finished. It has Crouch's new form of foot, firm and graceful. The body tube is 8 inches long,  $1\frac{3}{8}$  inches in diameter, and has graduated draw-tube. Rack and pinion adjustment for focus, having sufficient range for a 2-inch objective; also delicate fine adjustment, for use with high powers. Stage firm and of ample size, with delicate spring-clips, which are adjustable to hold a slide more or less firmly, or which may be entirely removed, if necessary. The diaphragm is of the usual form, consisting of a circular rotating plate, with three apertures, and fits into a tube beneath the stage, which may be entirely removed when oblique illumination is required. Concave mirror, with adjustments for direct or oblique light.

This Microscope is made to meet the wants of that class of observers who require an instrument, simple, *but good and well made* (and capable of doing excellent work), at a moderate price, and can be recommended to students in histology and vegetable anatomy, and for the examination of ferments, &c. Unlike many microscopes of similar price, the stand is so steady and of such good workmanship that objective



of the highest power may be used on it with facility. It can have the ordinary illuminating apparatus applied, *and is worthy the addition*; and when furnished with Condenser, Polariscope, Spot-Lens, Camera Lucida, Zoophyte Trough, Stage Micrometer, etc., it makes an instrument complete for almost any class of investigation.

We call particular attention to the recent addition of a much heavier (as well as somewhat more graceful) base. Also to an improved plan for swinging the mirror to obtain oblique light. By the present arrangement 79 degrees of obliquity may be obtained.

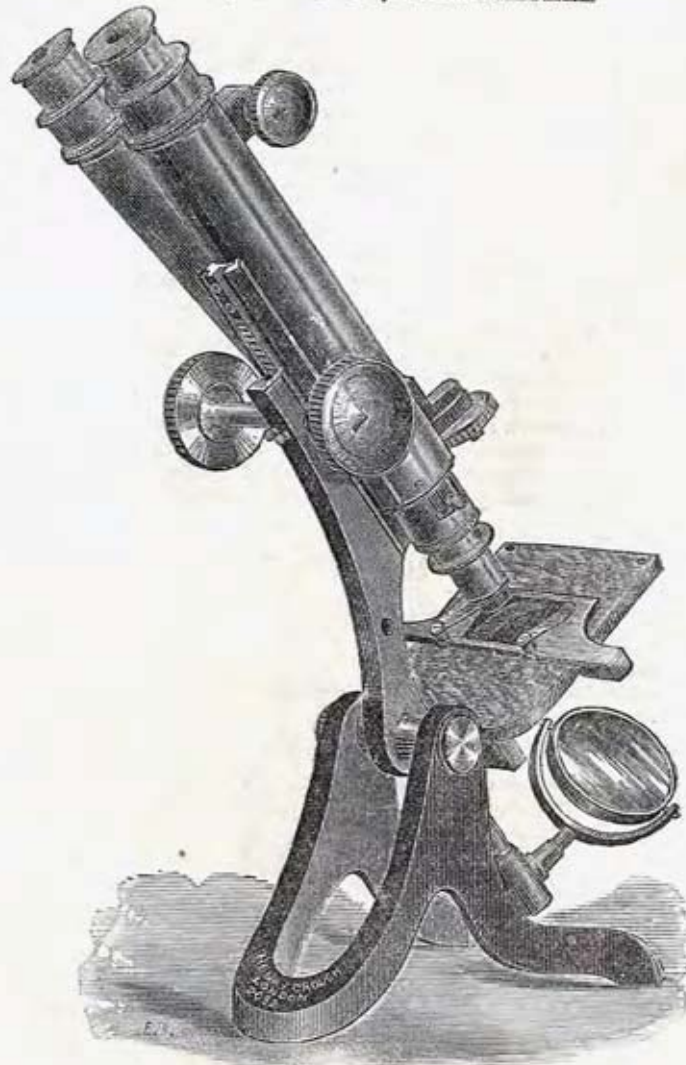
No.	PRICE.
3100. Crouch's New Histological Microscope, with	
No. 1 Eye-piece, giving from 45 to 350 diameters;	
No. 2 do. do. 70 to 530 do.	
1-inch Object-glass, 16° angular aperture;	
¼ do. do. 100° do. do. (this handsomely re-	
solves <i>P. angulatum</i> );	
Condenser on Stand, for opaque objects;	
Glass Slip with ledge, for examination of liquids.	
In upright portable mahogany case, with brass handle, lock and key	
and fittings for all the accessory parts that are furnished with No. 3101,	\$50 00
3101. Crouch's New Histological Microscope, with the following accesso-	
ries, viz.:	
Eye-pieces, Nos. 1 and 2;	
Objectives, 1-inch and ¼-inch, giving from 45 to 530 diameters;	
Condenser on Stand;	
Polariscope with Selenite;	
Beale's Camera Lucida;	
Stage Micrometer;	
Spot-Lens, for dark-ground illumination;	
Small Zoophyte Trough;	
Live-box;	
Stage-Forceps.	
In upright mahogany case, with brass handle and lock and key,	72 00
3102. Crouch's New Histological Microscope, stand with one eye-piece only,	
in upright portable mahogany case,	32 00

### CROUCH'S HISTOLOGICAL MICROSCOPE, BINOCULAR.

This microscope, as illustrated at No. 3103, is 14 inches high when arranged for use, of brass throughout, and handsomely finished. The draw-tubes have rack and pinion adjustment for distance between the eyes. Rack and pinion and fine lever adjustments for focus. Large and firm stage, having new form of sliding object-carrier which gives a very smooth and easy motion. Revolving diaphragm with 3 apertures, which, with the sub-stage tube, is removable for the purpose of obtaining oblique light. Plane and concave mirrors, 2 inches in diameter, with all adjustments: for illumination of opaque objects, they may be swung above the stage.

This microscope (the cheapest binocular made) is equal in workmanship and performance to the more costly instruments, and is one that we can thoroughly recommend. The objectives furnished with it are of Crouch's *first-class* series (but not adjustable for cover) and are superior to those furnished with other instruments of the same nominal grade by other makers.

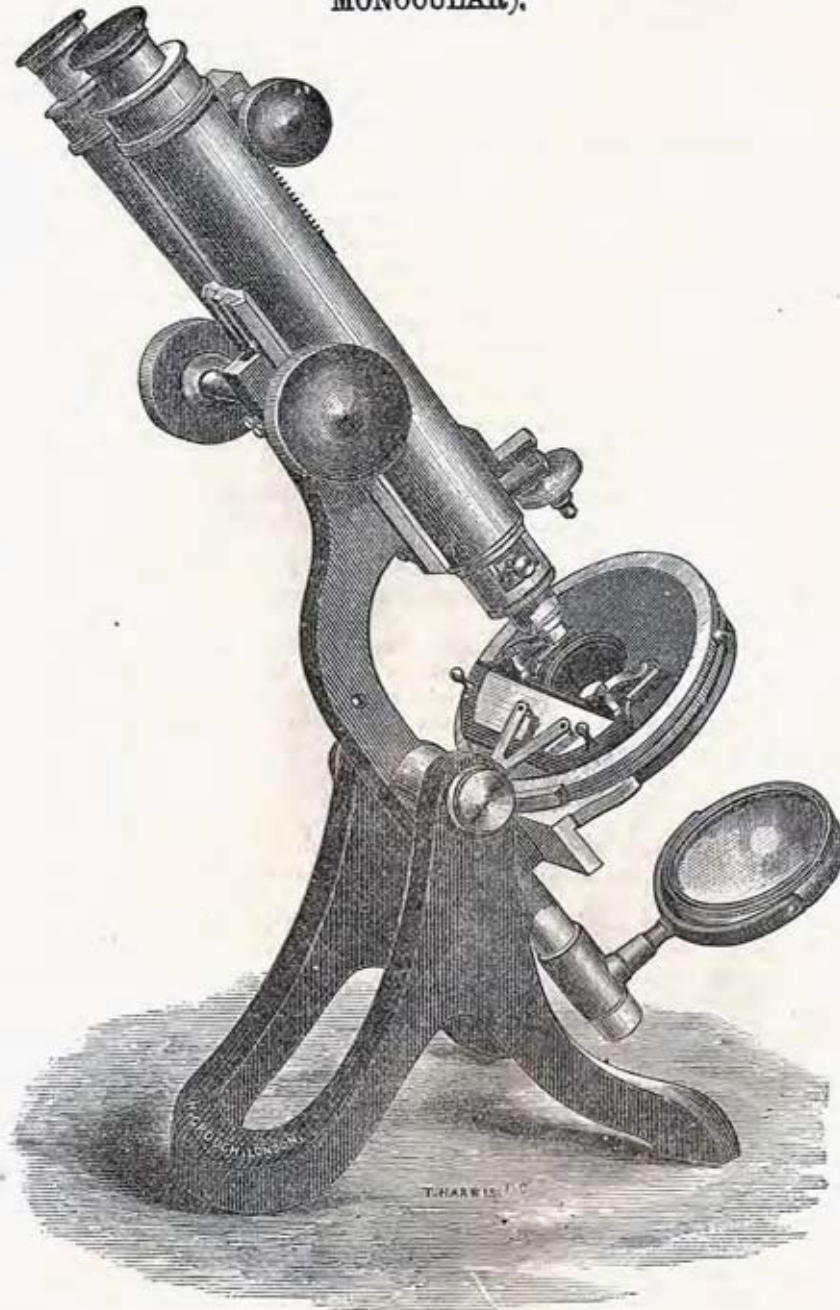
No.	PRICE.
3103. Crouch's Histological Microscope, Binocular, as above described, with	
the following accessories:	
One pair No. 1 Eye-pieces;	
One Object-glass, 1-inch focus, 25° aperture;	
One do. ¼ do. 100° do.	
One Glass slip with ledge and covers.	
In upright portable mahogany case, with handle, and lock and key,	75 00



3103.

No.	PRICE.
3104. Crouch's Histological Microscope, Binocular, with One pair No. 1 Eye-pieces; One Object-glass, 1-inch focus, 25° aperture; One do. $\frac{1}{2}$ do. 100° do. One Glass slip with ledge and covers; Bull's-eye condenser, on separate stand; Spot-lens, for dark ground illumination; Polarizing apparatus, with Selenite; Neutral Tint Camera Lucida; Animalculæ Cage; Stage Micrometer, $\frac{1}{100}$ and $\frac{1}{1000}$ ; Zoophyte Trough; Stage-Forceps.	
In upright mahogany case,	\$100 00
3104½. Crouch's Histological Microscope, Binocular, with 1 pair No. 1 Eye- pieces, (no objectives), in case,	50 00

HENRY CROUCH'S STUDENT'S MICROSCOPE (BINOCULAR AND MONOCULAR).



3105.

The Stand (as figured in No. 3105) is 16 inches high, and is of brass throughout, handsomely finished. The new form of Foot, with which this instrument is now made, combines elegance with great firmness and stability. The body is of the

standard length,  $1\frac{5}{16}$  inches in diameter, and has rack adjustment to draw tubes, for adaptation to the varying distance between the eyes in different individuals. Rack and pinion adjustment for focus, giving sufficient range even for a 4-inch objective; fine lever adjustment, which works well with the highest powers. Glass Concentric Rotating Stage (giving the greatest range and most delicate movement of any stage of its class extant), with complete rotation. Revolving Diaphragm of 3 apertures, removable Concave and Plane Mirrors, with complete adjustments; for oblique light the mirror bar swings as in the "Histological" Microscope, being hinged back of, and just below the stage. This arrangement admits of the mirror being swung above the stage, thus giving a brilliant illumination for opaque objects, and rendering the bull's-eye condenser unnecessary for this purpose.

This Microscope, in its "Binocular" form—the first introduced to the scientific public at a reasonable cost—has steadily increased in reputation, and has now attained the highest position of any microscope of its class. Either as "Binocular" or "Monocular," it has been selected by the first microscopists in England and America for personal use. Its thorough excellence of performance, stability in any position, freedom from tremor (in this respect being unrivaled), simplicity of construction, and consequent non-liability to derangement, render it by far the most perfect working microscope extant. It has now for many years been favored with the approval of Dr. Carpenter as his own working microscope, and was the instrument selected by him for use on the important expeditions of H. M. S. "Porcupine." It was also supplied to the naturalists of the "Alert" and "Discovery," of the Arctic expedition.

In using the Binocular as a Monocular Instrument, it is only necessary to withdraw the prism about  $\frac{1}{4}$  inch, thus leaving the field of the direct tube entirely clear where required.

Should the coarse adjustment be found in course of time to work too easily, it may usually be remedied by tightening the two small screws acting upon the bearings of the pinion.

The accessories applied under the stage are often found to accumulate dirt upon the *fitting*, making them slide uncomfortably. This is best remedied by carefully wiping off all accumulations with a clean rag *slightly oiled*, and also in the same manner cleaning out the fitting under the stage, taking care to wipe them finally with a perfectly dry cloth.

No.	PRICE.
3105. Crouch's Student's Microscope, Binocular, with	
One Object-glass, 1-inch focus, 25° angular aperture;	
One do. $\frac{1}{4}$ do. 100° do. do.	
One pair Eye-pieces, No. 1, giving from 50 to 320 diameters;	
One do. do. No. 2, do. 85 to 500 do.	
Stage-Forceps;	
Blue-tinted glass, for use at night;	
Stage Micrometer, (100 and 1000 to the inch);	
Glass Slip with ledge and covers.	
In portable upright mahogany case, with lock and key and brass handle,	\$100 00
3106. Crouch's Student's Microscope, Monocular, with draw tube, and with the following accessory parts:	
One Object-glass, 1-inch focus, 25° angular aperture;	
One do. $\frac{1}{4}$ do. 100° do. do.	
One Eye-piece, No. 1, giving from 50 to 350 diameters;	
One do. No. 2, do. 85 to 550 do.	
Glass Slip with ledge and covers.	
In upright portable mahogany case,	75 00
3107. Crouch's Student's Microscope, Binocular, Stand with 1 pair eye-pieces only, in upright portable mahogany case,	65 00
3108. Crouch's Student's Microscope, Monocular, stand with 1 eye-piece only, in upright portable mahogany case,	50 00

OROUCH'S NEW INTERMEDIATE STAND.



3110.

[For description, see next page.]

CROUCH'S NEW INTERMEDIATE STAND, BINOCULAR, is entirely of brass, handsomely finished, and stands 17 inches high. It is made to meet the requirements of those who need an instrument having some of the advantages of the Large-Best, at a considerably less price — being of similar style and finish, but simpler and somewhat lighter. Body of the standard length, with rack adjustment to draw-tubes. Rack and Pinion and fine Lever adjustments for focus, having sufficient range for all objectives from the 4-inch upwards. Glass Concentric Rotating Stage, having adjustments for accurately centring to all objectives, and with sliding object-carrier giving very delicate motion and great range. New Sub-stage, with centring and focussing adjustments, the whole being entirely removable laterally, leaving the space under the stage quite clear for the convenience of obtaining the greatest obliquity of illumination. Removable Diaphragm of 3 apertures; large Plane and Concave Mirrors, with complete adjustments.

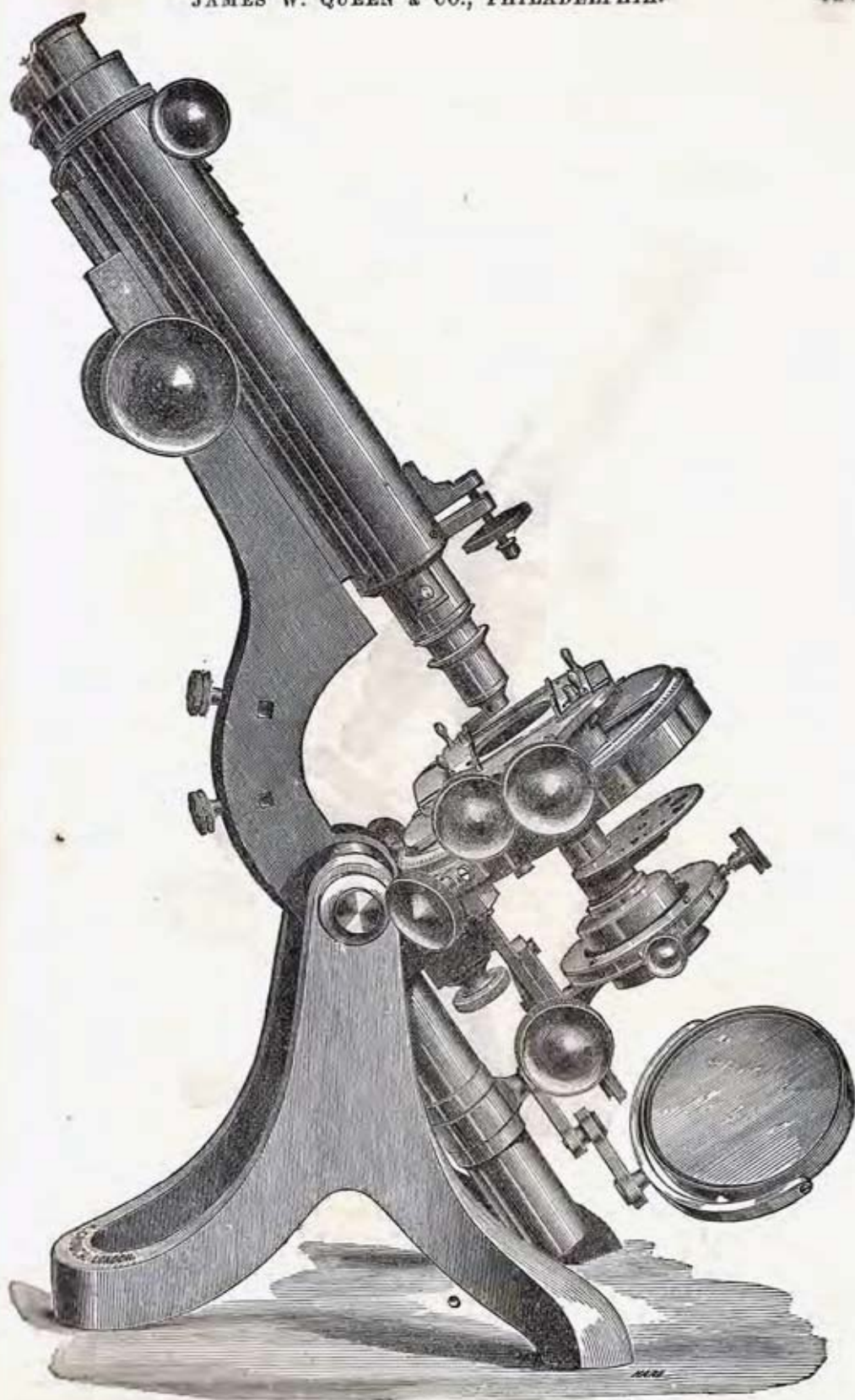
No.	PRICE.
3110. CROUCH'S INTERMEDIATE MICROSCOPE, BINOCULAR, with 2 pairs of Eye-pieces, Nos. 1 and 2, in best portable mahogany case, with best brass handle and lock, and fittings for accessory apparatus, . . .	\$140 00
3111. CROUCH'S INTERMEDIATE MICROSCOPE, BINOCULAR, as described above, with the following accessories, viz.:	
One pair Eye-pieces, No. 1;	
One pair Eye-pieces, No. 2;	
1½-inch Object-Glass, 20 degrees angle of aperture;	
¾-inch do. 30 do. do.	
½-inch do. 100 do. do.	
Animalcule Cage;	
Condensing-Lens, on separate stand;	
Stage-Forceps, and Brass Pliers.	
The whole packed in best upright, polished mahogany case, . . .	200 00

### CROUCH'S NEW LARGE-BEST MICROSCOPE STAND.

This handsome instrument combines all the latest improvements in construction. It has been very carefully remodelled, and includes every possible adjustment. The Stage and the whole of the optical arrangements are carried by the limb, which is sufficiently solid to practically abolish vibration, even with the application of the highest powers. The Body is fitted with Wenham's Binocular Arrangement, complete with rack-work adjustment to draw tubes, for perfect adaptation to individual vision; coarse and fine adjustments, with range for all objectives; Compound Goniometer Stage, graduated upon silvered ring to 360°, with complete rotary and rectangular movements, and new centring adjustments, by which the rotation of the Stage is rendered instantaneously perfect with any objective. New Sub-stage, with centring and focussing adjustments, entirely removable by lateral slide for oblique illumination by the mirror. Large flat and concave mirrors, with double crank and all necessary movements; graduated draw-tube.

3115. CROUCH'S NEW LARGE BEST MICROSCOPE, BINOCULAR, with two pairs of eye-pieces, Nos. 1 and 2, stage-forceps, and hand pliers, in best portable mahogany case, with best brass handle and lock, and fittings for accessory apparatus, . . .	240 00
3116. CROUCH'S NEW LARGE-BEST MICROSCOPE BINOCULAR, as described above, with the following accessories, viz.:	
One pair Eye-pieces, No. 1;	
One do. No. 2;	
Draw Tube;	
1½-inch Object-Glass, 20 degrees angle of aperture;	
¾-inch do. 30 do. do.	
½-inch do. 100 do. do.	
Condensing-Lens;	
Stage-Forceps and Hand-Pliers.	
The whole packed in best upright mahogany case, with side-case for accessories, . . .	300 00

*We will make any other desired grouping of Accessory parts and Microscope, and name price on application*



3115.

## ZENTMAYER'S MICROSCOPES.

### ZENTMAYER'S AMERICAN HISTOLOGICAL MICROSCOPE.

Patented 1876. One-third actual size.



3121.

Entire Stand of brass. Base and uprights of one piece, of a peculiar shape, of great rigidity, to which the bar is attached by a joint, allowing the use of the instrument at any angle of inclination. Coarse adjustment by sliding tube, or rack and pinion. The tube is  $5\frac{1}{2}$  inches long, capable of elongation to the standard length. Fine adjustment of the same style as that of the American Centennial Microscope, giving a very steady and delicate movement. Sub-stage, and Plain and Concave Mirrors swing in such a manner as to have the object as a centre, even when swung over the stage for illuminating opaque objects, thus making the Bull's-eye Condenser unnecessary. The removable sub-stage carries the diaphragms, which can be shifted up close to the object. The Stage, with removable spring clips, is only three inches



above the table when in a horizontal position. The object-carrier is a modification of the glass stage, consisting of a glass plate kept down by two spring clips. If preferred, the plate may be removed, and the clips used alone by simply placing them in the extra holes provided for that purpose.

No.	PRICE.
3120. Zentmayer's American Histological Microscope, with coarse adjustment by sliding tube, and One Eye-piece, No. 1 or 2; One Object-glass, $\frac{8}{10}$ -inch focus, $24^\circ$ angular aperture; One do. $\frac{1}{2}$ do. $75^\circ$ do. do. (which easily resolves P. angulatum). Packed in a neat walnut case, with lock and key and brass handle,	\$50 00
3121. Same as No. 3120, but with rack adjustment,	58 00
3122. Do. No. 3121, but Binocular, with one pair of Eye-pieces,	80 00
3123. Do. No. 3120, but without Object-glasses,	32 00
3124. Do. No. 3121, do. do.	40 00
3125. Do. No. 3122, do. do.	62 00

This Stand may be, if so desired, fitted out with any of the object-glasses, and many of the accessories from the lists. (See pages 131 to 143.)

### ZENTMAYER'S U. S. ARMY HOSPITAL MICROSCOPE.

This Stand was originally designed and constructed for the United States Army, Medical Department, in 1862, but has recently been reconstructed. The Stand is 16 inches high when arranged for use. The body is of standard length, has rack and pinion for coarse adjustment; and a fine micrometer screw, acting upon a lever, forms the delicate fine adjustment. The bar is supported by one stout pillar, with joint to incline to any angle.

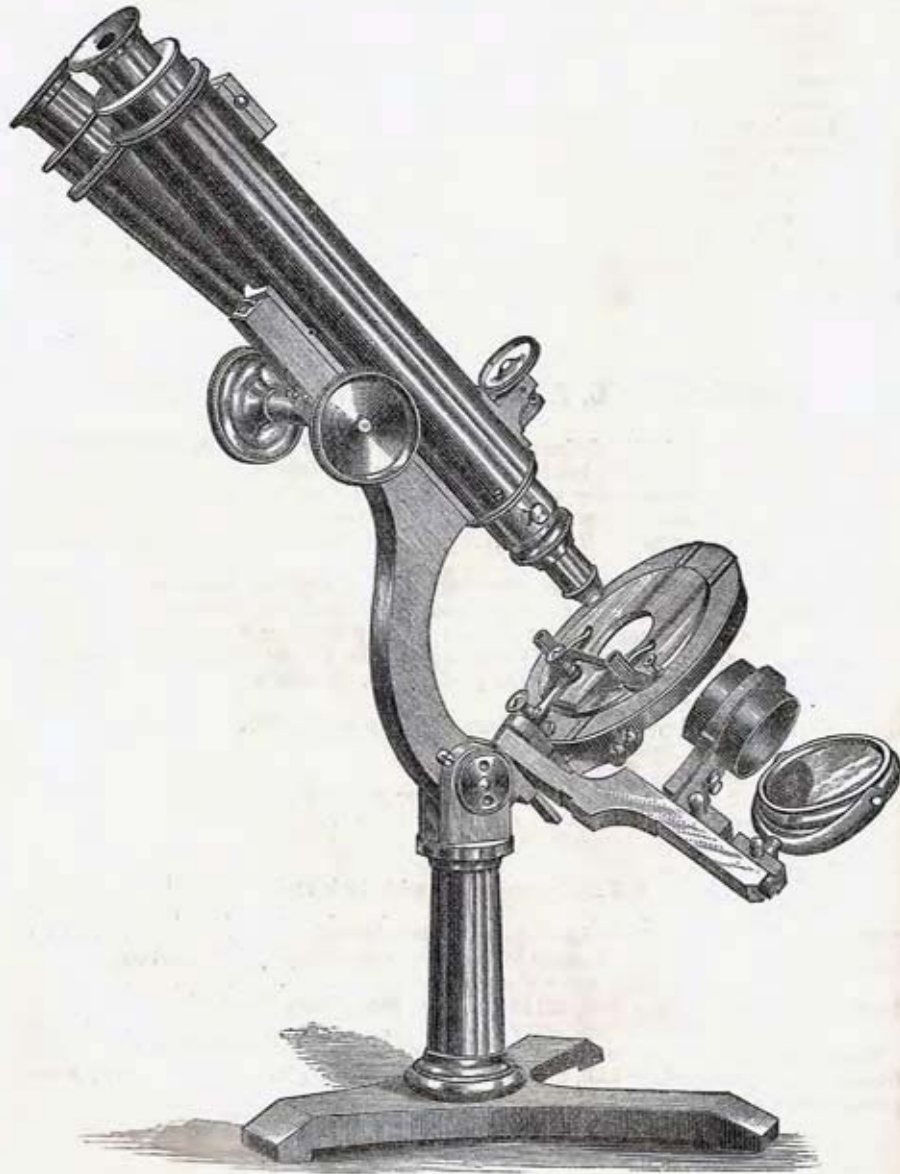
The sub-stage, which carries the accessories, and the plane and concave mirror, swing in the same manner as in the American Centennial Stand, having the object as its centre, even when swung over the stage for illuminating opaque objects, thus making a bull's-eye unnecessary. The stage is similar to that of the American Centennial Stand, with the exception of the graduations. It has a complete revolution and is adjustable.

3126. United States Army Hospital Microscope, Binocular, with One pair No. 1 Eye-pieces; One do. No. 2 do. One Object-glass, $\frac{8}{10}$ -inch focus, $32^\circ$ angular aperture; One do. $\frac{1}{2}$ do. $90^\circ$ do. do. Camera Lucida; Stage Micrometer. In upright polished mahogany case, with lock and key and brass handle,	173 00
3127. Same as No. 3126, but Monocular, with two Eye-pieces,	133 00
3128. United States Army Hospital Microscope, Binocular, Stand with two pairs Eye-pieces only, and mahogany case,	130 00
3129. United States Army Hospital Microscope, Monocular, Stand with two Eye-pieces only, and mahogany case,	90 00

These Microscopes may be fitted out with any of the object-glasses and accessories from our list (pages 131 to 143), and we shall be glad to give estimates for any such groupings as may be desired.

UNITED STATES ARMY HOSPITAL MICROSCOPE.

Patented 1876. One-third actual size.



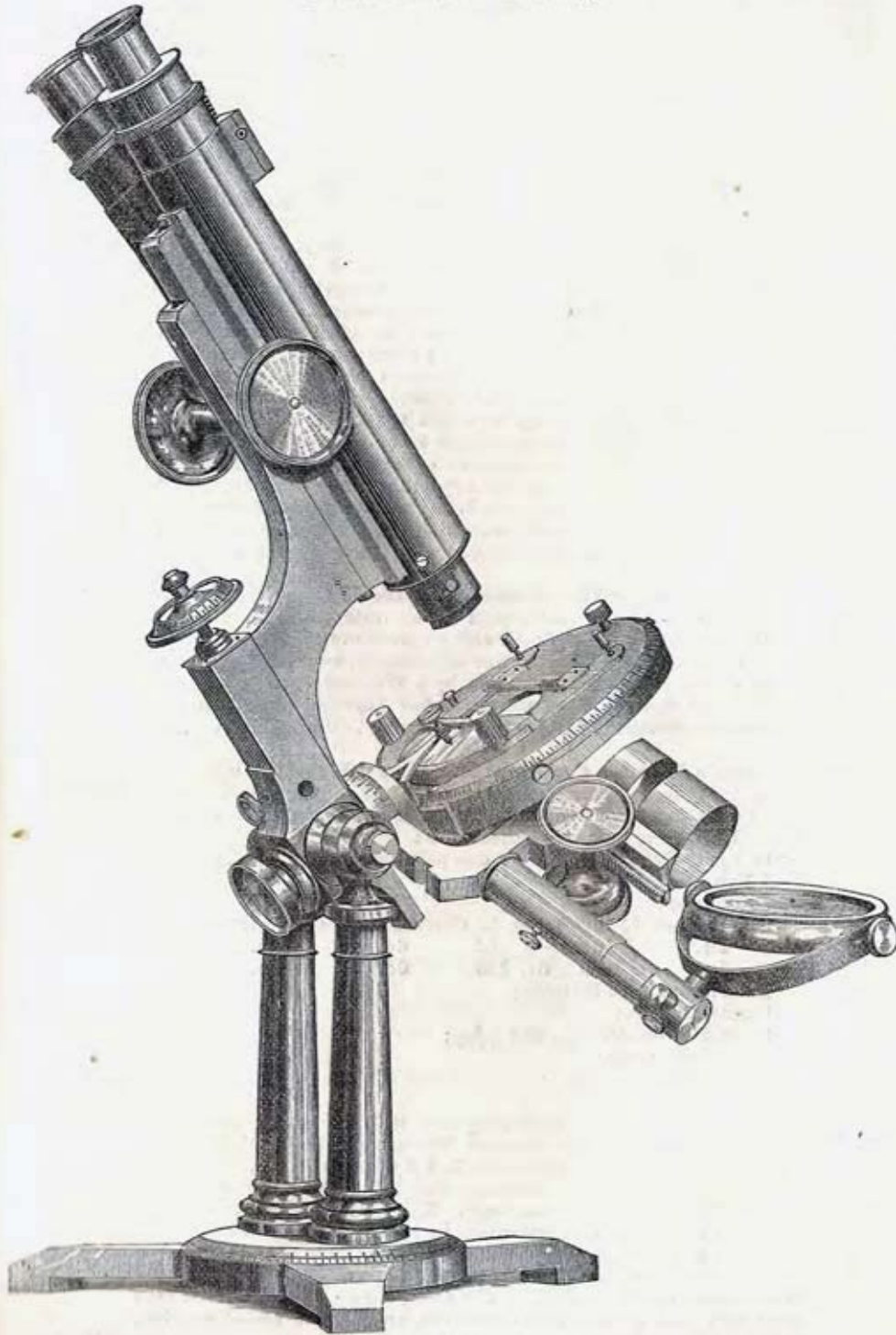
3126.

JAMES W. QUEEN & CO., PHILADELPHIA.

129

**ZENTMAYER'S AMERICAN CENTENNIAL STAND.**

Patented 1876. One-third actual size.



3130.

**ZENTMAYER'S AMERICAN CENTENNIAL STAND.** This Stand was designed and constructed especially for the Centennial Exhibition. It is mounted on a tripod, with revolving platform. The bar and trunnions are one piece, and swing between two pillars for inclining the instrument to any angle. The coarse adjustment is accomplished by rack and pinion. The swinging sub-stage, which carries the condenser, or other illuminating apparatus, and the mirror, swings around a pivot, of which the axis passes through the object observed, so that this object is in every position in the focus of illumination. The stage may be detached with facility, and replaced by one especially constructed for extreme oblique illumination, called a Diatom Stage. The mirror may be swung entirely above any of the stages, and the arm is provided with a graduated circle for indicating the degree of obliquity.

As an object placed on the stage is in a plane with the axis of the trunnions, it is obvious that, if the instrument is placed in a horizontal position, the object is in the axis of revolution of the graduated platform, and the angular aperture of an objective focussed on this object can be easily measured. It can be readily seen that in this position the object is in the centre of all the revolving parts of the instrument, the revolving stage, swinging sub-stage, and the platform.

The Stage consists of a bell-metal ring, firmly attached to the bar, but adjustable by means of set screws, in order to make it perfectly concentric to the optical axis of the instrument. This ring receives the stage platform, which has a complete revolution. The outer edge is bevelled, silvered, and graduated into degrees to serve as a goniometer. The carriage on which the object is placed rests on a piece of plate-glass, kept down by a spring with an ivory-pointed screw to the two rails on the revolving stage platform, which gives an exceedingly smooth and firm movement, and a freedom of motion not obtained by any other arrangement.

The Sub-stage is divided into two cylindrical receivers, to facilitate the adaptation of several accessories at one and the same time; the lower cylinder of the two can be moved up and down, or entirely removed, and the upper one has centering adjustment.

The Fine Adjustment (in other instruments of the Jackson principle in front of the body) is removed to the more stable part of the instrument, the bar, which is provided with two slides, one for the rack and pinion movement, and close to it another one of nearly the same length for the fine adjustment, moved by a lever concealed in the bent arm of the bar, and acted upon by a micrometer screw. In this way the body is not touched directly when using the fine adjustment, and the body does not change the relative distance of Objective, Binocular Prism, and Eye-piece.

No.	Price.
3130. Zentmayer's American Centennial Microscope, Binocular, with 1 pair Eye-pieces, No. 1, 1 pair Eye-pieces, No. 2, 1 Eye-piece, No. 3, no case,	\$300 00
3131. Zentmayer's American Centennial Microscope, Binocular, as above described, with the following accessories:	
One pair Eye-pieces, No. 1; one pair Eye-pieces, No. 2;	
1 Eye-piece, No. 3;	
Draw-tube;	
Object-glass, 1½-inch focus, 22 degrees angle of aperture;	
Do.     1-inch do. 32     do.     do.	
Do.     ¾-inch do. 120    do.     do.	
Polariscope with Selenite;	
Camera Lucida;	
Stage Micrometer, $\frac{1}{100}$ and $\frac{1}{1000}$ ;	
Animalcule Cage;	
Wenham's Compressor;	
Condenser on Stand.	
The whole packed in best mahogany case, with side case for accessories	458 00
3132. Zentmayer's American Centennial Microscope, Monocular, with 1 Eye-piece, No. 1, 1 Eye-piece, No. 2, 1 Eye-piece, No. 3, no case,	250 00
3133. Fine upright polished mahogany case with side case for accessories,	30 00
3134. Concentric Adjustable Diatom Stage. This stage is 3 inches in diameter, and extremely thin, allowing, in connection with the swinging sub-stage and mirror, not only the greatest oblique illumination, but the mirror and achromatic condenser will rise above the stage for illuminating opaque objects. The changing of stages does not take more time than changing of objectives, and can be added to 3130, 3131, 3132, at a cost of	20 00

*Any other desired grouping of Stand and Accessory pieces will be made to meet the wants of purchasers, and estimates of combined price will be furnished for such lists.*

**ACHROMATIC OBJECT-GLASSES.**

**JAMES W. QUEEN & CO.'S OBJECTIVES.**

No.					PRICE.
3170.	3-inch focus,	8 degrees angle of aperture,			\$12 00
3171.	1 $\frac{1}{2}$ do.	18 do.	do.		12 00
3172.	do.	30 do.	do.		12 00
3173.	do.	45 do.	do.		12 00

**C. A. SPENCER & SONS' OBJECTIVES.**

These lenses are of the widest angular aperture, and all, from the  $\frac{1}{2}$ -inch to the  $\frac{1}{5}$ -inch, are provided with collar adjustment (for thickness of cover-glass), which does not move the front lens.

3195.	3-inch focus,	13 degrees angle of aperture,			18 00
3196.	2 do.	20 do.	do.		25 00
3197.	1 do.	50 do.	do.		45 00
3198.	$\frac{2}{3}$ do.	47 do.	do.		32 00
3199.	$\frac{1}{2}$ do.	100 do.	do.		50 00
3200.	$\frac{1}{3}$ do.	180 do.	do.	dry and immersion, or immersion,	65 00
3201.	$\frac{1}{4}$ do.	180 do.	do.	do. do.	70 00
3203.	$\frac{1}{6}$ do.	180 do.	do.	do.	80 00
3204.	$\frac{1}{8}$ do.	180 do.	do.	do.	115 00
3205.	$\frac{1}{10}$ do.	180 do.	do.	do.	150 00
3206.	$\frac{1}{12}$ do.	180 do.	do.	do.	200 00
3207.	$\frac{1}{15}$ do.	180 do.	do.	do.	250 00

**SPENCERS' PROFESSIONAL SERIES.**

The Objectives of this series, from the  $\frac{1}{2}$ -inch upwards, are adjustable by an arrangement working very smoothly and delicately. It is the aim of the makers to have all the lenses of this series *strictly first-class*.

3210.	3-inch focus,	13 degrees angle of aperture,			18 00
3211.	2 do.	16 do.	do.		18 00
3212.	1 do.	33 do.	do.		18 00
3213.	$\frac{2}{3}$ do.	36 do.	do.		20 00
3214.	$\frac{1}{2}$ do.	65 do.	do.		25 00
3215.	do.	115 do.	do.		24 00
3215 $\frac{1}{2}$ .	do.	175 do.	do.	immersion,	34 00
3216.	$\frac{1}{3}$ do.	175 do.	do.	dry and immersion,	36 00
3217.	$\frac{1}{4}$ do.	175 do.	do.	do. do.	40 00
3218.	$\frac{1}{5}$ do.	175 do.	do.	immersion,	50 00
3219.	$\frac{1}{6}$ do.	175 do.	do.	dry and immersion,	60 00

**SPENCERS' STUDENTS' SERIES.**

These are excellent lenses of moderate angular aperture. As a specimen of their performances, we may say that the  $\frac{1}{4}$ -inch will clearly resolve *Pleurosigma angulatum* by central light from the mirror.

3230.	3-inch focus,	8 degrees angle of aperture,			6 00
3231.	2 do.	10 do.	do.		6 00
3232.	1 do.	22 do.	do.		10 00
3233.	do.	32 do.	do.		12 00
3234.	do.	50 do.	do.		15 00
3235.	do.	100 do.	do.		16 00
3236.	do.	120 do.	do.		24 00
3237.	do.	135 do.	do.	immersion,	25 00
3238.	$\frac{1}{5}$ do.	150 do.	do.	do.	35 00
3239.	$\frac{1}{6}$ do.	120 do.	do.		35 00

## THE BAUSCH &amp; LOMB OPTICAL CO.'S OBJECTIVES.

The excellent lenses made by this Company have attained a high reputation in a very short time, and have been greatly improved in the past year, since Mr. Gundlach's separation from them. We do not here name all their Objectives, but only such as are most generally called for, and such as are, in our opinion, the most useful. We call particular attention to the  $\frac{1}{10}$ ths of 110 degrees, which is the finest lens of that focus of which we have any knowledge. It shows P. angulatum by central light from the mirror. The  $\frac{1}{2}$ -inch of 98 degrees and the  $\frac{1}{10}$ ths of 75 degrees will show the same test by oblique light. The other lenses are of corresponding excellence.

No.							PRICE.
3259.	2-inch focus,	20 degrees	angular	aperture,	.	.	\$18 00
3260.	2 do.	15 do.	do.	do.	.	.	13 00
3261.	2 do.	12 do.	do.	do.	.	.	6 00
3262.	1 do.	36 do.	do.	do.	.	.	15 00
3263.	1 do.	20 do.	do.	do.	.	.	6 00
3264.	$\frac{3}{4}$ do.	35 do.	do.	do.	.	.	14 00
3265.	do.	27 do.	do.	do.	.	.	8 00
3266.	do.	98 do.	do.	do.	.	.	25 00
3266 $\frac{1}{2}$ .	$\frac{1}{2}$ do.	98 do.	do.	do.	adjustable,	.	27 00
3267.	$\frac{1}{2}$ do.	60 do.	do.	do.	.	.	15 00
3268.	$\frac{1}{2}$ do.	40 do.	do.	do.	.	.	9 00
3269.	$\frac{1}{10}$ do.	110 do.	do.	do.	.	.	28 00
3270.	$\frac{1}{10}$ do.	110 do.	do.	do.	adjustable,	.	30 00
3272.	$\frac{1}{10}$ do.	75 do.	do.	do.	.	.	13 00
3273.	$\frac{1}{4}$ do.	100 do.	do.	do.	.	.	14 00
3274.	$\frac{1}{5}$ do.	110 do.	do.	do.	.	.	15 00
3275.	$\frac{1}{6}$ do.	165 do.	do.	do.	immersion, adjustable,	.	23 00
3275 $\frac{1}{2}$ .	$\frac{1}{6}$ do.	180 do.	do.	do.	do.	do.	50 00
3276.	$\frac{1}{8}$ do.	170 do.	do.	do.	do.	do.	25 00
3277.	$\frac{1}{8}$ do.	120 do.	do.	do.	dry, non-adjustable,	.	18 00
3277 $\frac{1}{2}$ .	$\frac{1}{10}$ do.	180 do.	do.	do.	immersion, adjustable,	.	65 00
3278.	$\frac{1}{12}$ do.	175 do.	do.	do.	do.	do.	30 00
3279.	$\frac{1}{15}$ do.	175 do.	do.	do.	do.	do.	35 00

## CROUCH'S OBJECTIVES.

3325.	4-inch focus,	9 degrees	angle of	aperture,	.	.	8 25
3326.	3 do.	12 do.	do.	do.	.	.	12 00
3327.	2 do.	15 do.	do.	do.	.	.	12 00
3328.	1 $\frac{1}{2}$ do.	20 do.	do.	do.	.	.	12 00
3329.	1 do.	25 do.	do.	do.	.	.	12 00
3330.	$\frac{2}{3}$ do.	30 do.	do.	do.	.	.	12 00
3331.	$\frac{1}{2}$ do.	40 do.	do.	do.	.	.	18 00
3332.	$\frac{1}{4}$ do.	100 do.	do.	do.	.	.	28 00
3333.	$\frac{1}{5}$ do.	100 do.	do.	do.	.	.	28 00
3334.	$\frac{1}{10}$ do.	140 do.	do.	do.	.	.	32 50
3335.	$\frac{1}{13}$ do.	140 do.	do.	do.	.	.	35 50
3336.	$\frac{1}{13}$ do.	140 do.	do.	do.	immersion,	.	35 50
3337.	$\frac{1}{13}$ do.	140 do.	do.	do.	with both dry and immer-	.	43 50
					sion anterior,	.	
3338.	$\frac{1}{15}$ do.	140 degrees	angle of	aperture,	.	.	53 00
3339.	$\frac{1}{20}$ do.	140 do.	do.	do.	.	.	65 00

All the Objectives, from the  $\frac{1}{4}$ -inch to the  $\frac{1}{10}$ -inch, have collar adjustment for thickness of cover-glass. Attention is requested to the  $\frac{1}{2}$ -inch, 40 degrees, specially constructed for use with the Binocular Microscope, and giving sufficient focusing distance to enable an opaque object to be easily illuminated.

LIEBERKUHNS FOR CROUCH'S OBJECTIVES.

No.									PRICE.
3345.	Lieberkuhn to 3-inch Objective,	.	.	.	.	.	.	.	\$6 00
3346.	Do.	2	do.	.	.	.	.	.	6 00
3347.	Do.	1½	do.	.	.	.	.	.	4 00
3348.	Do.	1	do.	.	.	.	.	.	4 00
3349.	Do.	$\frac{2}{3}$	do.	.	.	.	.	.	4 00
3350.	Do.	$\frac{1}{2}$	do.	.	.	.	.	.	3 75

CROUCH'S STUDENT'S SERIES.

3351.	3-inch focus, 10 degrees angle of aperture,	.	.	.	.	.	.	.	7 25
3352.	2 do.	12	do.	do.	.	.	.	.	7 25
3353.	1 do.	16	do.	do.	.	.	.	.	7 25
3354.	$\frac{1}{4}$ do.	60	do.	do.	.	.	.	.	12 00
3355.	$\frac{1}{4}$ do.	95	do.	do.	.	.	.	.	17 25
3356.	$\frac{1}{3}$ do.	110	do.	do.	.	.	.	.	23 75
3357.	$\frac{1}{6}$ do.	100	do.	do.	.	.	.	.	23 75
3358.	$\frac{1}{10}$ do.	120	do.	do.	.	.	.	.	25 00
3359.	$\frac{1}{15}$ do.	120	do.	do.	.	.	.	.	32 50

R. & J. BECK'S OBJECTIVES.

3370.	4-inch focus, 9 degrees angle of aperture,	.	.	.	.	.	.	.	8 00
3371.	3 do.	12	do.	do.	.	.	.	.	14 00
3372.	2 do.	18	do.	do.	.	.	.	.	16 00
3373.	1½ do.	23	do.	do.	.	.	.	.	15 00
3374.	$\frac{2}{3}$ do.	32	do.	do.	.	.	.	.	23 00
3375.	$\frac{4}{10}$ do.	55	do.	do.	.	.	.	.	20 00
3376.	$\frac{4}{10}$ do.	90	do.	do.	.	.	.	.	30 00
3377.	$\frac{4}{10}$ do.	75	do.	do.	.	.	.	.	20 00
3378.	$\frac{1}{5}$ do.	85	do.	do.	.	.	.	.	28 00
3379.	$\frac{1}{5}$ do.	100	do.	do.	.	.	.	.	30 00
3380.	$\frac{1}{8}$ do.	120	do.	do.	.	.	.	.	38 00
3381.	$\frac{1}{10}$ do.	160	do.	do.	immersion,	.	.	.	45 00
3382.	$\frac{1}{10}$ do.	140	do.	do.	.	.	.	.	115 00
3383.	$\frac{1}{10}$ do.	170	do.	do.	immersion,	.	.	.	60 00
3384.	$\frac{1}{10}$ do.	140	do.	do.	.	.	.	.	80 00

LIEBERKUHNS FOR BECK'S OBJECTIVES.

3387.	Lieberkuhn to 3-inch Objective,	.	.	.	.	.	.	.	5 00
3388.	Do.	2	do.	.	.	.	.	.	5 00
3389.	Do.	1½	do.	.	.	.	.	.	5 00
3390.	Do.	$\frac{2}{3}$	do.	.	.	.	.	.	3 50
3391.	Do.	$\frac{1}{10}$	do.	.	.	.	.	.	3 00
3392.	Do.	$\frac{1}{4}$	do.	.	.	.	.	.	3 00

E. HARTNACK'S OBJECTIVES.

These are all Hartnack's first quality of Objectives, are furnished with the "Society Screw," and are contained in engraved brass boxes.

3400.	2-inch focus, No. 1,	9 degrees angle of aperture,	.	.	.	.	.	.	7 50
3401.	1 do.	2, 19	do.	do.	.	.	.	.	7 50
3402.	$\frac{3}{4}$ do.	3, 40	do.	do.	.	.	.	.	13 00
3403.	$\frac{1}{2}$ do.	4, 45	do.	do.	.	.	.	.	14 00
3404.	$\frac{1}{4}$ do.	5, 95	do.	do.	.	.	.	.	14 00
3405.	$\frac{1}{5}$ do.	6, 95	do.	do.	.	.	.	.	15 00
3406.	$\frac{1}{6}$ do.	7, 120	do.	do.	.	.	.	.	17 50
3407.	$\frac{1}{8}$ do.	8, 115	do.	do.	.	.	.	.	20 00
3408.	$\frac{1}{10}$ do.	9, 170	do.	do.	.	.	.	.	25 00
3409.	$\frac{1}{15}$ do.	9, 160	do.	do.	immersion, adjustable,	.	.	.	40 00
3410.	$\frac{1}{16}$ do.	10, 160	do.	do.	do.	do.	.	.	60 00

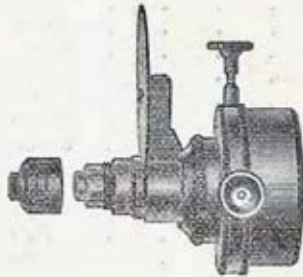
## FRENCH OBJECTIVES.

These are achromatic combinations of small angular aperture, and are made with the French screw. If furnished with an adapter having the "Society Screw," they will cost 75 cents additional.

No.								Pr	ca.
3425.	$\frac{1}{8}$ -inch focus,	20 degrees angle of aperture,	.	.	.	.	.	\$2	50
3426.	do.	25 do.	do.	do.	.	.	.	3	00
3427.	$\frac{1}{8}$ do.	30 do.	do.	do.	.	.	.	3	50
3428.	do.	35 do.	do.	do.	.	.	.	4	00
3429.	do.	50 do.	do.	do.	.	.	.	4	00
3430.	do.	70 do.	do.	do.	.	.	.	5	00
3431.	do.	80 do.	do.	do.	.	.	.	10	00
3432.	do.	100 do.	do.	do.	.	.	.	11	00
3433.	$\frac{1}{10}$ do.	55 do.	do.	do.	.	.	.	7	00
3434.	$\frac{1}{10}$ do.	120 do.	do.	do.	.	.	.	17	00
3435.	$\frac{1}{12}$ do.	60 do.	do.	do.	.	.	.	10	00

## ACCESSORY APPARATUS.

ALPHABETICALLY ARRANGED.



3501-3503.



3505.

3500.	Achromatic Condenser, Beck's; aperture from 20 to 60 degrees, with centring adjustments,	18 00
3501.	Achromatic Condenser, Beck's; aperture from 25 to 80 degrees, with centring adjustments, and revolving diaphragm with stops,	36 00
3502.	Achromatic Condenser, Crouch's; with centring adjustments, and revolving diaphragm with stops,	33 00
3503.	Achromatic Condenser, Zentmayer's; with centring adjustments, and revolving diaphragm with stops,	38 00
3504.	Achromatic Condenser (Bicknell's form), Zentmayer's; with revolving diaphragm, and blue and ground glass,	20 00
3505.	Achromatic Condenser (Webster's form), Crouch's; with revolving diaphragm, for Best and Intermediate Microscopes,	17 00
3506.	Achromatic Condenser (Webster's form), Crouch's; with revolving diaphragm, for Student's Microscope,	14 00
3507.	Adapter for use of Object-glass as Achromatic Condenser, for the Histological Microscope,	1 00
3508.	Adapter on Stand, for use of Object-glass as Achromatic Condenser,	4 00



No.		Price.
3509.	Amplifier, Zentmayer's, for increasing the power of any objective, .	\$8 00
3510.	Animalculæ Cage, screw adjustment, . . . . .	5 00
3511.	Do. do. large size, slip adjustment, . . . . .	3 25
3512.	Do. do. medium size, do. . . . .	2 50
3513.	Do. do. small size, do. . . . .	80



3511.



3512.

3514.	Black Glass, for polarizing light, . . . . .	3 50
3515.	Blue- and Ground-glass Shade, Zentmayer's, . . . . .	4 00
3516.	Blue-glass Slip, 3 by 1 inches, . . . . .	25
3517.	Do. Disc, to fit diaphragm, . . . . .	40
3518.	Do. Cap, Zentmayer's, . . . . .	1 50
3519.	Brown's Graduating Diaphragm (for Beck's or Crouch's Microscopes),	11 50
3520.	Camera Lucida (neutral tint), for Zentmayer's Histological Microscope,	3 00



3519.



3521.

3521.	Camera Lucida (neutral tint), Crouch's, . . . . .	2 75
3522.	Do. (steel disc), Beck's, . . . . .	4 00
3523.	Do. (Wollaston's form), with lens to magnify pencil point, for Beck's and Crouch's Microscopes, . . . . .	7 75
3524.	Camera Lucida (Wollaston's form), Crouch's, without lens, . . . . .	5 50
3525.	Do. Zentmayer's, without lens, . . . . .	6 00



3526.



3527.



3528.



3529.

3526.	Compressor, Lever, . . . . .	7 50
3527.	Do. Parallel, . . . . .	8 00
3528.	Do. Reversible, . . . . .	7 00
3529.	Do. Wenham's, . . . . .	3 00

No.	PRICE
3531. Condensing-Lens, 1½ inches in diameter, on stand with iron base, . . .	\$2 00
3532. Do. do. do. do. brass base, . . .	3 00
3533. Do. same as 3532, but with larger stand, and ball and socket joint, . . .	4 00
3534. Condensing-Lens (Bull's-eye), 2½ inches in diameter, . . .	8 00
3535. Crystals, to show rings around the optic axis, for use with 3539, from . . .	3 50
3536. Dark-wells, set of 3, and Holder, for use with Lieberkuhn, . . .	4 00



3539. Double Image Prisms (set of 2) and Selenite Film, with fittings to Eye-piece, and brass plate with holes, . . .	15 50
3540. Double Image Prism, with fitting to Eye-piece, . . .	7 00
3541. Draw-tubes, for Beck's Microscopes, each, . . .	3 00
3542. Draw-tubes, for Crouch's or Zentmayer's Microscopes, each, . . .	4 00
3543. Erecting-glass, to screw into Draw-tube, . . .	6 00
3544. Erecting Eye-piece, Crouch's, . . .	9 00
3544½. Eye-shade, for fitting over the cap of eye-piece of Monocular Microscopes. With this valuable little piece of apparatus <i>both eyes</i> may be kept open with perfect ease, and the microscope used for long periods without in the least tiring the eyes. Fitted to any microscope for . . .	1 00

No.		Price.
3545.	Eye-pieces for Crouch's Largest Stand, . . . . .	\$6 50
3546.	Do. Beck's or Zentmayer's Large Stand, each, . . . . .	6 00
3547.	Do. Zentmayer's Histological Microscope, each, . . . . .	5 00
3548.	Do. No. 2, for Crouch's Educational Microscope, each, . . . . .	4 00
3549.	Do. do. 3, for Crouch's Intermediate, Student's, or Educational Microscopes, each, . . . . .	5 50
3549½.	Solid Eye-pieces, of ½ or ¼ inch focus, fitted to any microscope, each,	8 00



3545.



3548.

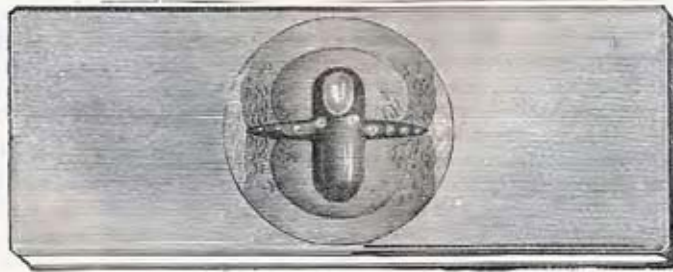


3549.

3550.	Eye-pieces, Kelner's Orthoscopic, each, . . . . .	8 25
3551.	Eye-piece Micrometer, ruled on glass disc, . . . . .	2 00
3552.	Do. do. with Jackson's adjusting screw, . . . . .	6 00
3553.	Frog-plate, plain, . . . . .	1 00
3555.	Glass Slip, with Ledge, . . . . .	30
3556.	Do. with Hollow and Ledge, . . . . .	40
3557.	Do. do. Lip, and Ledge, . . . . .	1 50
3558.	Growing-cell, for preserving objects alive in water, . . . . .	3 50
3559.	Hemispherical Lens, for same purpose as Woodward's Prism, (No. 3597.) . . . . .	1 50

**HOLMAN'S LIFE AND CURRENT SLIDES.**

These very useful and ingenious accessories to the Microscope are attracting great attention among scientific men everywhere, and have received the strongest commendations from Medical and other Scientific Journals at home and abroad. By an arrangement with the inventor, we are enabled to supply them to our customers of the most perfect quality, each one having passed through Mr. Holman's hands before being delivered to us.



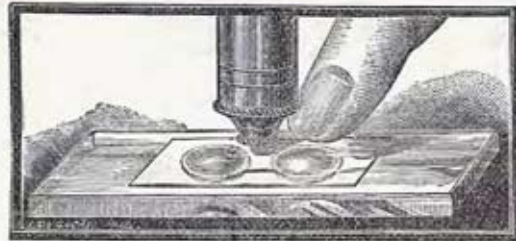
3560.

3560.	HOLMAN'S LIFE SLIDE, with Cover, in a neat box, . . . . .	1 50
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In the use of the Microscope in Biology, it is often desirable to keep under view small organisms, such as bacteria and vibriones, for hours, and even for days and weeks, at a time. Hitherto this has not been possible, for lack of a proper contrivance; the animals would soon die from the exhaustion of oxygen in the confined space, and they were not in that normal condition necessary for satisfactory study during the time that they did live.

Cut No. 3560 illustrates Holman's Life Slide, which obviates this difficulty. The construction of this accessory to the microscope may be described as follows: In the centre of one face of a strip of glass 3 inches long,  $1\frac{1}{8}$  inches wide, and  $\frac{1}{16}$  of an inch thick, are ground two very shallow cavities, side by side, oval in form, and with their length in the direction of the length of the slide; a straight shallow groove extends between, and a little beyond, them at each end; through the centre of these cavities, and at right angles to their long diameter, but not so long as to reach their sides, a cavity is ground as deep as the thickness of the glass will permit.

The cavities and groove thus described occupy a circular surface of the slide about  $\frac{3}{4}$  of an inch in diameter, which is covered, when in use, with a circular piece of microscopic glass 1 inch in diameter. When the smaller forms are included in one of these life slides, to get access to the air they seek the edges of the cover, and range themselves in a zone, at a short distance from its rim, close to where the air comes in contact with the water. Being thus situated, in accordance with the law that compels them to take up these positions, they can be viewed with the highest powers of the microscope, and their true nature and habits much better studied than by the old methods.

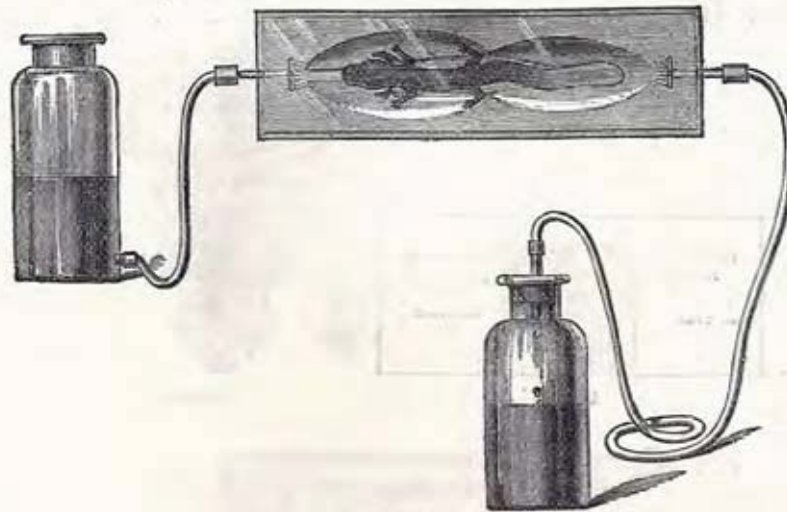


3561.

No.	PRICE.
3561. HOLMAN'S CURRENT SLIDE, with Cover, in a neat box, . . . . .	\$1 50

*The Current Slide* consists of a slip of plate-glass, 3x1 inch, in which two oval concave cells are ground, there being a space of  $\frac{1}{12}$  inch left between the cells. These cells, which are about  $\frac{1}{2}$  an inch in diameter, and as deep as the glass will permit — say  $\frac{1}{16}$  of an inch — are united by a very shallow channel somewhat below the centre of the two cells, so that with cells placed  $\frac{1}{2}$  inch apart, the channel is about  $\frac{3}{8}$  inch long. Both the cells and channel are polished. If a few drops of blood be placed in these cells, and a cover of thin glass be pressed down, some of the blood, finding its way between the surfaces in contact, will dry, and act as a cement to hold the fluid blood in the cells in place. The quantity of blood being insufficient to fill the cells, a considerable amount of air becomes imprisoned with the blood, and the expansion of the air in either cell will drive the blood through the channel into the adjacent cell, and in the shallow channel it is presented under the most favorable condition for examination. By holding the tip of the finger near one or the other cell, the heat is enough to cause the expansion and a consequent more or less rapid flow of the fluid through the channel. This flow may be arrested, or continued and reversed at will, by change of position of the finger, so that any particles floating in the liquid can pass in succession across the field, but can be arrested and examined with ease at will.

Blood or other fluid inclosed in the cells remains in good condition for examination for several days, and changes undergoing in the fluid can be examined.



3562.

No.	PRICE
3562	
HOLMAN'S SYPHON SLIDE, complete, with Flexible Tubes and Glass	
Cover, but without Bottles,	\$4 00

This is a modification of the "LIFE" and "CURRENT" slides, whereby living objects of suitable size and habits can be retained under observation uninterruptedly for days or even weeks. A current of water, or other fluid, is made to flow continuously through the chamber containing the object, so that the processes of respiration, circulation, digestion and nutrition, the phenomena of inflammation, and the effects of some classes of poisons, may be studied at leisure and under perfectly natural or entirely controllable conditions. The habits of life of small aquatic animals are similarly brought within reach of our observations. For use with the Magic Lantern, in projecting the images of living objects upon the screen, this apparatus is absolutely perfect—the flow of fresh water through the chamber being so constant that its inmates are entirely free from inconvenience during the most protracted exhibition.

The following description of the SYPHON SLIDE will render its construction and use quite clear. In a slip of thick plate glass, a chamber is excavated similar to that in the LIFE SLIDE. In each end of this chamber are fine perforations, too small to permit the escape of the animal under view, but sufficient to maintain a flow of water. These openings merge into tubular mouths, to each of which is attached a tightly-fitting elastic tube: one of these communicates with the reservoir of water, whilst the other acts as an escape conduit. The position of the slide, when in use, must be slightly *above* the level of the reservoir, while the escape-tube must rest *below* the same, thus insuring a veritable *siphon* action in the apparatus; a constant flow of water being secured in connection with the required atmospheric pressure for the retention of the cover on the slide. It is not necessary to have bottles specially fitted for use with this apparatus; any vessel capable of holding water will answer, it being only necessary to insert the end of one tube in the reservoir, and by gently sucking at the end of the other establish a flow of the water, which will continue so long as the reservoir contains any.

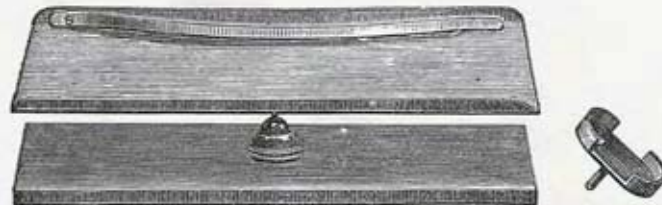
No.		PRICE.
3563.	Indicators to Eye-pieces, each, . . . . .	\$2 00
3564.	Jones's Pad for cleaning thin glass covers, . . . . .	1 25
3565.	Key for Tightening Joint of First-class Instruments, . . . . .	1 50
3566.	Leeson Goniometer, Beck's, . . . . .	17 50
3567.	Live-trap, . . . . .	2 00
3568.	Live-traps, set of 6, with Trough, in case, complete, . . . . .	8 00
3569.	Maltwood Finder, in case, . . . . .	3 00



3569.



3571.



3570.



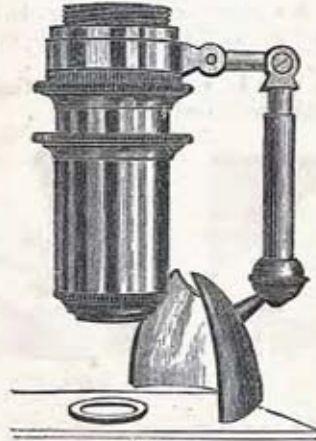
3572.



3575.

3570.	Morris's Rotating Object-Holder, for presenting opaque objects in any position, with two Discs and Holder, . . . . .	3 00
3571.	Nose-piece, Centring, for rendering every Objective concentric to the rotation of the Stage, . . . . .	5 50
3572.	Nose-piece, Double, straight, bronzed, . . . . .	5 00
3573.	Do. do. best straight, . . . . .	7 50
3574.	Do. do. do. aluminum, . . . . .	16 50
3575.	Do. do. bent, bronzed, . . . . .	6 00
3576.	Do. do. best bent, . . . . .	11 50
3577.	Do. Triple, straight, . . . . .	8 00
3578.	Do. Quadruple, best bent, aluminum, . . . . .	35 00
3579.	Opal Glass Slip, 3x1, for moderating the light, . . . . .	30
3580.	Opaque Disc Revolver, with tray of 24 Discs, Forceps, and Capsule of gold size, in mahogany case, . . . . .	10 00

No.		PRICE.
3581.	Opaque Disc Revolver, with 3 trays of Discs, Forceps, and Capsule of gold size, in mahogany case, . . . . .	\$16 50
3582.	Opaque Illuminator, Queen's, for high powers, with thin glass Reflector and Diaphragm; the best arrangement for the resolution of fine test Diatoms, mounted on the cover, with objectives of over 82° interior aperture; in brass box, . . . . .	4 50



3586.

3583.	Parabolic Illuminator, fitted to Zentmayer's 1 1/4-, 1 5/8-, or 3/4-in. Objectives, . . . . .	8 00
3584.	Do. do. Beck's 1 1/4- or 3/4-inch Objectives, . . . . .	6 00
3585.	Do. same as 3584, with Sorby's Reflector, . . . . .	15 00
3586.	Do. with Crouch's Adapter, adjusting it to any Object-glass, . . . . .	8 50



3588.



3588.



3588.

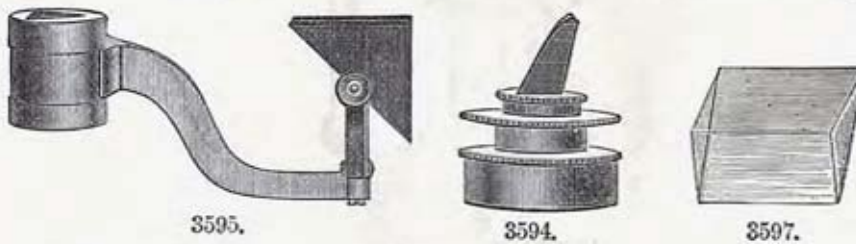
3597.	Polariscope, with Selenite and extra large Prisms, for Beck's or Crouch's Large Stands, . . . . .	26 00
3588.	Polariscope, with Selenite, for Crouch's Student's or Educational Microscope, . . . . .	11 00
3589.	Polariscope, with Selenite, for the Zentmayer's Centennial Stand, . . . . .	32 00
3590.	Do. do. do. do. Army Stand, . . . . .	22 00
3591.	Do. do. do. do. Histological Stand, . . . . .	15 00



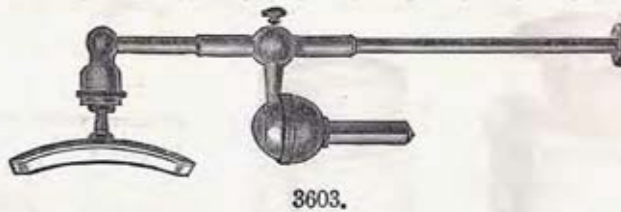
3593.

3592.	Prism, Abraham's Achromatic, for oblique illumination, for Zentmayer's Centennial Stand, . . . . .	12 00
3593.	Prism, Amici's, for oblique illumination, . . . . .	12 00

No.		PRICE
3594.	Prism, Nacet's, for oblique illumination, for Beck's or Crouch's First-class Stands, . . . . .	\$7 75
3595.	Prism, Right-angle, reflecting the light more perfectly than the Plane Mirror, fitted to either Beck's or Crouch's Large Stand, . . . . .	15 50
3596.	Prism, Right-angle, fitted to Zentmayer's Centennial Stand, . . . . .	20 00
3597.	Prism, Woodward's, for obtaining light of extreme obliquity with immersion lenses of over 82 degrees balsam aperture, such as No. 3201 of this Catalogue. It is unmounted, and when in use should be attached to the under surface of the Slide by glycerine, immediately beneath the object, . . . . .	1 50
	If preferred, the above may be mounted in a fitting to be carried by the sub-stage, at an additional cost of . . . . .	2 50



3598.	Rainey's Blue-tinted Light Moderator, on Stand, . . . . .	8 00
3599.	Selenite, mounted on Slip, 3 by 1 inch, . . . . .	75, 1 50 and 2 00
3600.	Selenite-Stage, with one Selenite, . . . . .	2 75
3601.	Do. Darker's, with three Selenites in box, giving thirteen tints, . . . . .	15 50
3602.	Selenites, Darker's Series of Revolving, giving thirteen tints, for Beck's, Crouch's or Zentmayer's Large Stand, . . . . .	25 00



3603.	Silvered Side Reflector, on Stand, or fitted to Limb of Beck's or Crouch's Large Microscope, . . . . .	8 25
3604.	Sorby's Spectroscope Eye-piece, in mahogany case, . . . . .	40 00
3605.	Do. Dichroscope, . . . . .	8 00
3606.	Do. Standard Spectrum Scale, . . . . .	8 00
3607.	Spot-Lens, for dark-ground illumination, . . . . .	4 00

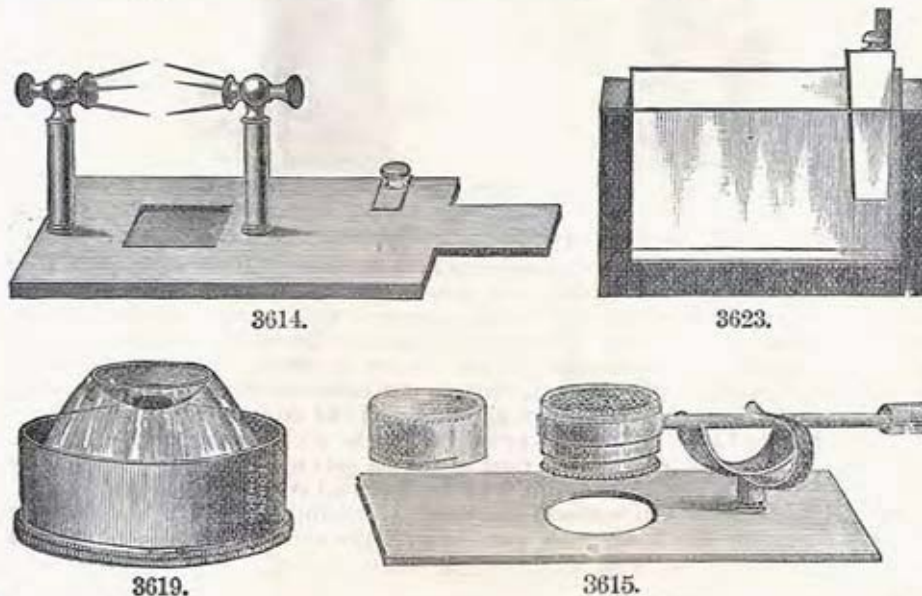


3608.	Stage-Forceps, for Histological or Educational Microscope, . . . . .	2 00
3609.	Do. do. larger instruments, . . . . .	3 00
3610.	Do. Three-pronged, . . . . .	5 00



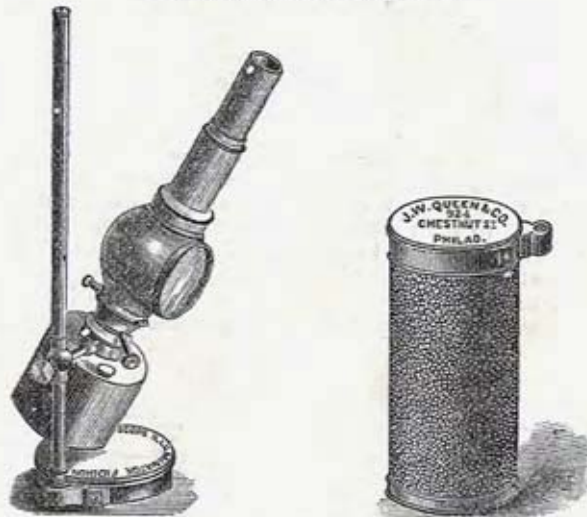
No.	PRICE.
3611. Stage Forceps, Three-pronged, German silver, with screw adjustment,	\$6 00
3612. Stage Micrometer, 100 and 1,000 to the inch,	1 00
3613. Do. 10, 100 and 1,000 to the centimeter,	1 50
3613½. Do. Millimetre and Inch Scales, on one Slide,	2 50
3614. Stage Mineral Holder,	8 00
3615. Insect Cage,	2 50

This accessory is intended for the study of live insects. To one end of a 3 by 1 brass plate is attached an upright, supporting a cross-piece at the top, on which rests the stem carrying the cage. This is held in place by a spring, and may be rotated or moved longitudinally by the milled head. The cage is constructed on the same principle as the ordinary live-box, but, instead of glass, cobbinet is used, in order to confine the insect better and without injury. An extra cover of glass, is furnished, however, and may be used if preferred. The cage may be rotated in the optic axis of the microscope, in order that the object may be illuminated in the best manner.



3616. Tourmalines, to fit Eye-piece,	6 50
3617. Universal Sub-stage Illuminator (Crouch's), combining all the accessories necessary for the examination of transparent objects, either by Polarized Light, Dark-ground Illumination, Condensed Light, etc. The Polarizer is of the best description, and has two Selenites. The Achromatic Condenser is fitted with central stops, cap for preventing diffusion, blue-glass and rack adjustment for focusing, complete. Specially applicable to Crouch's Student's, Intermediate, or Best Microscope,	30 50
3618. Wenham's Paraboloid, for dark-ground illumination, with adjustable stop,	13 50
3619. Wenham's Paraboloid, plain,	8 00
3620. Do. Reflex Illuminator (made by Ross, of London), for obtaining light of extreme obliquity in connection with objects mounted in balsam, or dry on the slide,	17 50
3621. White Cloud Illuminator, for the large Stands,	4 00
3622. Zoophyte Trough, small size,	60
3623. Do. do. with glass plate, and wedge and spring,	2 50
3624. Do. same as 3623, but larger size,	3 25

MICROSCOPE LAMPS.



LAMP.

3630.

CASE.

No. 3630. FIDDIAN'S MICROSCOPE ILLUMINATOR, nickel-plated, . . . . . Price \$15 00

This very convenient and useful Lamp has been designed to combine the qualities of other microscope lamps, together with greater portability, the whole fitting into a brass tubular box, the exterior of which is covered with morocco leather, the lid forming the stand of the Lamp. The metallic chimney being telescopic, occupies a very small compass; the condenser fits into the cell in front. The reservoir is of brass, and will contain sufficient petroleum for six hours' consumption. The entire Lamp fitting into the case from the top, the escape of the oil is prevented.

In trimming the Lamp, care should be taken that the wick is perfectly dry, and the petroleum of good quality; also that none of the oil gets upon the metallic chimney or reservoir, or a bad smell will be given off until the oil is burnt away.

In using the Lamp, it will be found convenient to slightly incline it, so as to bring the broad surface of the flame more parallel with the surface of the mirror of the Microscope.

When it is necessary to re-line the chimney, screw off the sliding portion, wash out the old lining, and re-coat it with superfine plaster of Paris. When dry, it will be ready for use—a few minutes will be found sufficient to do this.

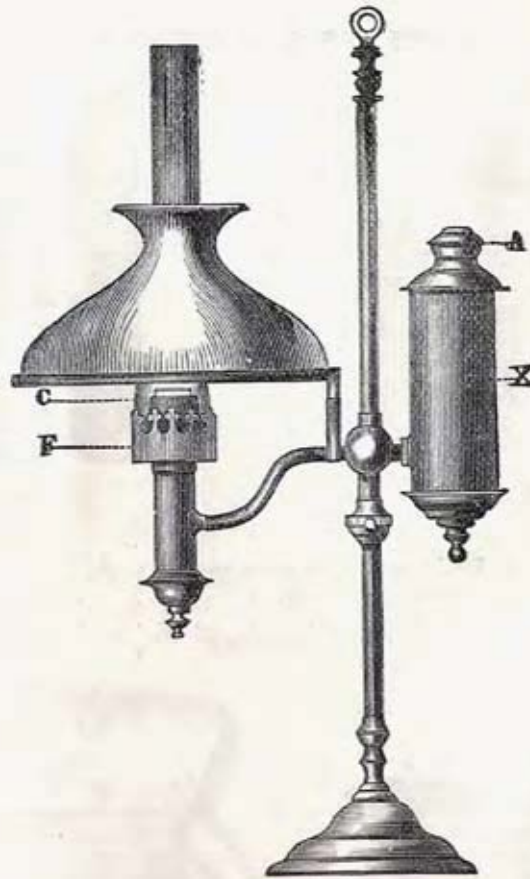
Size of Case.—Height, 6 inches; Diameter, 3 inches.



3631.

3631. Belmontine Microscope Lamp. This very portable, simple and cheap lamp, is arranged to carry the flame at any desired height above the table, thus adapting it to the use of all sizes of microscopes. The shade is of paper, enameled green on the exterior, affording full protection to the eyes, and emitting no heat. The base is heavy, and the lamp perfectly steady at any height, . . . . . 5 00

3632. Belmontine Microscope Lamp, with the addition of a Bull's-eye condensing lens 2½ inches in diameter, . . . . . 10 00



3633.

No.	PRICE.
3633. SAINT GERMAIN; OR, GERMAN STUDENT'S LAMP, all brass, . . . . .	\$5 00

*Directions for Use.* — To fill the lamp, take out the holder A, invert it and pour in the oil till it reaches the valve; then pull up the valve by means of the wire B; invert it, holding it above the holder X, so that any oil which may escape drops into this holder; replace it in the holder X.

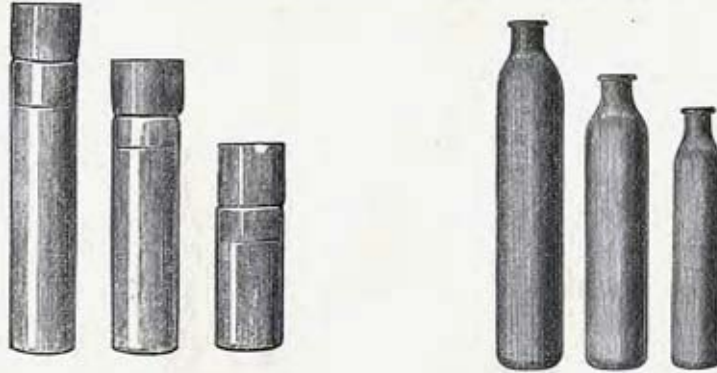
This lamp gives a very superior and steady light, and with ordinary care will emit neither smell nor smoke.

Testimonials have been given by highest authority, as to its safety against explosions.

The wick should be trimmed regularly. If a crust has formed, do not disturb it, but only remove any little point or unevenness that may occur; do not use the scissors unless the wick, through uneven draft, should have coaled or charred unevenly. By this method you will have an even flame, and the wick will last much longer than when cut frequently. If your lamp should make a humming noise, which is caused by the shank of the chimney being of the wrong length, raise the chimney slightly, or change it for one with a longer shank.

3634. Student's Lamp, same as 3633, but nickel-plated, . . . . .	6 00
3635. Blue or Green Porcelain Shade, . . . . .	1 00
3636. Extra Chimneys, each, . . . . .	15
3637. Blue Chimneys, each, . . . . .	20
3638. Extra Wicks, per dozen. . . . .	25

APPARATUS FOR COLLECTING OBJECTS.



3651.

3652.

No.		PRICE.
3650.	Collecting Boxes, for insects, with glass covers, each, . . . . .	\$0 15
3651.	Collecting Bottles, round, per dozen, . . . . .	.25 to .75
3652.	Do. flat, each, . . . . .	.10 to .15
3653.	WRIGHT'S MICROSCOPIC COLLECTING BOTTLE. . . . .	2 50



3653.



3654.

Microscopists will find this new form of Collecting Bottle an indispensable companion in their pond-hunting excursions, for collecting and retaining the various minute objects that may be obtained in water by the dipping bottle. It consists of a bottle with a movable brass cap, in which is fastened two small tubes with screw tops. One of these (A) projects a little higher than the other; in which is fixed the funnel (C) when in use. The other tube (B) has a trumpet-shaped form, across the mouth of which a piece of fine muslin is stretched; the loose funnel shown is placed in the outer tube, and the water containing the various organisms which it is wished to retain is poured into it. As soon as the bottle is full the water rises through the porous material placed across the lower end of this inner tube, and flows over, retaining behind and in the bottle the various *diatoms*, *volvox*, *desmids*, *entomostraca*, &c., which may have been floating therein. Any quantity of water may be deprived of the minute objects floating in it, without the troublesome, imperfect, and destructive process of first filtering through a piece of muslin or flannel, and then reversing the filtering material in the mouth of the bottle, to detach the deposit.

For collecting larger objects, the cap of the bottle can be removed.

3654.	Queen's Collecting Case, with sling strap for the shoulder, containing Bottles, Tubes, Net, &c. Particularly recommended for Microscopical Excursions, . . . . .	4 00
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**MATERIALS FOR PREPARING AND MOUNTING OBJECTS.**

No.		PRICE.
3680.	Glass Slips, 3 by 1 inch, flatted crown, unground edges, per dozen, 18 cents; per gross,	\$1 75
3681.	Glass Slips, 3 by 1 inch, flatted crown, ground edges, per dozen, 30 cts.; per gross,	3 00
3682.	Glass Slips, 3 by 1 inch, best patent plate, ground edges, per dozen, 45 cents; per gross,	4 50
3683.	Glass Slips, 3 by 1 inch, best flatted crown, extra thin, ground and polished edges, per dozen, 45 cents; per gross,	4 75
3684.	Glass Slips, 2 $\frac{3}{8}$ by $\frac{3}{4}$ inch, best flatted crown, unground edges, per dozen, 15 cents; per gross,	1 75
3685.	Glass Slips, 2 $\frac{3}{8}$ by $\frac{3}{4}$ inch, best flatted crown, ground edges, per dozen, 30 cents; per gross,	3 00
3686.	Glass Slips, 2 $\frac{3}{8}$ by $\frac{3}{4}$ inch, with concave centres, for examination of liquids, per dozen,	1 50
3687.	Glass Slips, 3 by 1 inch, with concave centres, for examination of liquids, per dozen,	1 50
3688.	Wooden Slips, 3 by 1 inch, with hole $\frac{1}{8}$ inch in diameter, in centre, for mounting objects between thin glass, or opaque, per dozen,	20
3689.	Glass Slips, 3 by 1 inch, smooth edges, with cells of different sizes and depths, per dozen,	1 50
3690.	Glass Rings, for making cells as above, per dozen,	1 00
3691.	Block-Tin Rings, do. do. do.	50
3692.	Ebonite do. do. do.	15
3693.	Thin Glass, in sheets; No. 1 ( $\frac{1}{150}$ to $\frac{1}{200}$ inches thick) per oz., \$1.50; No. 2 ( $\frac{1}{100}$ to $\frac{1}{150}$ ) per oz., \$1.00; No. 3 ( $\frac{1}{50}$ to $\frac{1}{100}$ ) per oz.,	75
3694.	Thin Glass Squares, No. 3, $\frac{1}{2}$ to 1 inch square, per doz., 13 cts.; per oz.,	1 25
3695.	Do. do. No. 2, do. do. do. 20 cts.; do.	2 25
3696.	Do. do. No. 1, do. do. do. 25 cts.; do.	2 75
3697.	Thin Glass Circles, No. 3, $\frac{1}{4}$ to 1 inch diam., per doz., 20 cts.; per oz.,	2 25
3698.	Do. do. No. 2, do. do. do. 25 cts.; do.	2 75
3699.	Do. do. No. 1, do. do. do. 30 cts.; do.	3 75
3700.	Do. do. $\frac{1}{100}$ to $\frac{1}{150}$ inches thick, per doz. 40 cts.; per oz.,	5 00
3701.	Finest Canada Balsam, pure, in flexible tubes, each,	25
3702.	Do. do. prepared for use without heat, per bottle,	50
3703.	Damar, the new mounting medium, per bottle,	50
3704.	Pure Glycerine, per bottle,	25
3704 $\frac{1}{2}$ .	Glycerine and Camphor Water, per bottle,	25
3705.	Deane's Gelatine Medium, do.	35
3705 $\frac{1}{2}$ .	Hæmatoxylin Staining Fluid, per bottle,	25
3706.	Beale's Ammonia Carmine, do.	25
3706 $\frac{1}{2}$ .	Aniline Violet, per bottle,	25
3707.	Do. Red, do.	25
3707 $\frac{1}{2}$ .	Do. Green, do.	25
3708.	Do. Blue, do.	25
3708 $\frac{1}{2}$ .	Brunswick Black, per bottle,	25
3709.	Asphalte, do.	25
3710.	Gold Size, do.	25
3711.	Marine Glue, do.	35
3712.	Oil of Cloves, do.	50
3713.	Bell's Cement, the best for use with Glycerine,	50
3713 $\frac{1}{2}$ .	Queen's Shellac Cement, transparent, per bottle,	40
3714.	White Zinc Cement, the best for fluid mounting,	50
3715.	Watch Glasses, all sizes, per dozen,	70
3716.	Dipping Tubes, each,	10
3717.	Dropping Tubes, with rubber bulb, each,	10

No.		PRICE
3718.	Capped Bottles, for holding mounting fluids, with glass pipette, each,	\$0 50
3719.	Dropping Bottles, with glass bulbs, each, . . . . .	25
3720.	Do. do. rubber top, will supply a large quantity of fluid promptly, . . . . .	30



3718.



3719.



3720.

3721.	Pipettes, with bulb, each, . . . . .	25
3722.	Test Tubes, 3 to 8 inches long, each, 3 to 8 cents; per dozen, . . . . .	30 cts. to 75
3723.	Small Bell Glass, for preserving objects from dust during preparation, . . . . .	50
3724.	Spring Compressor, of brass wire, nickel-plated, for holding down thin covers in mounting specimens, per dozen, . . . . .	60
3725.	Spring Compressor, wood, per dozen, . . . . .	25
3726.	Brass Forceps, ordinary, . . . . .	15
3727.	Do. curved, better quality, . . . . .	35
3727½.	Do. large, very delicate, . . . . .	75



3728.



3729.



3730.



3731.

3728.	Steel Forceps, 4 inches long, nickel-plated, straight, . . . . .	1 00
3729.	Do. 4 do. do. curved, . . . . .	1 00
3730.	Do. 4 do. do. do. very delicate, . . . . .	1 50
3731.	Do. 4 do. do. straight, do . . . . .	1 50

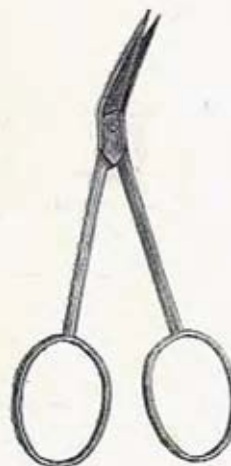
No.	PRICE.
3732. Bull-nose Forceps, . . . . .	\$1 00
3732½. Quekett's do. for taking objects out of deep bottles, . . . . .	1 50
3733. Combined Knife and Trowel, for transferring objects from one solution to another, or to the slide; a most convenient tool, . . . . .	75



3734.

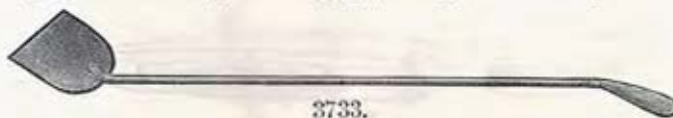


3735.

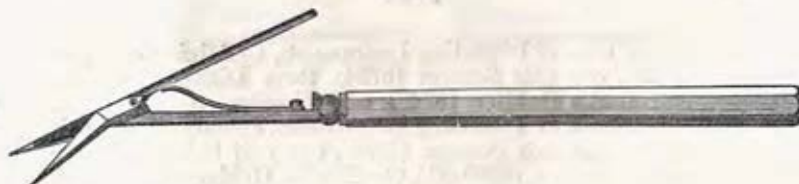


3736.

3734. Dissecting Scissors, very delicate, straight points, . . . . .	1 50
3735. Do. do. curved do. . . . .	1 50
3736. Do. do. elbow do. . . . .	1 50



3733.

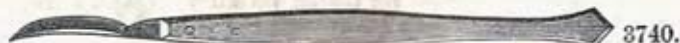


3737.

3737. Spring Scissors, very delicate, ivory handle, . . . . .	6 00
3738. Elbow Scissors, with strong blades for cutting elytra and legs of beetles, &c., . . . . .	1 25



3739.



3740.



3741.



3742.

3739-3742.

3739 to 3742. Small Dissecting Knives, each, . . . . .	75
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No.	PRICE.
3743. Knife in strong Ebony Handle, for cutting Sections, with 3752 to 3755, in morocco case, . . . . .	\$3 25
3744. Knife, same as above, but extra large size, in morocco case, . . . . .	5 00



3743.

3745. Dissecting Needles, straight ebony handles, each, . . . . .	15
3746. Do. do. hook points, do. do. . . . .	15
3747. Dissecting-Needle Holders, with binding screw, each, . . . . .	60
3748. Valentine Knife, for making thin sections of soft substances, . . . . .	6 50



3745.



3746.



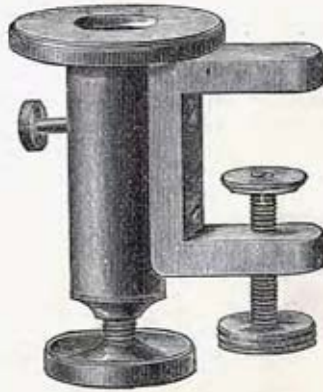
3747.



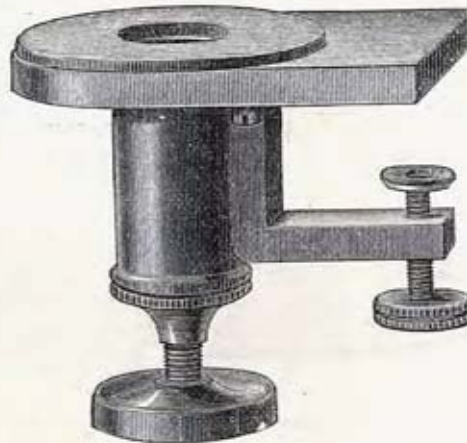
3748.

3749. Morocco Leather Case of Dissecting Instruments, containing one pair Forceps (3729), one pair Scissors (3734), three Dissecting Knives 3740-2), two Needle Holders (3747), with Needles, . . . . .	7 00
3750. Morocco Leather Case of Dissecting Instruments, containing one pair Forceps (3730), one pair Scissors (3734), one pair Scissors (3735), three Dissecting Knives (3739-41), two Needle Holders (3747), with Needles, one Valentine's Knife (3748), . . . . .	14 00
3751. Morocco Leather Case of Dissecting Instruments, containing two pairs of Forceps (3730-31), two pairs of Scissors (3734-35), one pair Spring Scissors (3737), four Dissecting Knives (3739-42), two Needle Holders (3747), with Needles, one Valentine's Knife (3748), . . . . .	23 00
3752. Section Instrument, with glass top, and clamp to fasten to table, for cutting soft tissues, . . . . .	7 50
3752½. Section Instrument, with glass top and clamp, for cutting hard tissues, . . . . .	8 00
3753. Do. Army Medical Museum Pattern, with large glass top and clamp to fasten to table, for cutting soft tissues, . . . . .	10 00
The above has arrangements for taking up all wear, and is recom- mended as the best Section Instrument in the market.	
3754. Section Instrument, same as No. 3753, but arranged to cut either hard or soft tissues at pleasure, . . . . .	13 00
3755. Section Instrument (Rutherford's Microtome), Army Medical Museum Pattern (No. 3753), with ice-box for freezing, . . . . .	15 00
3755½. Section Instrument (Ether Freezing Microtome), complete, with Atomizer, \$20.00; without Atomizer, . . . . .	16 00



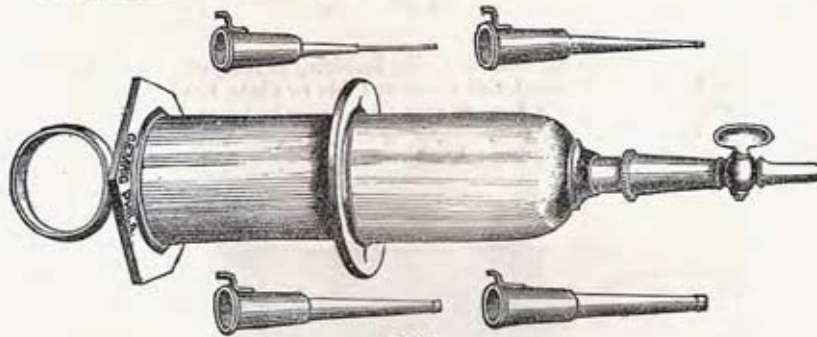


3752-52½.



3753.

No.		PRICE.
3756.	Injecting Syringe, of brass, with four pipes and stop-cock, in case, . . . . .	\$8 00
3757.	Do. of German silver, with six pipes and two stop-cocks, in fine morocco case, . . . . .	15 00



3756.

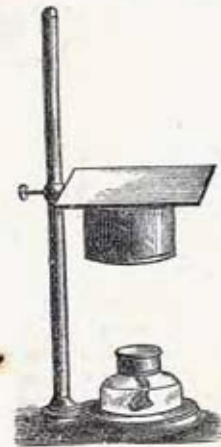
3758.	Brass Table, with lamp for heating Slides, . . . . .	1 50
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3761-62.



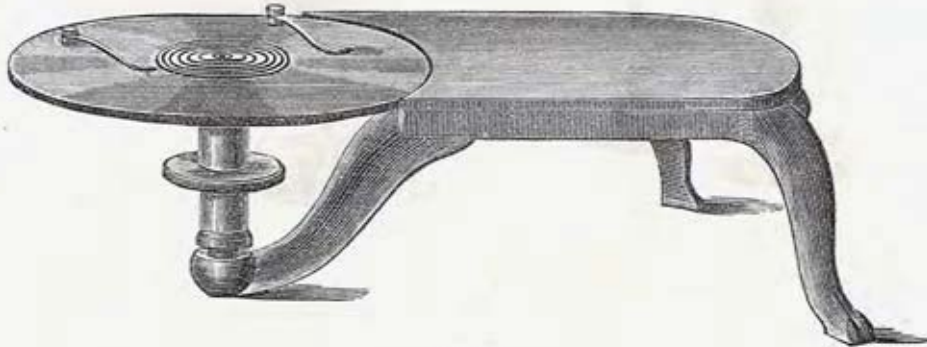
3758.



3759.

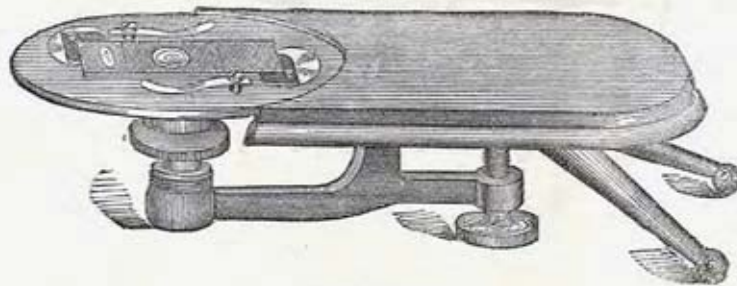
No.	PRICE.
3759. Mounting Stand, with lamp and sand-bath, . . . . .	\$2 50
3760. Small Glass Spirit-Lamp, with cover, . . . . .	60
3761. Porcelain Saucers, 2½ inches diameter, per nest of five, with cover, . . . . .	60
3762. Do. 3¼ do. do. do. do. do. . . . .	80

These will be found the most useful of all contrivances for holding small specimens whilst soaking in any medium, and for mounting from the Oil of Cloves or Turpentine.



3763.

3763. Turn-Table, for making Cement Cells, finishing Slides, etc. This has a firm tripod metal stand, and circular table or plate, having concentric rings turned in the face, so that slides may be instantly centered by the eye, . . . . . 3 00
- 3763½. Bulloch's Self-centering Turn-Table, . . . . . 6 50



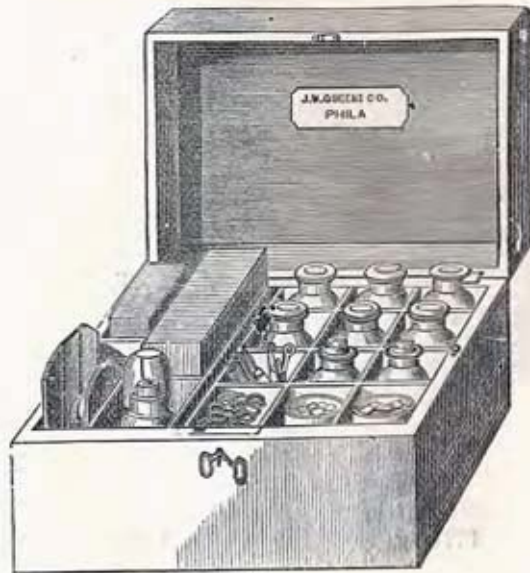
3764.

3764. The "Congress" Turn-Table, . . . . . 6 50
- This new form of self-centering Turn-Table may be used with the ordinary tripod stand, or clamped to the edge of a table, as preferred. The jaws holding the slide are separated by a single motion of the hand turning a milled head beneath the plate, and are closed by the action of a spiral steel spring, thus firmly grasping the slide, which will then be accurately centered. For refinishing old slides, or others, in which the object has not been well centered, a pair of spring clips are provided, and concentric circles are turned in the plate (as in No. 3763), by which the slide may be easily adjusted.
- 3764½. The Kinne Self-centering Turn-Table. In this form of turn-table the slide is grasped by a single motion of the hand (easily and quickly accomplished), operating a lever beneath the plate. Very efficient and easily used, . . . . . 6 00



3765.

No.	PRICE.
3765. Jackson's Drying Board, with spring clips, for hardening one dozen balsam mountings at once,	\$1 00
3766. Queen's Mounting Cabinet, consisting of a neat polished walnut case, with lock and key, containing:	
6 Wooden Compressors (3725),	1 Dipping Tube (3716),
6 Nickeled do. (3724),	1 Tube of Balsam (3701),
1 Pair Steel Forceps (3729),	1 Capped Bottle (3718), Containing Damar (3703),
1 Pair Scissors (3736),	1 Bottle of Glycerine (3704),
1 Knife (3739),	1 Do. Haematoxylin (3705½),
2 Dissecting Needles (3745-6),	1 Do. Brunswick Black (3708½),
1 Turn-Table (3763),	1 Do. Gold Size (3710),
1 Brass Table and Lamp (3758),	1 Do. Oil of Cloves (3712),
4 Dozen Slips (3683),	1 Do. Zinc Cement (3714),
4 Do. Covers (3698),	1 Dropping Bottle (3719),
1 Do. Ebonite Cells (3692),	100 Labels (3776),
1 Do. Tin Cells (3691),	2 Camel's-hair Brushes,
6 Watch Glasses (3715),	
1 Wide-Mouth Glass Jar for solutions,	20 00



3766.



3771.

3766½. Improved Double Punch, for making cells from sheet wax,	1 50
3767. Punches for labels, various sizes,	50 cents to 1 25
3768. Glazier's Diamond, ebony handle,	4 00
3769. Do. do. do. with keys,	5 00
3770. Writing do. do.	3 00



3768.



3770.

No.		Price.
3771.	Diamond, for cutting circles of thin glass, . . . . .	\$10 03
3772.	Hot Water Drying Case, for drying tissues and hardening Balsam mountings; of heavy zinc, with copper bottom, and handsomely japanned; will harden one hundred and fifty Balsam mountings at one time, . . . . .	12 00

**LABELS AND COVERS FOR SLIDES.**



3775.

3773, 3777.

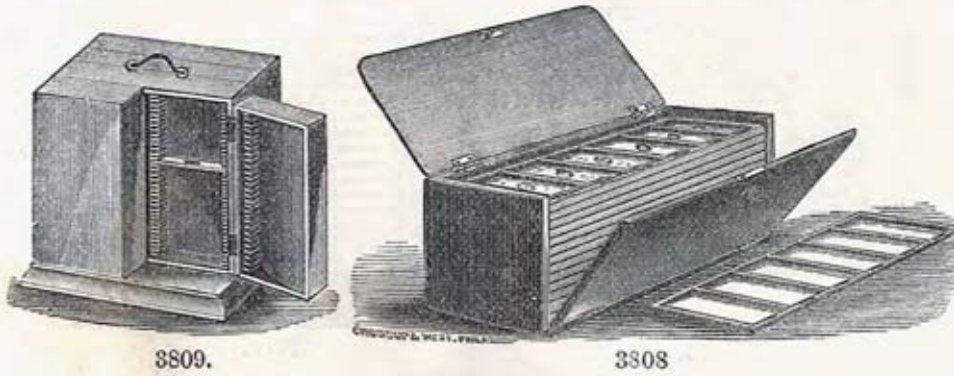
3774.

3776.

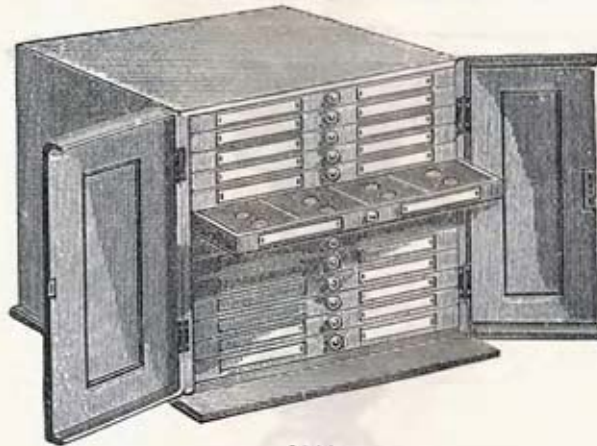
3773.	Adhesive Gilt Fronts, per hundred, . . . . .	25
3774.	Do. Backs, do. . . . .	20
3775.	Do. Fronts, for covering small-sized slides, per hundred, . . . . .	20
3776.	Adhesive Labels, with borders, assorted colors, per hundred, . . . . .	25
3777.	Adhesive Name Labels, round or oval, per hundred, . . . . .	10
3778.	Backs or Fronts, if with holes punched, per hundred, extra, . . . . .	15

BOXES AND CABINETS FOR OBJECTS.

No.					PRICE.
3800.	Mailing Box, of whitewood, for 1 object,	.	.	.	\$0 06
3801.	Do. do. 3 do.	.	.	.	08
3802.	Do. do. 6 do.	.	.	.	10
3803.	Do. do. 12 do.	.	.	.	12
3804.	Do. do. 25 do.	.	.	.	15
3805.	Card-board Rack Box, for 12 objects,	.	.	.	12



3806.	Portable Cabinet, of whitewood, 4 trays, holding 24 objects,	.	.	.	1 00
3807.	Do. mahogany, 6 do. 36 do.	.	.	.	2 00
3808.	Do. do. 12 do. 72 do. with lock,	.	.	.	3 00
3808½.	Do. do. 12 do. 144 do. do.	.	.	.	5 50
3809.	Do. walnut, with racks, holding 200 do.	.	.	.	5 00



3811.

WALNUT OR MAHOGANY CABINETS; DRAWERS WITH NUMBERED PORCELAIN KNOBS, AND SILICATE TABLETS FOR NAMES OF OBJECTS.

3810.	For 300 Objects, 10 Drawers,	.	.	.	20 00
3811.	For 520 do. 13 do.	.	.	.	35 00

MAHOGANY CABINETS, WITH NUMBERED KNOBS AND PORCELAIN TABLETS.

3812.	For 500 Objects, solid door,	.	.	.	30 00
3813.	For 500 do. with glass-panel door,	.	.	.	36 00
3814.	For 750 do. solid door,	.	.	.	40 00
3815.	For 750 do. with glass-panel door,	.	.	.	47 00
3816.	For 1000 do. solid door,	.	.	.	50 00
3817.	For 1000 do. with glass panel door,	.	.	.	68 00

NOTE. — In all our Cabinets the Objects lie flat.



3816.



3818.

- | No.   |   | Price. |
|-------|---|--------|
| 3818. | Russia Leather Case, silk-lined, with clasp, holding 6 objects, . . . | \$2 00 |
| 3819. | do. do. do. do. holding 12 objects, . . .                             | 2 50   |
- These cases have racks arranged diagonally, holding the slides in such a position that the names of the objects may be read without removing from the case.

**REVOLVING MICROSCOPE TABLE.**



3820.

- | No.   |  | Price.  |
|-------|--|---------|
| 3820. | Revolving Table, especially arranged for Microscopic purposes, in walnut, with handsome leather top, . . . . . | \$30 00 |

QUEEN'S REVOLVING MICROSCOPE TABLE.



3821.

No.	3821. Queen's Revolving Microscope Table has been constructed especially for use with the microscope, and is designed to meet the want of a cheap, though good, revolving table. It has a very heavy and firm tripod base of cast iron, handsomely finished, and of neat and graceful appearance. The top is of ash, 28 inches in diameter. A novel feature is that the top may be set and rotated at any height, from 26 inches up, thus adapting it to microscopes of different sizes. The table is of substantial and first-class workmanship throughout, and is one that we can thoroughly recommend. Price, . . . . .	PRICE.
		\$11 00

A CLASSIFIED LIST  
OF  
*FIRST-CLASS MICROSCOPIC OBJECTS,*

WITH MANY NEW, RARE AND INTERESTING SPECIMENS, AFFORDING INSTRUCTIVE ILLUSTRATIONS IN ZOOLOGY, BOTANY AND MINERALOGY, INCLUDING THE FINEST PREPARATIONS OF WHEELER, NORMAN, COLE, MÖLLER, BOURGOGNE, MERRIMAN, HUNT, AND OTHER FOREIGN AND AMERICAN PREPARERS.

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INTRODUCTORY REMARKS AND EXPLANATIONS.

Although this Catalogue is intended as a guide in the selection and purchase of objects, yet it is obvious that no such list can be strictly correct for any considerable time, since new objects are being added continually, and the vacancies that occur cannot always be filled instantly. It must therefore be understood that these objects can be supplied on demand with *probability* rather than *certainty*; hence, it is advisable, when ordering, to name a few more than the number actually required. In this Catalogue about 4,000 objects are comprised; of these it may be calculated that more than one-half will be found in stock. All objects will be procured, *if possible*, when ordered, and orders are solicited for any object desired, even if not named in the Catalogue, as it is our aim to keep and supply the fullest assortment of Microscopic Objects to be found in this country.

It has been, and is, our desire to furnish only *the best* preparations. We do not think it desirable to introduce as many objects as possible in each department, but rather to rest satisfied with such as are the most beautiful as natural objects, or of their kind the best illustrations of special structure or function, and hence, of the highest interest. In arranging and classifying them, we have endeavored, as far as possible, to place each object in its natural order and relationship.

Any person confidentially known, or giving reference to those who are, if he desires to purchase a reasonable number of objects, can have an assortment sent for examination and approval, the express charge both ways being at his expense, the objects to be returned *within one week*, and the risk of damage or loss in transit borne by the purchaser. Such specimens are sent securely packed in rack boxes, affording facilities for inspection, as well as for packing and returning those not chosen.

Instead of making separate lists of Polariscope and Test Objects, we simply designate the former by an asterisk (\*), and the latter by a dagger (†). We have not attempted to mark *all* that may be examined either with Polarized Light or as Tests, but only such specimens as are thus most generally used.



## Division I.—THE ANIMAL KINGDOM.

### Section I.—VERTEBRATA.

#### DR. SEILER'S MICROSCOPIC PREPARATIONS.

These preparations are double stained by a process calculated to give the greatest possible brilliancy and differentiation of structural detail, and are mounted in Canada balsam, under the thinnest cover glasses, so that the higher powers may be used in examining finer details.

Each set comprises twenty-four objects, contained in a neat walnut cabinet, arranged diagonally so as to enable one to read all the headings at a glance. The labels are printed, and give a short description, beside the name, of the most important points shown in the specimen.

Larger and special sets will be furnished to order.

#### 3830.—Pathological Series. Price, \$15.00.

- |                                     |                                     |                                   |
|-------------------------------------|-------------------------------------|-----------------------------------|
| 1. Lung, Phthisis, Man.             | 8. Kidney, Amyloid, Man.            | 17. Aorta, Atheroma, Man.         |
| 2. Do. Tuberculosis, Man.           | 9. Do. Interstitial Nephritis, Man. | 18. Tonsil, Hypertrophy, Man.     |
| 3. Do. Interstitial Pneumonia, Man. | 10. Do. Cirrhosis, Man.             | 19. Mammary Gland, Scirrhus, Man. |
| 4. Do. Croupous Pneumonia, Man.     | 11. Liver, Nutmeg, Man.             | 20. Intestine, Tubercular, Man.   |
| 5. Do. Catarrhal Pneumonia, Man.    | 12. Do. Cirrhosis, Man.             | 21. Stomach, Scirrhus, Man.       |
| 6. Kidney, Large White, Man.        | 13. Do. Yellow Atrophy, Man.        | 22. Brain, Sclerosis, Man.        |
| 7. Do. Fatty, Man.                  | 14. Do. Jaundice, Man.              | 23. Uterus, Fibroid, Man.         |
|                                     | 15. Spleen, Amyloid, Man.           | 24. Ovary, Cyst, Man.             |
|                                     | 16. Heart, Fatty, Man.              |                                   |

#### 3831.—Histological Series. Price, \$15.00.

- |                            |  |                                    |
|----------------------------|--|------------------------------------|
| 1. Lung, Normal, Child.    | 11. Stomach, Normal, Man.                      | 19. Muscular Fibre, Injected, Cat. |
| 2. Do. Fœtus, 7 M., Human. | 12. Do. Frog.                                  | 20. Mammary Gland, Normal, Human.  |
| 3. Kidney, Normal, Child.  | 13. Tongue, Injected, Cat.                     | 21. Testicle, Normal, Child.       |
| 4. Do. Injected, Cat.      | 14. Skin, Sole of Foot, Man.                   | 22. Toe, Fœtus, 7 M., Human.       |
| 5. Liver, Normal, Man.     | 15. Brain, Normal, Man.                        | 23. Finger, Fœtus, 7 M., Human.    |
| 6. Spleen, Normal, Man.    | 16. Medulla Oblongata, Normal, Man.            | 24. Wrist, Fœtus, 7 M., Human.     |
| 7. Heart, Normal, Man.     | 17. Uterus, twelve days after delivery, Human. |                                    |
| 8. Aorta, Normal, Man.     | 18. Ovary, Normal, Human.                      |                                    |
| 9. Intestine, Normal, Man. |  |                                    |
| 10. Do. Injected, Cat.     |  |                                    |

#### 3832.—Tumor Series. Price, \$15.00.

- |  |                                    |                                  |
|--|------------------------------------|----------------------------------|
| 1. Round-celled Sarcoma.               | 8. Fibro Myoma.                    | 14. Epithelioma, Uterus.         |
| 2. Spindle-celled Sarcoma.             | 9. Rhabdo Myoma.                   | 15. Do. Lip.                     |
| 3. Spindle and Round-celled Sarcoma.   | 10. Papilloma.                     | 16. Carcinoma, Stomach.          |
| 4. Enchondroma.                        | 11. Adenoma, Breast.               | 17. Do. Liver.                   |
| 5. Osteo—Sarcoma.                      | 12. Glandular Epithelioma, Breast. | 18. Medullary Carcinoma, Breast. |
| 6. Mixoma.                             | 13. Cylinder-celled Epithelioma.   | 19. Scirrhus, Breast.            |
| 7. Inter-canalicular Fibroma (Breast). |                                    | 20. Colloid Carcinoma.           |

#### ANATOMICAL PREPARATIONS (in Sets). By ARTHUR C. COLE & SON.

#### 3835.—Series No. 1. 24 Pathological Preparations—Human.

- |  |  |   |
|--|--|---|
| 1. Lung, in Phthisis.                        | 9. Liver, Syphilitic, showing fibrous bands at margin.                   | 17. Hypertrophied Lymphatic Gland from Neck.                    |
| 2. Do. Catarrhal Pneumonia.                  | 10. Kidney, Scarlet Fever, Desquamative Nephritis.                       | 18. Scirrhus Mammeæ, round Cells elongating into Spindle Cells. |
| 3. Do. Croupous Pneumonia.                   | 11. Kidney, advanced Bright's disease, tubes and vessels much distended. | 19. Uterus, Fibroid Tumor, showing Spindle Cells.               |
| 4. Liver, Amyloid, not universal in lobules. | 12. Kidney, Fatty degeneration.  | 20. Epithelioma of Lip.   |
| 5. Do. Cancer.                               | 13. Kidney, Cirrhosis, showing inter-tubular fibroid growth.             | 21. Do. of Hand.  |
| 6. Do. Cirrhosis, universal in lobules.      | 14. Kidney, Contracted constitutional Syphilis.                          | 22. Do. of Vulva.   |
| 7. Do. Fatty, not universal in lobules.      | 15. Spleen, Amyloid (or Sago).   | 23. Malignant Tumor from Neck.                                  |
| 8. Do. Indurated.                            | 16. Stomach, Cancer.   | 24. Vascular Tumor of Perinæum.                                 |

*In case, with list of subjects, \$16.00.*

**3336.—Series No. 2. 24 Physiological Preparations.**

1. Man, Tongue, Transverse Section.	9. Man, Pancreas.	18. Cat, Bladder, Transverse Section
2. Do. Ileum, Transverse Section.	10. Do. Placenta.	19. Dog, Stomach of Puppy.
3. Do. Kidney, Injected from Artery only.	11. Do. Cuticle, showing hair follicles.	20. Pig. Parotid Gland.
4. Do. Kidney, from Artery and Vein.	12. Do. Thyroid Gland.	21. Rabbit, Colon, mucous membrane.
5. Do. Skin, Vertical Sec'n.	13. Cat, Ileum, Transverse Section.	22. Do. Ileum, mucous membrane.
6. Do. Brain, cerebellum.	14. Do. Lung.	23. Do. Kidney, from Artery and Vein.
7. Do. do. cerebrum.	15. Do. Brain, cerebrum.	24. Do. Tongue, Transverse Section.
8. Do. Stomach.	16. Do. Tongue, Transverse Section.	
	17. Do. Liver, two Colors.	

*In case, with list of subjects, \$16.00.*

**3337.—Series No. 3. 24 Educational Preparations.**

1. Adipose tissue.	9. Hyaline Costal Cartilage.	17. Tooth, Vertical Section.
2. Connective tissue.	10. Bone, Long. Section.	18. Capillaries in Pia-Mater.
3. Yellow elastic tissue.	11. Do. Transverse Section.	19. Pigment Cells.
4. Striped Muscular fibre.	12. Do. Skull, Transverse Sec.	20. Lung of Cat, Injected.
5. Unstriped do. do.	13. Scalp, showing hair shafts.	21. Liver do. do.
6. Tendon, Long. Section.	14. Nerve fibres.	22. Brain do. do.
7. Do. Transverse Sec'n.	15. Do. Cells.	23. Kidney of Rabbit.
8. Yellow elastic Cartilage of Cow's Ear.	16. Skin, Vertical Section.	24. Ileum Do.

*In case, with list of subjects, \$16.00.*

*(From the BRITISH MEDICAL JOURNAL, Oct. 30th, 1875.)*

We have just had an opportunity of inspecting a series of microscopic slides prepared by Arthur C. Cole & Son, of Liverpool. These slides illustrated both healthy and morbid tissues, and the sections brought out well the different structures, and were chosen from good specimens. As to the mounting, it was all that could be desired, and the sections, in size and amount of surface, exceed anything we have hitherto seen. The staining is done by a process peculiar to Messrs. Cole, and is far superior to any in use elsewhere. Taken altogether, they are the most perfect and beautiful things of the kind ever offered for public sale. This is not only our own opinion, but that of some of the most expert microscopists of the day, who have testified to the excellence of these slides. For teachers wishing illustrations for their class-teaching, they will be found very acceptable, while to students commencing their histological researches, they will be invaluable, not only for their demonstrating power, but as models to be aimed at as the students themselves become experts in the art.

**3338.—Pathological Preparations—Human. (Injected, Stained, and both Injected and Stained.) By A. C. Cole & Son.**

**Each, 75 cents; per dozen, \$7.50.**

<b>ARM—</b> Keloid growth after gunshot wound. Myxoma.	<b>FEMUR,</b> Round-celled Sarcoma. Frontal, Recurring Periosteal Tumor. Frontal, Spindle-celled Sarcoma. Humerus, Periosteal Sarcoma. Occiput of Infant, Naevus. Parietal, Gumma. Patella, Fibroid Cyst. Scapula, Alveolar Sarcoma.	<b>Cerebrum,</b> Atrophy. Do. General Paralysis. Do. Meningitis. Do. Softening. Dura-Mater, much thickened. Medulla Oblongata, Diabetes. Do. do. Locomotor Ataxia. Medulla Oblongata, Myelitis. Pons Varolii, Diabetes. Do. General Paralysis. Do. Locomotor Ataxia.
<b>ARTERIES—</b> Aortic Valve ossified. Cerebral, organizing Thrombus in Syphilis. Chronic thickening.	<b>BRAIN—</b> Encephaloid Cancer. Cerebellum, Locomotor Ataxia. Cerebrum, Acute Inflammation	<b>BREAST—</b> Cancer. Do. Recurrent Fungoid.
<b>BLADDER—</b> Chronic Cystitis.		
<b>BONE—</b> Caries. Clavicle, Enchondroma.		

Cystic Adenoma. Fibroid Cyst.	Osteo-Sarcoma.	PROSTATE GLAND— Carcinoma. Enlarged.
COLON— Acute Inflammation. Mucous Polypus.	LIP— Epithelioma.	SCALP— Recurrent Sarcoma.
DIAPHRAGM. Calcareous Nodule.	LIVER— Abscess. Amyloid Degeneration. Do. and Fatty Degeneration. Cancer and Cirrhosis. Carcinoma. Cirrhosis. Cirrhotic and Vascular Tumor. Fatty Degeneration. Indurated with Atrophy of Lobules. Nutmeg. Parenchymatous, Inflammation. Peculiar Fat in Lobules. Red Atropy. Syphilitic.	SKIN— Cancer. Granulations in Healing Sore. Do. Ulcer. Hypertrophied. Inflamed. Lupus vulgaris. Pityriasis. Plastic Effusion from Foot after Inflammation. Scarlet Fever. Small Pox, Hemorrhagic. Do. Simple. Tattooed.
EAE. Myxoma.	LUNG— Acute Bronchitis. Carcinoma. Catarrhal Pneumonia. Croupous do. Embolie do. Emphysema. Empyema. Hemorrhagic Pneumonia. Melansarcoma. Miliary Tubercle. Phthisis. Pleurisy. Pneumonia. Pyæmic Tuberculosis. Round-celled Sarcoma. Syphilitic. Saw-grinder's. Smothered Child. Tubercle. Tubercular Pneumonia.	SPINAL CORD, from Various Regions— Degeneration of the Nerve Cells. Fracture. General Paralysis. Hydrophobia. Insanity. Locomotor Ataxia. Tetanus.
EYE— Spindle-celled Sarcoma, Melanotic.	HEART— Fatty Degeneration. Do. Infiltration. Fibroid Degeneration. Pericarditis.	SPLEEN— Amyloid (or Sago). Calcareous Cicatrix. Embolism. Enlarged, in Chronic Heart Disease. Inflammation. Leukaemia. Tubercle.
FACE— Cancer. Epithelioma.	ILEUM. Amyloid Degeneration. Enteritis. Inflammation. Tubercle. Ulceration. Do. Typhoid.	STOMACH— Chronic Catarrh. Passive Congestion. Thickening.
FOOT— Corn. Epithelioma.	JAW— Cancer. Epithelioma. Fibroid Cyst. Soft Wart. Tumor, Bony. Do. Myeloid.	SUPRA-RENAL CAPSULE— Addison's Disease.
HAND— Epithelioma. Fibroid Cyst. Round-celled Sarcoma.	KIDNEY— Bright's Disease. Atrophy. Amyloid. Cirrhosis. Cirrhotic and Amyloid. Fatty. Embolism. Gouty or Red Degeneration. Hypertrophied. Indurated. Medullary Cancer. Nephritis, Acute. (Desquamative, Scarlet Fever, etc.) Nephritis, Chronic. (Suppurative, etc.) Strictured (Cystic). Tubercle.	TESTICLE— Fibroid Degeneration. Indurated. Sarcoma, Cystic. Do. Round-celled.
HEART— Fatty Degeneration. Do. Infiltration. Fibroid Degeneration. Pericarditis.	LYMPHATIC GLAND— Cancer. Carcinoma. Chronic Inflammation. Spindle-celled Sarcoma.	THIGH— Papilloma.
HEART— Fatty Degeneration. Do. Infiltration. Fibroid Degeneration. Pericarditis.	MESENTERY— Spindle-celled Sarcoma.	THYROID GLAND— Bronchocele.
HEART— Fatty Degeneration. Do. Infiltration. Fibroid Degeneration. Pericarditis.	MUSCLE— Fatty Tubercle. Fatty Infiltration. Inflamed. Do. in Hip Disease. Pseudo-hypertrophic Paralysis Trichinous.	TONGUE— Cavernous Tumor. Epithelioma. Ulcer.
HEART— Fatty Degeneration. Do. Infiltration. Fibroid Degeneration. Pericarditis.	NECK— Elephantiasis. Enlarged Strumous Gland. Simple Lymphadenoma.	TONSILS— Enlarged.
HEART— Fatty Degeneration. Do. Infiltration. Fibroid Degeneration. Pericarditis.	OVARY— Cancer. Dermoid Tumor.	UTERUS— Chronic Leucorrhœa. Polypus. Spindle-celled Sarcoma.
HEART— Fatty Degeneration. Do. Infiltration. Fibroid Degeneration. Pericarditis.	PANCREAS— Carcinoma.	VULVA— Epithelioma.
HEART— Fatty Degeneration. Do. Infiltration. Fibroid Degeneration. Pericarditis.	PENIS— Epithelioma. Propruce, Chanere.	

3839.—Histological Preparations. (Injected, Stained, and both Injected and Stained.) By A. C. Cole & Son.  
Each, 75 cents; per dozen, \$7.50.

Air Bladder of Sturgeon.*	Ileum, Human, mucous membrane.	Skin, Human, Caucasian.
Artery, Human.	Do. do. Trans. Section.	Spinal Cord, Cat.
Bladder, Cat.	Kidney, Cat.	Do. do. Horse.
Do. Human.	Do. Fowl.	Do. do. Human, Long. Sec.
Bone (Femur), Human.	Do. Human, Adult.	Do. do. do. Tran. do.
Do. do. do. Foetal.	Do. do. Child.	Spleen, Human.
Do. (Humerus), do.	Do. Rabbit.	Stomach, Cat.
Do. (Parietal), do.	Do. Snake.	Do. Dog.
Do. (Tibia), do.	Larynx, Human, Foetal.	Do. Fowl.
Brain (Cerebellum), Cat.	Do. do. Infant.	Do. Human.
Do. do. Human.	Liver, Cat.	Sub-maxillary Gland, Cat.
Do. do. Monkey.	Do. Human.	Do. do. Human.
Do. (Cerebrum), Cat.	Lung, Cat.	Supra-renal Capsule, Cat.
Do. do. Human.	Do. Fowl.	Do. do. Human.
Do. do. Monkey.	Do. Human, Adult.	Tendon, Giraffe.*
Do. (Medulla oblongata), Cat.	Do. do. Foetal.	Do. Human.*
Do. do. do. Human.	Do. Snake.	Do. Ostrich.*
Do. do. do. Monkey.	Lymphatic Gland, Cat.	Testicle, Cat.
Do. (Pons Varolii), Human.	Do. do. Human.	Do. Human, Adult.
Cartilage, yellow fibrous, Ear of Cow.	Mammary do. do. in Lactation.	Do. do. Child.
Do. Human, from Sternum.	Muscle, Cat.	Do. do. Infant.
Do. do. Foetal.	Do. Human, voluntary.	Thymus Gland, Human.
Do. cellular, Ear of Mouse.	Do. do. involuntary.	Thyroid do. do.
Claw, Fowl.*	Nose, Human.	Tongue, Cat.*
Do. Polar Bear.*	Oesophagus, Cat.	Do. Human.
Do. Wild Cat.*	Olfactory Bulb, Cat.	Do. Rabbit.
Colon, Cat.	Optic Nerve, Human.	Do. Snake.
Do. Human.	Do. do. Sheep.	Tooth, Calf, Transverse Sect.
Do. Rabbit.	Ovary, Cat.	Do. Human (Incisor), Long. Section.
Crystalline Lens, Human, showing ultimate fibre.	Do. Human, Adult.	Do. Human (Incisor), Tran. Section.
Cuticle, Human.	Do. do. Child.	Do. Human (Molar), Long. Section.
Epithelium, do. from Mouth.	Pancreas, Human.	Do. Human (Molar), Tran. Section.
Eyelid, do.	Parotid Gland, Human.	Do. Myliobates.
Finger-Nail, Human.*	Penis, Human.	Do. Sheep.
Foot, Dog.	Do. Monkey.	Do. Wild Cat.
Foot-pad, Cat.*	Do. Rabbit.	Do. Zygobates.
Hoof, Horse.*	Do. Rat.	Umbilical Cord, Human.
Do. Ox.*	Placenta, Human.	Uterus, Human, Adult.
Do. Sheep.*	Prostate Gland, Human.	Do. do. Infant.
Horn, Antelope.*	Scalp, Human, Caucasian.	Whalebone.*
Do. Buffalo.*	Do. do. Negro.	Yellow Elastic Tissue, Neck of Cow.
Do. Rhinoceros.*	Skin, Frog, showing pigment cells.	Yellow Elastic Tissue, Neck of Giraffe.
Ileum, Cat, mucous membrane.	Do. Human, African, showing pigment cells.	
Do. Dog, do.		

3840.—Blood, Spermatozoa and Urinary Deposits. Each, 60 cents; per dozen, \$6.00.

Blood Discs—	Sparrow.	Mouse.
Amphiuma.	Sturgeon.	Newt.
Bat.	Swallow.	Rabbit.
Camel.	Toad.	Rat.
Canary.	Triton.	Rhinoceros.
Cat.	White Mouse.	Sheep.
Dog.		Wolf.
Domestic Fowl.	HEMATOCRYSTALLIN—	
Eel.	From Human Blood. (75 cts.)	
Hedge-hog.		URINARY DEPOSITS—
Horse.	SPERMATOZOA—	Carbonate of Lime, Horse.
Lepidosiren.	Ass.	Do. do. Man.
Man.	Boar.	Chloride of Sodium.
Monkey.	Bull.	Cholesterine.
Mouse.	Camel.	Creatinine.
Ostrich.	Deer.	Cystine, or Cystic Oxide.
Ox.	Dog.	Hippuric Acid.
Pigeon.	Elephant.	Leusine.
Salamander.	Fish.	Murexide.
Salmon.	Goat.	Nitrate of Urea.
Sheep.	Horse.	Oxalate of Lime, Dumb-bell form.
Slow-worm.	Man. (75 cts.)	

Oxamate of Lime, Ellipsoidal form.	Triple Phosphate, in Hip-Joint Disease.	Uric Acid from Man, Rectang/r
Oxalate of Lime, Octahedral form.	Do. do. in Paralysis.	Do. do. do. Rhombic.
Oxalate of Urea.	Do. do. in Renal Calculus.	Do. in Cirrhosis of Liver.
Oxalurate of Ammonia.	Do. do. in Rheumatism.	Do. in Conges'n of L'ngs.
Phosphate of Ammonia, amorphous.	Do. do. in Ulceration of Knee-Joint.	Do. in Dysentery.
Phosphate of Lime.	Tube Casts.	Do. in Eczema.
Sugar in Diabetes.	Tyrosine.	Do. in Gastralgia.
Do. of Milk.	Urate of Ammonia.	Do. in Gastric Fever.
Taurine.	Do. of Lime.	Do. in Gout.
Triple Phosphate, Rhombic.	Do. of Magnesia.	Do. in Hematuria.
Do. do. Stellate.	Do. of Soda.	Do. in Pneumonia.
Do. do. in Catarrh of Bladder.	Urea.	Do. in Rheumatism (Ac.)
Do. do. in Hepatitis.	Uric Acid from Boa Constrictor	Do. in Rheumatic Endocarditis.
Do. do. do. (Syphilitic).	Do. do. Man.	Do. in Rheumatic Fever.
	Do. do. do. Fusiform.	Do. do. Gout
		Do. do. Peri-carditis.
		Do. in Scurvy.

3841.—Feathers, Hair and Scales.

<b>FEATHERS—</b>	Egyptian Mummy.	Russian Sable.
Albatross.	Elephant.	Seal.
Cassowary, Quill.*	Do. (Section, from tail).*	Do. Whisker (Section).*
Domestic Fowl.	Ermine.	Sheep (Coarse Eng'h Cheviot).*
Eider Duck (showing transition from Down to Feather).	Goat (Mohair).*	Do. (Merino).
Goldfinch.	Giraffe.	Siberian Mammoth (Section).
Humming Bird (opaque).	Do. (Section, from tail).	Squirrel.
Nightingale.	Gorilla.*	Walrus, Whisker (Section).*
Ostrich.	Harte-beest (Section).	Water Rat.
Owl.	Hippopotamus (do. from tail.)	Whale, Eyelash (Section).
Parrot.	Horse, woven.*	
Peacock.	Lion, Whisker (Section).*	<b>SCALES—</b>
Penguin.	Mau.	Carp.*
Pigeon.	Do. Beard.*	Dog-Fish.*
Sun-Bird.	Do. Eyebrow.*	Eel.*
	Do. Fetal.	Gudgeon.*
	Do. (Section).	Perch.*
<b>HAIR—</b>	Mole.	Shark.*
Ant-Eater (Section).	Monkey.	Sole.*
Bat, American.†	Mouse.	Sturgeon.*
Do. Australian.†	Do. Indian.†	
Do. British.†	Do. White.*	<b>SKIN, with Scales in situ—</b>
Do. Indian.†	Ornithorhynchus.	Dog-Fish (opaque).
Beaver.	Porcupine, Quill (Section).*	Eel.*
Brahmin Bull.*	Rabbit.	Shark (opaque).
Cat.	Rat.*	Sole do.
Deer (Section).	Reindeer (Body), Cellular.*	Do. *
	Do. (Legs), Bristly.*	

Section II.—ARTICULATA.

3842.—Parasitic Insects, Acari, etc. Each, 60 cts. ; per doz., \$6.00.

Bed-Bug, Cimex lectularius, Male.	Flea of Man, Pulex irritans, Male.	Itch Insect, Sarcoptes scabiei, Male, Female, Egg and Larva. \$3.00.
Bed-Bug, Cimex lectularius, Female.	Flea of Man, Pulex irritans, Female.	Itch Insect, from Cat, with Larva. \$1.25.
Body Louse, Pediculus vestimental. 75 cts.	Harvest Bug, Trombidium autumnale. 75 cts.	Louse of Dog.
Book Mite, Cheyletus eruditus. 75 cts.	Head Louse, Pediculus capitis, Male.	Do. Domestic Fowl.
Cheese Mite, Male and Female. 75 cts.	Head Louse, Pediculus capitis, Female.	Do. Mouse.
Chigoe (or Jigger), Pulex penetrans.	Head Louse, Pediculus capitis, Egg.	Do. Monkey.
Crab Louse, Pediculus pubis, Male. \$1.00.	House Mite, Glyciphagus cursor. 75 cts.	Do. Peacock.
Crab Louse, Pediculus pubis, Female. \$1.00.	Itch Insect, Sarcoptes scabiei, \$1.50.	Do. Pigeon.
Face Insect, Demodex folliculorum. 75 cts.	Itch Insect, Sarcoptes scabiei, Male and Female. \$2.00.	Do. Swallow.
Flea of Cat, Pulex felis.	Itch Insect, Sarcoptes scabiei, Male, Female and Larva. \$2.50.	Do. Vampire Bat.
Do. Dog, Pulex canis.		Mange Insect, from Horse, Male, Female and Larva. \$2.00.
Do. Fowl, Pulex gallina.		Meal Mite, Tyroglyphus farinae.
		Parasite of Bee.
		Do. Beetle.
		Sheep Tick, Melophagus ovinus.

**3843.—Whole Insects (not Parasitic). Each, 75 cts.; per doz., \$7.50.**

Ant, <i>Formica rufa</i> .	Gnat, <i>Culex pipiens</i> , Male.	Scorpion Fly, <i>Panorpa vul-</i>
Ant-Lion, <i>Myrmelcon formi-</i>	Do. do. Female.	garia.
carinus, Larva.	Do. do. larva.	Shadow Watcher, <i>Syrirta pi-</i>
Asparagus Beetle, <i>Crioceris</i>	Grasshopper, <i>Locusta viridis</i> .	piens.
Asparagi (opaque).	Green-scale Beetle, <i>Cassida vi-</i>	Spider, Garden, <i>Epeira dia-</i>
Blow Fly, <i>Musca vomitoria</i> .	ridis, pupa.	dema.
Blow Fly, <i>Musca vomitoria</i> ,	Honey Bee, <i>Apis mellifica</i> .	Spider, Ground, <i>Lycosa agres-</i>
Larva (Maggot).	Hornet, <i>Vespa crabo</i> .	tica.
Bot Fly, Larva.	House Fly, <i>Musca domestica</i> .	Spider, Harvest, <i>Phalangium</i>
Carpet Beetle, <i>Anthrenus mus-</i>	Ichneumon Fly, <i>Ophion lut-</i>	cornutum.
corum, Larva.	um.	Spider, House, <i>Aranea laby-</i>
Cattle Fly, <i>Musca corvina</i> .	Lace-wing Fly, <i>Chrysopa perla</i> .	rinthica.
Centipede, <i>Lithobius forcipa-</i>	Do. C. perla, larva.	Spider, Jumping, <i>Salticus seni-</i>
tus.	Lady-Bird, <i>Coccinella</i> .	cus
Click Beetle, Larva (Wire	Do. do. larva.	Spider, Marsh, <i>Lycosa piratica</i> .
Worm).	Do. do. pupa.	Spider, Water, <i>Argyroneta</i>
Crane Fly, <i>Tipula oleracea</i> .	Midge, <i>Psychoda</i> .	aquatia.
\$1.00.	Mosquito, <i>Culex</i> , Male.	Tussock Moth, young larva.
Cuckoo Spit, <i>Aphrophora spu-</i>	Do. do. Female.	Wasp, <i>Vespa vulgaris</i> .
maria.	Plant Bug, <i>Tingis Cardui</i>	Water Beetle, <i>Gyrinus natator</i> .
Dragon Fly, larva.	(opaque).	Do. do.
Drone Fly, <i>Helophilus pen-</i>	Plant Bug, <i>Tingis foliacea</i>	larva.
dulus.	(opaque).	Water Beetle, <i>Hygrotus elegans</i>
Earwig, <i>Forficula auricularis</i> .	Plant Bug, <i>Tingis hyalina</i>	Do. do.
False Scorpion, Chelifer.	(opaque).	larva.
Frog Hopper, <i>Amblycephalus</i>	Plant Louse of Rose, <i>Aphis</i>	Water Boatman, <i>Notonecta</i>
viridis.	Rosae.	glaucia.
Gall Fly, <i>Cynips</i> .	Privet Hawk Moth, <i>Sphinx</i>	Water Boatman, <i>Notonecta</i>
Glow-worm, <i>Lampyrus nocti-</i>	ligustri, young larva.	glaucia, pupa.
luca, Male.	Saw Fly, <i>Allantus scolopacea</i> .	Water Scorpion, <i>Nepa cinerea</i> .
Glow-worm, <i>Lampyrus nocti-</i>	Scissor-Bug, <i>Capsus plani-</i>	Water Skater, <i>Gerris lacustris</i> .
luca, Female.	cornis.	Weevil, <i>Hypera nigrirostris</i>
		(opaque).

**3844.—Insect Anatomy, displayed complete on one Slide.**

Each, \$2.50.

Blow Fly, <i>Hæmatophota plu-</i>	Earwig, <i>Forficula auricu-</i>	Honey Bee, <i>Apis mellifica</i> .
vialis.	laris.	Scorpion Fly, <i>Panorpa vul-</i>
Blow Fly, <i>Musca vomitoria</i> .	Garden Spider, <i>Epeira dia-</i>	garia.
Butterfly, <i>Argynnis Paphia</i> .	dema.	Wasp, <i>Vespa vulgaris</i> .

**3845.—Parts of Insects, etc. Each, 50 cents; per dozen, \$5.00.**

<b>ABDOMEN—</b>	Latticed Heath Moth (opaque).	Moth (opaque).
Beetle, <i>Curculio</i> (opaque).	Parasite of Buzzard do.	Spider, "
Moth, from Ecuador (opaque).	Do. Crane do.	
Sand Bee, from West Africa	Do. Goose, do.	Foot—
(opaque).	Do. Owl, do.	Caterpillar.
Weevil, <i>Prepodes spectabilis</i>	Do. Pig. do.	Water Beetle, <i>Dytiscus</i> .
(opaque).	Sedge Fly, <i>Sialia suturalis</i>	Do. do. (opaque)
	(opaque).	Do. Spider (opaque).
<b>ANTENNE—</b>	<b>ELYTRA—</b>	<b>GIZZARD—</b>
Blow Fly.	Diamond Beetle (opaque).	Centipede.*
Cockchafer.	Tiger do. do.	Cockroach.*
Cockroach.	Water do. <i>Dytiscus</i> .*	Cricket.*
Gnat, Male.	Weevil, <i>Hypomeces squamosus</i>	Diamond Beetle.*
Do. Female.	(opaque).	Water Beetle, <i>Acilius</i> .*
Sedge Fly.	Weevil, <i>Prepodes spectabilis</i>	Do. <i>Dytiscus</i> .*
Sphinx Moth.	(opaque).	Weevil, <i>Cyphus</i> .*
Wasp.	<b>EXUVIUM (CAST SKIN)—</b>	<b>HAIR—</b>
<b>EGGS—</b>	<i>Dermestes</i> , larva (for Parabola).	Bird-catching Spider.
Butterfly, <i>Cenonympha</i>	<i>Ephemera</i> (for Parabola).	Caterpillar of Tiger Moth.
(opaque).	Tortoise Beetle, do.	Do. Vapor do.
Butterfly, <i>Chrysophanus</i>		Centipede.
(opaque).	<b>EYES—</b>	<i>Dermestes</i> , larva.†
Butterfly, <i>Hipparchia Janira</i>	Beetle, showing multiplied	<b>HALTERES (OR BALANCES)—</b>
(opaque).	images.	Blow Fly.
Butterfly, <i>Polyommatus Al-</i>	Bee Fly.	Crane Fly.
axis (opaque).	Blow Fly.	
Butterfly, Small Heath	Do. (Simple).	<b>HEAD—</b>
(opaque).	Butterfly.	Cricket.
Common Veneer Moth	Dragon Fly.	Diamond Beetle (opaque).
(opaque).	Drone Fly.	Hive Bee.
Goat Moth, <i>Cossus ligniperda</i>	House Fly.	
(opaque).		

Mosquito (showing lancets).	Gad Fly.	Garden Spider.
Weevil, Eupholus (opaque).	Hive Bee.	Silk worm.
Do. Hypomeces, do.	House Fly.	Water Beetle, larva.
LANCETS—	Moth.	SPINNERETS—
Bed Bug, Cimex.	Rhingia.	Silk worm.
Flea, Pulex.	Saw Fly.	Spider.
Gnat, Culex.	PYGIDIUM—	SPRACLES—
LEG AND FOOT—	Flea, †	Blow Fly.
Ant.	SCALES—	Do. larva.
Blow Fly.	Amathusia Horsfieldii.	Cricket.
Diamond Beetle (opaque).	Buff Tip Moth.	Drone Fly.
Drone Fly.	Clothes Moth, Tinea vestianella	Dytiscus, larva.
Honey Bee.	Diamond Beetle.	STING—
Hornet.	Forester Moth.	Humble Bee.
Sand Bee (opaque).	Gnat, Culex pipiens. †	Honey do.
Snipe Fly.	Hipparchia Janina. †	Hornet.
Spider.	Iphia glaucippe.	Wasp.
Tiger Beetle (opaque).	Lepidocyrtus curvicolis. † 75 c.	TRACHEE—
Tortoise-shell Butterfly	Lepisma saccharina. † (60 cts.)	Caterpillar of Vanessa.
(opaque).	Morpho Menelaus. †	Centipede.
Water Beetle, Dytiscus.*	Papilio Paris.	Water Beetle, Dytiscus, larva.
Do. Gyrinus.	Peacock Butterfly.	WING—
Weevil, Prepodes (opaque).	Petrobius maritimus. † (60 cts.)	Atlas Moth (opaque).
MOUTH—	Pieris Brassicae.	Bee, showing hooklets.
Bee.	Do. Napi.	Blow Fly.
Garden Spider.	Do. pyrria.	Earwig.
Wasp.	Do. Kapae.	Gnat, Culex pipiens.
Water Boatman.	Podura plumbea. † (75 cts.)	Goat Moth, Cossus (opaque).
OVIPOSITOR—	Polyommatus Alexis.	Harvest Fly, Cicada.
Blow Fly.	Do. Argus.	Hornet.
Gad Fly.	Do. Corydon.	Morpho Anexbia (opaque).
Gall Fly.	Privet Hawk Moth, Sphinx li-	Do. Menelaus do.
Grasshopper.	gustri.	Ornithoptera Cressus (opaque).
Harvest Fly, Cicada.	Tortoise-shell Butterfly.	Do. Richmondii do.
Ichnumon Fly.	Vanessa Atalanta.	Papilio Paris do.
Moth, Brindle Beauty.	SEXUAL ORGANS—	Peacock Butterfly do.
Saw Fly.	Blow Fly.	Do. do. (embryonic)
Spider.	Drone Fly.	(opaque).
PALPI—	Humble Bee.	Red Admiral Butterfly (embry-
Butterfly.	SILK—	onic) (opaque).
Spider.	Silk worm.	Sangala gloriosa (opaque).
PROBOSIS (OR TONGUE)—	Spider.	Urania Ferdinandina do.
Blow Fly. † (75 cts.)	SKIN—	Water Beetle, Gyrinus.
Butterfly.	Bird-catching Spider.	

**3846.—Scales of Butterflies, arranged to form Bouquets and Vases of Flowers, etc.; very handsome. Prepared by Harold Dalton. Each, \$2.50 to \$15.00.**

**3847.—Crustaceans. Each, 75 cents; per dozen, \$7.50.**

Caligus rapax (Marine Parasite).	Cyclops quadricornis.	Shell of Crab, Superficial Sec.
Cirri of Sea Acorn, Balanus balanoides.*	Exuvium of Prawn.*	Do. do. Vertical do.
Crystal of Carbonate of Lime in Tail of Shrimp.*	Fish-louse, Argulus foliaceus (fresh-water).	Spider Crab (opaque).
	Pigment Cells in Tail of Shrimp	Water Flea, Daphnia pulex.*
	Shell of Barnacle, Vertical Sec.	Young of Crab, 1st Stage.

**3848.—Worms. Each, 75 cents; per dozen, \$7.50.**

Ascarides, and Ova, from Lion.	Entozoon from Cuttle Fish.	Tape-worm, Tania solium, segment.
Cysticercus from Pike Fish.	Do. do. Horse.	Do. Tania solium, ova.
Do. do. Rabbit.	Filaria from Human Blood.	Teeth of Medicinal Leech.
Do. do. do., Head of.	Do. do. Lion.	Trichina spiralis, Encysted.
Eels from Sour Paste, Anguilla glutinis.	Hydatid from Aorta of Hartebeest.	Do. do. mature form,
Do. from Vinegar, Anguilla aceti.	Do. from Liver of Man.	both Sexes on one slide.
	Rotifer vulgaris.	\$1.00.

## Section III.—MOLLUSCA.

## 3849.—Palates. Each, 60 cents; per dozen, \$6.00.

Cuttle Fish, Octopus.*	Janthina.*	Periwinkle, Littorina.
Cellar Snail, Zonites.	Limnaeus.	Do. do. (opaque).
Chiton.*	Limpet, Patella.*	Planorbis.
Doris.	Do. do. (opaque).	Purpura lapillus.
Garden Snail, Helix.*	Nerita.*	Trochus zizyphinus.*
Haliotis.*	Neritina.	Do. do. (opaque).
Do. (opaque).	Paludina.	Whelk, Buccinum.*

## 3850.—Shell Sections, etc. Each, \$1.00; per dozen, \$10.00.

EMBRYO OYSTERS—	Common Oyster.	Mother-of-Pearl, Haliotis, from
In Balsam.* 75 cts.	Conus nanus.*	Do. Japan.
In Fluid, moving.*	Cerithium rugosum.	Do. Pearl Oyster,
Opaque. 75 cts.	Cypraea annulus.	Do. Avicula.
SECTIONS OF SHELL—	Mother-of-Pearl, Haliotis splen-	Pearl, Alasmodon margaritifera
Cuttle Fish (so-called "bone").*	dens.	Pinna pectinata.*
		Terebratula australis.

## 3851.—Polyzoa. Each, 60 cents; per dozen, \$6.00.

Bicellaria ciliata, showing	Canda reptans (opaque).	Crisia eburnea.*
"Bird's-head" processes.	Catenicella plagiostoma.	Flustra foliacea (opaque).
Bicellaria grandis.*	Cellularia ciliata.*	Do. paraceta.*
Do. tuba (opaque).	Do. do. (opaque).	Gemellaria loriculata.*
Bugula avicularia, showing	Do. seruposa. do.	Membranipora pilosa (opaque).
"Bird's-head" processes.	Crisia eburnea do.	Notamia bursaria.
Bugula Murrayana.*		

## Section IV.—RADIATA.

## 3852.—Echinodermata. Each, 75 cents; per dozen, \$7.50.

Brittle Star Fish, Ophiocoma,	Holothuria impatiens.	SPINES—
neglecta (opaque).	Do. Savignyi.	Brissopsis.*
Pedicellariae of Echinus.	Do. tremula.	Do. from Barbadoes
Do. of Uraster.	Pseudo-cucumis Pacificus.	(opaque).
Pentactinoid Larva of Anteno-	Stichopus chloronotus.	Echinanthus, do.
don.	Do. monacarius.	Echinocardium australe
		(opaque).
PLATES FROM SKIN—	PLATES AND ANCHORS FROM	Laganum Tonganense.
Wheel-shaped, Chirodota pa-	SKIN—	Spatangus (opaque).
nensis.	Synapta from Australia.	Do. etc., from Bermudas
Wheel-shaped, Chirodota pa-	Do. do. New Zealand.	(opaque), very fine, \$1.25.
nensis, group of 9, ar-	Do. Besseli.	Star Fish, Ophiocoma rosula
anged, \$1.25.	Do. digitata.	(opaque).
Wheel-shaped, Chirodota vari-	Do. dubia. \$1.50.	Do. Palmipes membra-
abilis.	Do. glabra.	naceus (opaque).
Wheel-shaped, Chirodota vari-	Do. do. group of 4 each,	
abilis, group of 7, ar-	arranged, \$1.25.	
anged, \$1.25.	Do. Godeffroyi.	SECTIONS OF SPINES—
Wheel-shaped, Myriotrochus	Do. inhaerens.	Acrocladia trigonaria.
Rinkii. \$1.25.	Do. Kefersteini.	Cidaris imperialis.
Wheel-shaped, Myriotrochus	Do. molesta. \$1.50.	Diadema Savignyi.
Rinkii, group of 4, ar-	Do. recta. \$1.00.	Doroceidaris abyssicola.
anged, \$2.75.	Do. similis. \$1.00.	Echinocidaris purpurascens.
Echinus.	Do. and Chirodota, group	Echinometra lucunter.
Holothuria from Australia.	of 13, arranged, \$2.00.	Do. heteropora.
Do. do. Fiji Islands.	Do. and Chirodota, group	Echinotrix Petersii.
Do. do. Monterey Bay	of 19, arranged, \$3.50.	Echinus, longitudinal.
Do. do. Navigator's	Do. Chirodota and Myrio-	Do. group of 13, arranged,
Island.	trochus, group of 33,	\$6.00.
Do. do. New Zealand.	arranged, \$4.50.	Do. from Bermudas group
Do. do. Port Curtis.		of 9, arranged, \$1.00.
Do. do. do. Essington	SHELL—	Do. from Philippine Id.
Do. do. do. Phillip.	Echinus (Section).	Do. atratus.
Do. do. Torquay.	Spatangus (opaque).	Do. esulentus.
Do. atra.	SKIN—	Do. lividus.
Do. edulus.	Holothuria, plates <i>in situ</i> .	Mespilia globulus.
Do. Floridana.	Synapta, plates and anchors <i>in</i>	Orthocidaris hystrix.
Do. fusco-cinerea.	<i>situ</i> .*	Parasalenia gratioa.



**3853.—Zoophytes (or Polypes). Each, 60 cents; per dozen, \$6.00.**

Anguinaria spatulata.*	Thoa nalecina.	Aleyonium murale.*
Do. do (opaque).	SECTIONS OF CORAL—	Do. tuberculosum.
Campanularia volubilis.	Distichopora. \$1.00.	Gorgonia setosa.
Do. raridentata.	Hydnophora.	Do. verrucosa.
Plumularia falcata.	Madrepora.	Do. mixed (opaque).
Do. simplex.	Seriatopora. 75 cts.	Isis Hippuris.
Sertularia argentea.	SPICULES—	Lophogorgia Palma.
Do. do (opaque).	Aleyonium digitatum.	Melitea ochracea.
Do. rosea do.		Plexaura antipathes.

**Section V.—PROTOZOA.**

**3854.—Sponges.**

SECTIONS—	Euplectella.	Spongilla (fresh-water
Dendrospongia.	Geodia.	sponge).
Smyrna Sponge.	Do. (opaque).	Stelletta Grubii.
Spongilla.	Grantia (calcareous).	Tethya.
Syeon ciliatum.	Halichondria.	Sponge from Samoa.
	Hyalonema.	Do. biclavate.
SPICULES—	Papillina (pin-shaped).	Do. sphero-stellate.
Dusideia.		

**3855.—Foraminifera and Polycystina. Each, 60 cents; per dozen, \$6.00.**

FORAMINIFERA—	Arranged for Paraboloid. \$1.00.	POLYCYSTINA—
From Adriatic Sea.	Alveolina (Section). \$1.25.	From Barbadoes.
Do. Bay of Bengal.	Eozoon Canadense (Section).	Do. do. (opaque).
Do. Bermuda, selected	\$2.00.	Do. do. (in situ).
(opaque), including Orbic-	Globerina (Challenger Expe-	Do. do. arranged
ullina, Orbitolites, Penerop-	dition, 1875).	(opaque). \$2.25.
lis, etc. \$1.00.	Lagena sulcata.	From Nankoori.
From Chalk, Dover, England.	Orbiculina complanata (Sec-	Arranged, group of 4-8 (opa.)
Do. do. Kent, do.	tion). \$1.00.	\$1.25.
Do. do. in situ.	Orbitolites (Section). \$1.00.	Arranged, group of 8-16
Do. Cuxhaven.	Polystomella serobiculata (Sec-	(opaque). \$2.75.
Do. Gulf Stream.	tion). 75 cts.	Astromma Aristotelis.
Do. Levant.	Rotalia ornata, (Section).	Do. various.
Do. Samoa.	Siderolina Spenglerii.	Haliomma Humboldtii.
		Stylodyctya gracilis.

**Division II.—THE VEGETABLE KINGDOM.**

**Section I.—PHÆNOGAMIA.**

**3862.—Double-stained Vegetable Objects; by the Best American and Foreign Preparers. Each, 75 cents; per dozen, \$7.50.**

BLADDEES of Utricularia.	LEAF—	Limnanthemum lacunosum,
	Allspice, Section.	showing stomata.*
FLOWER of Spring Beauty,	Cyperus alternifolius.	Melissa officinalis.
Claytonia.	Deutzia scabra, showing stel-	Mexican Soap-plant, Trans.
	late hairs.*	Section, showing bundles
FRUIT—	Deutzia gracilis, showing stel-	of woody tissue.
Burdock, Lappa, Section.	late hairs.*	Nerium Oleander, Section.
Cherry, Prunus, do.	Drosera rotundifolia, showing	Nettle, showing cystoliths and
Horse Chestnut, Aesculus, Sec-	glands.	stinging hairs.
tion, showing spiral vessels.	Euphorbia Ipecacuanha, show-	OVARY—
Lemon, young, Section, show-	ing latex vessels.	Datura Stramonium, Section.
ing oil-cells.	Ficus elastica, Section, show-	Passion Flower, Passiflora, Sec-
May Apple, Podophyllum, Sec-	ing cystoliths.	tion.
tion.	Fuchsia, showing raphides.	Tiger Lily, L. tigrinum, Sec-
Pear, Pyrus, Section, showing	Gallium pilosum, showing spe-	tion.
raphides.	cial oil-cells.	Trumpet Creeper, Tecoma ra-
Walnut, Juglans, Section.	Hepatica triloba.	dicans, Section.

Tulip, <i>Tulipa Gesneriana</i> , Sec.	SPADIX of Calla Lily, Trans. Section, ovaries <i>in situ</i> .	Milk-weed, <i>A. cornuti</i> , Trans. Section.
Tulip-tree, <i>Liriodendron</i> Sec.		<i>Nerium Oleander</i> , 2.
PETIOLE of <i>Ricinus Communis</i> , Section.	SPATHE of Calla Lily, Trans. Section.	<i>Papyrus</i> , Trans. Section.
PITCHER— <i>Nepenthes distillatoria</i> .	STEM— <i>Caladium</i> , Trans. Section.	<i>Pine</i> , <i>Pinus Strobus</i> , Long. Section, showing pitted structure.
<i>Nepenthes Rafflesiana</i> , showing cylindrical water-glands.	<i>Dracena Braziliensis</i> , 2.	<i>Poke</i> , <i>Phytolacca</i> , Trans. Section.
<i>Sarracenia variolaris</i> , showing oval glands.	Do. <i>terminalis</i> , 2.	<i>Reed</i> , <i>Phragmites</i> , Trans. Section.
Roof of <i>Opuntia</i> , Trans. and Long. Sections, showing annular and spiral deposits.	<i>Elder</i> , <i>S. Canadensis</i> , Sec., showing nucleated cells.	<i>Ricinus communis</i> , Trans. Section.
	<i>Hazel</i> , <i>Corylus Americana</i> , Trans. Section.	<i>Ricinus communis</i> , Long. Section.
	<i>Hazel</i> , <i>Corylus rostrata</i> , Trans. Section.	<i>Thistle</i> , <i>C. lanceolatum</i> , Trans. Section.
	<i>May Apple</i> , <i>Podophyllum</i> , Trans. Section.	

## 3863.—Sections of Woody and other Stems (unstained).

The number 3 indicates that there are 3 Sections on the Slide, transverse, tangential and radial.

Three on a Slide, 75 cts.; per doz., \$7.50. Others, 60 cts.; per doz., \$6.00.

<i>Ailanthus glandulosa</i> , 3.	<i>Elder</i> , <i>Sambucus nigra</i> , 3.	<i>Passion Vine</i> , <i>Passiflora cereum</i> , 3.
<i>Akebia quinata</i> .	<i>Gleditschia sinensis</i> , 3.	<i>Pear</i> , <i>Pyrus communis</i> , 3.
<i>Alder</i> , <i>Alnus glutinosa</i> , 3.	<i>Gooseberry</i> , <i>Ribes Grossularia</i> , 3.	<i>Pepper Plant</i> , from Australia.
<i>Almond</i> , <i>Amygdalus communis</i> , 3.	<i>Grape Vine</i> , <i>Vitis riparia</i> , 3.	<i>Pomegranate</i> , <i>Punica granatum</i> , 3.
<i>Araucaria excelsa</i> , 3.	Do. <i>do. vinifera</i> , 3.	<i>Prickly Pear</i> , <i>Opuntia major</i> .
<i>Arbutus unedo</i> , 3.	<i>Gutta percha Tree</i> , <i>Isonandra Gutta</i> , 3.	<i>Privet</i> , <i>Ligustrum vulgare</i> , 3.
<i>Aristolochia serpentaria</i> .	<i>Hawthorn</i> , <i>Crataegus Oxyacantha</i> , 3.	<i>Quince</i> , <i>Cydonia vulgaris</i> , 3.
<i>Ash-leaved Maple</i> , <i>Negundo aceroides</i> , 3.	<i>Hazel</i> , <i>Corylus Avellana</i> , 3.	<i>Rattan</i> , <i>Calamus Rotang</i> .
<i>Ash</i> , <i>Fraxinus excelsior</i> , 3.	<i>Holly</i> , <i>Ilex Aquifolium</i> , 3.	<i>Rose</i> , <i>Rosa sempervirens</i> , 3.
<i>Aspen</i> , <i>Populus tremula</i> , 3.	<i>Honduras Mahogany</i> , 3.	<i>Ruscus aculeatus</i> .
<i>Australian Nettle</i> , <i>Laportea gigas</i> , 3.	<i>Honeysuckle</i> , <i>Lonicera Caprifolium</i> , 3.	<i>Rush</i> , <i>Juncus tenuis</i> .
<i>Bamboo</i> , <i>Bambusa vulgaris</i> , 2.	<i>Hop Hornbeam</i> , <i>Ostrya Virginica</i> , 3.	<i>Sarsaparilla</i> , <i>Smilax aspera</i> .
<i>Banksia oblongifolia</i> .	<i>Hornbeam</i> , <i>Carpinus Betulus</i> , 3.	<i>Screw Pine</i> , <i>Pandanus odoratissimus</i> .
<i>Barberry</i> , <i>Berberis vulgaris</i> , 3.	<i>Ivy</i> , <i>Hedera Helix</i> , 3.	<i>Sloe</i> , <i>Prunus spinosa</i> , 3.
<i>Beech</i> , <i>Fagus sylvatica</i> , 3.	<i>Juniper</i> , <i>Juniperus communis</i> , 3.	<i>Smilax syphilitica</i> ,*
<i>Bignonia capreolata</i> .	<i>Labrador Tea</i> , <i>Ledum palustre</i> , 3.	<i>Snow-ball Tree</i> , <i>Viburnum Opulus</i> , 3.
<i>Birch</i> , <i>Betula nigra</i> , 3.	<i>Larch</i> , <i>Larix Europaea</i> , 3.	<i>Spanish Broom</i> , <i>Spartium scoparium</i> , 3.
<i>Birthwort</i> , <i>Aristolochia Siphoboswellia papyrifera</i> .	<i>Lilac</i> , <i>Syringa vulgaris</i> , 3.	<i>Spindle Tree</i> , <i>Euonymus Europaeus</i> , 3.
<i>Box</i> , <i>Buxus sempervirens</i> , 3.	<i>Linden</i> , <i>Tilia Europaea</i> .	<i>Styrax officinale</i> , 3.
<i>Buckthorn</i> , <i>Rhamnus Frangula</i> .	<i>Mespilus coccinea</i> , 3.	<i>Sugar Cane</i> , <i>Saccharum officinarum</i> , 2.
<i>Burdock</i> , <i>Lappa officinalis</i> , 2.	<i>Mock-orange</i> , <i>Philadelphus coronarius</i> , 3.	<i>Tamarind Tree</i> , <i>Tamarindus Indica</i> , 3.
<i>Cabbage Palm</i> , 2.	<i>Monstera deliciosa</i> .	<i>Tectona grandis</i> .
<i>Cactus hexagonus</i> , 3.	<i>Mountain Ash</i> , <i>Sorbus Aucuparia</i> , 3.	<i>Thunbergia unidentata</i> .
<i>Cassia fastigiata</i> , 3.	<i>Oak</i> , <i>Quercus pedunculata</i> , 3.	<i>Upas Tree</i> , <i>Antiaris toxicaria</i> .
<i>Celtis australis</i> , 3.	Do. <i>do. Robur</i> , 3.	<i>Walnut</i> , <i>Juglans nigra</i> , 3.
<i>Century Plant</i> , <i>Agave Americana</i> , 2.	Do. <i>do. Suber</i> (Cork Oak), 3.	<i>Washingtonia gigantea</i> , 3.
<i>Chilian Pine</i> , <i>Araucaria imbricata</i> , 3.	<i>Olea Europaea</i> , 3.	<i>Willow</i> , <i>Salix fragilis</i> , 3.
<i>Clematis Vitalba</i> .	<i>Oleander</i> , <i>Nerium Oleander</i> , 3.	<i>White Mulberry</i> , <i>Morus alba</i> , 3.
<i>Coffee Shrub</i> , <i>Coffea Arabica</i> , 2.	<i>Orange</i> , <i>Citrus Aurantium</i> , 3.	<i>White Pine</i> , <i>Pinus Strobus</i> , tangential Section.
<i>Cycas revoluta</i> , 3.	<i>Palm</i> , <i>Areca pumila</i> .	<i>White Pine</i> , <i>Pinus Strobus</i> , radial Section, showing glandular (?) dots.†
<i>Cypress</i> , <i>Cupressus sempervirens</i> , 3.	Do. <i>Chamerops excelsa</i> , 2.	<i>Yellow Pine</i> , 3.
<i>Date Palm</i> , <i>Phoenix dactylifera</i> , 2.	<i>Paper Birch</i> , <i>Betula papyracea</i> , 3.	
<i>Dogwood</i> , <i>Cornus alba</i> , 3.		
<i>Dragon-wood</i> , <i>Dracena Draco</i> , 2.		

## 3864.—Miscellaneous Vegetable Objects. Each, 60 cents; per dozen, \$6.00.

ANTHER of Water Lily, <i>Nymphaea</i> , Section.	Bark of Cork Oak, <i>Quercus Suber</i> , Section.	<i>Eleagnus</i> , showing stellate hairs.*
BARK of Cinnamon Tree, <i>Cinnamomum Zeylonicum</i> , Section.	CUTICLE— <i>Deutzia scabra</i> , showing stellate hairs.*	<i>Loasa aurantiaca</i> ,*
		<i>Onion</i> , <i>Allium Cepa</i> , showing crystals.
		<i>Pitcher of Nepenthes</i> .

Rice Straw, siliceous. Stangeria paradoxa. Wheat Straw, siliceous.	PETIOLE of Water Lily, Nuphar luteum, Section, showing internal hairs.	Bouncing Bet, Saponaria officinalis (opaque). Loasa aurantiaca (opaque). Lobelia inflata, do. Nemesia versicolor, do. Parnassia palustris, do. Paulownia imperialis. Poppy, Papaver somniferum (opaque). Portulaca grandiflora (opaque). Silene ornata, do. Snap-dragon, Antirrhinum majus (opaque). St. John's Wort, Hypericum perforatum (opaque). Trumpet Creeper, Tecoma radicans. Wood Sorrel, Oxalis stricta, (opaque).
FIBRES— Cotton. Flax, Irish. Do. from New Zealand. Hemp, Manila. Do. Russian. Jute, from Calcutta.	PITH of Elder, Sambucus (simple cellular tissue), Sec. Do. do. Rice-paper Plant, Aralia papyrifera.	SEEDS—SECTION— Atalca funifera (Coquilla nut). Cola acuminata (Cola nut). Henbane, Hyoscyamus niger. Mustard, Sinapis nigra. Peach, Amygdalus Persica. Pepper, Piper nigrum. Poppy, Papaver somniferum. Phytelephas macrocarpa (Veg-etable Ivory Nut). Quince, Cydonia vulgaris. Stramonium.
FRUIT— Anise, Pimpinella Anisum, Sec. Caraway, Carum Carui, do. Carrot, Daucus Carota, do. Coriander, Coriandrum sativum, Section. Cummin, Cuminum Cyminum, Section. Fool's Parsley, Æthusa Cynapium, Section. Henlock, Conium maculatum, Section. Parsley, Petroselinum sativum, Section. Pepper, Piper alba, Section.	POLLEN— Cobcea scandens. Convolvulus. Cuphea platycentra. Geranium. Hazel, Corylus Avellana, in situ (opaque). Do. showing development of pollen-tubes. Hollyhock, Althea rosea. Do. in situ (opaque). Hyacinth. Lily, Liliium aurantium. Nasturtium. Passion Flower, Passiflora. Portugal Pine, Pinus Pinaster. Do. do. (opaque). Scarlet Flax. Scotch Fir. Do. do. (opaque). Tulip, do.	SHELL of Cocoa Nut, Section.
HAIRS from Leaf of Adystoma.* Do. do. do. Tillandsia. Do. do. Stamens of Tradescantia.	RAPHIDES in Cactus. Do. in Rhubarb.	SPIRAL VESSELS— From Seed of Cobcea scandens. Do. do. of Collomia grandiflora.
HUSK of Pine Seed, showing resin and gum cells.	ROOT— Alkanet, Alkanna tinctoria, 2. Althaea, 2. Aristolochia rotunda, 2. Arum. Asarabacca, Asarum Europaeum, 2. Colchicum, 2. Dandelion, Taraxacum dens-leonis, 2. Elder, Sambucus Canadensis, 3. Hedge Hyssop, Gratiola officinalis, 2. Iris florentina, 2. Pyrethrum, 2. Sedge, Carex arenaria, 2. Soapwort, Saponaria officinalis, 2.	STARCH— Arrow-root.* Barley.* Oats.* Pea.* Potato.* Rice.* Sago.* Tous les Mois.* Wheat.*
LEAF— Deutzia scabra, showing stellate hairs.* Do. do. (opaque). Mullein, Section, showing branched hairs. Onosma taurica (opaque). Water Lily, Nymphaea, Section, showing internal hairs.	SEEDS, WHOLE— Alyssum Olympticum.	STONE of Cherry, Prunus Avium.
OVARY of Poppy, Section, cell contents preserved.		WING of Seed of Eecremocarpus.*
PETALS— Crown Imperial, Fritillaria imperialis. Geranium. Pansy, Viola tricolor. Peony, Paeonia officinalis. Poppy, Papaver somniferum.		

**3865.—A Series of 24 Preparations, Illustrating the Structure of the Higher Orders of Plants. In Case, \$15.00.**

In order to show the points of structure to the greatest advantage, these objects are generally double-stained; and, in most cases, the cell contents are preserved.

1. Protoplasm and Nucleus in Cells of Mexican Soap Plant.
2. Simple Cellular Tissue, Parenchyma, in Leaf of Galium pilosum.
3. Simple Cellular Tissue, Prosenchyma, in Stem of Elder, Sambucus.
4. Simple Cellular Tissue, Stellate form, in Stem of Rush, Juncus.
5. Pitted Wood-cells, in Stem of White Pine, Pinus Strobus, Radial Section.
6. Woody Tissue, in Stem of White Oak, Quercus alba. 2 Sections.
7. Annular Vessels, in Root of Cactus.
8. Spiral do. Stem do.
9. Pitted do. do. Nerium Oleander.
10. Scleriform Vessels, in Stem of Fern, Osmunda.
11. Medullary Rays, in Stem of Mahogany, 2 Sections.
12. Lactiferous Vessels, in Leaf of Dandelion.
13. Stomata, in Leaf of Indian Corn, Zea Mays.
14. Rootlet of Lemna, showing root-cap, etc.
15. Branched Hairs, on Leaf of Deutzia scabra.

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| 16. Stinging Hairs, on Leaf of Nettle, <i>Urtica dioica</i> .<br>17. Internal Hairs, in Leaf-stalk of Water Lily, <i>Nymphaea odorata</i> .<br>18. Glandular Hairs, on Leaf of Sundew, <i>Drosera rotundifolia</i> .<br>19. Glands, in cuticle of Lemon, containing essential oil. | 20. Chlorophyll, in Leaf of <i>Iris Germanica</i> , Section.<br>21. Starch, in Cells of Canna Root.<br>22. Aleurone (Proteine grains), in Seed of <i>Ricinus communis</i> .<br>23. Raphides, in Leaf of <i>Fuchsia</i> .<br>24. Cystoliths, in Leaf of <i>Ficus elastica</i> , Trans. Section. |
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## Section II.—CRYPTOGAMIA.

## 3866.—Ferns, Mosses, Etc. Each, 75 cents; per dozen, \$7.50.

CUTICLE— Fern, <i>Polypodium</i> , showing Stomata, etc. Scouring Rush, <i>Equisetum</i> .*  FRONDS OF FERNS— <i>Adiantum pedatum</i> , double-stained. <i>Angiopteris erecta</i> (opaque). <i>Aspidium marginale</i> , double-stained. <i>Aspidium Noveboracense</i> , double-stained. <i>Aspidium Thelypteris</i> , double-stained. <i>Asplenium Filix-foemina</i> , double-stained. <i>Cystopteris fragilis</i> , double-stained.	<i>Dicksonia punctilobula</i> , double-stained. <i>Gymnogramma</i> (opaque). <i>Lygodium palmatum</i> , double-stained. <i>Woodsia obtusa</i> , double-stained.  FRUIT (SECTIONS)— <i>Equisetum hyemale</i> . <i>Funaria hygrometrica</i> .  MOSSES— <i>Bryum capillare</i> . <i>Hookera lucens</i> . <i>Hypnum praelongum</i> . <i>Jungermannia hyalina</i> . <i>Mnium cuspidatum</i> . <i>Sphagnum cymbifolium</i> .	PERISTOMES OF MOSS— <i>Funaria hygrometrica</i> . Do. do. (opaque). <i>Polytrichum commune</i> , do. SCALARIFORM VESSELS FROM ROOT-STOCK— Fern, <i>Aspidium</i> . Do. <i>Osmunda</i> .  SCALES FROM FERNS. <i>Cheilanthes Eckloniana</i> .* <i>Elaphoglossum squamosum</i> .* <i>Gonitopnebiium sepultum</i> .* <i>Nothochlaena maranta</i> .*  SPORES— <i>Equisetum</i> . <i>Lycopodium</i> . Stem of Club-moss, <i>Selaginella selaginoides</i> , 2 Sections.
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## 3867.—Fungi and Lichens. Each, 60 cents; per dozen, \$6.00.

Bramble Brand, <i>Aregma bulbosum</i> (opaque). Bunt Fungus in Corn, <i>Uredo foetida</i> . Chain Brand, <i>Xenodochus carbonarius</i> . "Chignon" Fungus, <i>Sclerotium Bugelianum</i> . Corn Mildew, <i>Puccinia graminis</i> . Corn Smut, <i>Ustilago segetum</i> . Fungus from Elder ( <i>Sambucus</i> ) Fungus from Pepper Plant, <i>Aspergillus candidus</i> .	Gooseberry Cluster-cups, <i>Aecidium grossulariae</i> . Mould from Jam, <i>Aspergillus umbellatus</i> . Do. <i>mucor mucedo</i> . Do. <i>Penicillium glaucum</i> . Potato Mould, <i>Peronospora infestans</i> . Red Rust, <i>Trichobasis rubigovera</i> . Rust or Corn Mildew, <i>Puccinia graminis</i> . <i>Sarcina ventriculi</i> , from Man.	Smut in Ear and Grain of Wheat. Spiral Fungus, <i>Trichia chrysosperma</i> . Spores of Bramble Brand ( <i>Aregma bulbosum</i> ). Do. Yeast Plant. Spores and Filaments of <i>Peziza coccinea</i> . Star Fungus, <i>Asterosporium Hoffmannii</i> . Truffle, <i>Tuber aestivum</i> , Section.
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## 3868.—Algæ (Excepting Diatoms). Each 60 cts.; per doz., \$6.00.

<i>Batrachospermum moniliforme</i> . <i>Calithamnion corymbosum</i> . Do. <i>rosetum</i> . <i>Ceramium eilatium</i> . Do. <i>pellucidum</i> . <i>Chaetophora elegans</i> . <i>Chondrus crispus</i> . <i>Cladophora refracta</i> . <i>Dasya coccinea</i> .	<i>Delesseria sinuosa</i> . <i>Draparnaldea glomerata</i> . <i>Ectocarpus litoralis</i> . <i>Griffithsia setacea</i> . <i>Hydrodictyon utriculatum</i> . <i>Micrasterias denticulata</i> (Desmid). <i>Nostoc alpinum</i> . <i>Pediastrum ellipticum</i> , etc. (Desmids).	<i>Plocamium vulgare</i> . <i>Polysiphonia fastigiata</i> . Do. <i>fibrillosa</i> . Do. <i>parasitica</i> . <i>Ptilota elegans</i> . Do. <i>plumosa</i> . <i>Rhizoclonium rivulare</i> . <i>Spirogyra nitida</i> . <i>Volvox globator</i> . <i>Zygnema</i> (in conjugation).
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**3839.—Diatoms (Fossil, etc.) (Localities named only).  
Each, 50 cents; per dozen, \$5.00.**

<p>CEMENT-STONE from Island of Mors.</p> <p>DIATOMACEOUS EARTH— From Berlin.</p> <p>Do. Canada West.</p> <p>Do. Cherryfield, Maine.</p> <p>Do. Christianstad, Sweden.</p> <p>Do. Cornwallis, Nova Scotia.</p> <p>Do. Dolgelly, Wales.</p> <p>Do. Duck Pond, Maine.</p> <p>Do. East Stoughton, Mass.</p> <p>Do. Franzensbad, Bohemia.</p> <p>Do. French's Pond, Albany, N. Y.</p> <p>Do. Great Salt Lake Desert.</p> <p>Do. Ipswich, Massachusetts.</p> <p>Do. Kamtschatka.</p> <p>Do. Laconia, New Hampshire.</p> <p>Do. Livorno, Italy.</p> <p>Do. Lough Mourne, Ireland.</p> <p>Do. Luneburgh, Hanover.</p> <p>Do. Monmouth, Maine.</p> <p>Do. Monterey, California.</p> <p>Do. Monticello, New York.</p> <p>Do. Moron, Spain.</p> <p>Do. Morris County, N. J.</p> <p>Do. Mull, Scotland.</p> <p>Do. Nottingham, Maryland.</p> <p>Do. Oran, Algeria.</p> <p>Do. Petersburg, Virginia.</p> <p>Do. Providence, R. I.</p> <p>Do. Richmond, Virginia.</p> <p>Do. Salem, Massachusetts.</p>	<p>From Sierra Nevada.</p> <p>Do. Southern Australia.</p> <p>Do. Sing Sing, New York.</p> <p>Do. South Bridgeton, Maine.</p> <p>Do. Tokay, Hungary.</p> <p>Do. Toome Bridge, Ireland.</p> <p>DIATOMS FROM MARINE ALGÆ— Algoa Bay.</p> <p>Honduras.</p> <p>Japan.</p> <p>DIATOMS FROM SHIP'S HULL— Atlantic Ocean. 83 cts.</p> <p>Java. 80 cts.</p> <p>Spitzbergen. 80 cts.</p> <p>EDIBLE EARTH from Java.</p> <p>FRESH-WATER MUD from Porto Rico.</p> <p>From Trondhjem, Norway.</p> <p>Do. Wedel, Denmark.</p> <p>GUANO— From Baker's Island.</p> <p>Do. California.</p> <p>Do. Canary Islands.</p> <p>Do. China Islands.</p> <p>Do. Ichaboe Island.</p> <p>Do. Lobos de Tierra.</p> <p>Do. Patagonia.</p> <p>Do. Peru.</p> <p>Do. Saldanha Bay.</p>	<p>From St. Helena.</p> <p>MOUNTAIN MEAL (BERG-MEHL): From Finland.</p> <p>Do. Lapland.</p> <p>Do. Santa Fiore, Italy.</p> <p>Do. Sweden.</p> <p>PEAT from Hammerfest, Norway.</p> <p>Do. do. Premnay, Scotland.</p> <p>SALT-WATER MUD (Marsh Earth), from Wedel, Denmark.</p> <p>SEA SOUNDINGS— From Atlantic Ocean, 2,070 fathoms.</p> <p>Do. Campeachy Bay.</p> <p>Do. Carpentaria Gulf.</p> <p>Do. Cuxhaven, Germany.</p> <p>Do. Davis Straits (at great depth). 80 cts.</p> <p>Do. Indian Ocean, 2,200 fathoms.</p> <p>Do. Japan.</p> <p>Do. Kiel, Denmark.</p> <p>Do. Persian Gulf, 504 fathoms.</p> <p>Do. Samoa.</p> <p>Do. Tongataboo.</p> <p>TRIPOLI from Bilin, Bohemia.</p>
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**3870.—Diatoms (Named). Each, 50 cents; per dozen, \$5.00.**

<p>Achnanthes longipes.</p> <p>Do. subsecessilis.</p> <p>Actinocyclus Ralfsii.</p> <p>Actinoptychus splendens.</p> <p>Do. undulatus.</p> <p>Amphiprora alata.</p> <p>Amphitetras antediluviana.</p> <p>Amphora laevis.</p> <p>Arachnoidiscus Ehrenbergii.</p> <p>Do. Do. <i>in situ</i>, on Seaweed.</p> <p>Arachnoidiscus Japonicus.</p> <p>Do. ornatus.</p> <p>Aulacodiscus Crux.</p> <p>Auliscus sculptus.</p> <p>Biddulphia pulchella.</p> <p>Do. rhombus.</p> <p>Campylodiscus Clypeus.</p> <p>Do. Echineis.</p> <p>Do. spiralis.</p> <p>Ceratoneis Arcus.</p> <p>Do. lunaris.</p> <p>Climacosphecia monilifera.</p> <p>Cocconeis Pediculus.</p> <p>Do. placentula.</p> <p>Do. Scutellum.</p> <p>Cocconeis Cistula.</p> <p>Do. lanceolatum.</p> <p>Colletonema vulgare.</p> <p>Coscinodiscus Oculus Iridis.</p> <p>Do. radiatus.</p> <p>Cyclotella Meneghiniana.</p> <p>Cylindrotheca gracilis.</p> <p>Cymatopleura Solea.</p> <p>Cymbella affinis.</p> <p>Do. amphicephala.</p> <p>Do. gastroides.</p>	<p>Cymbella ventricosa.</p> <p>Diatoma elongatum.</p> <p>Do. vulgare.</p> <p>Endostaurum crucigerum.</p> <p>Epithemia constricta.</p> <p>Do. gibba.</p> <p>Do. Hyndmannii.</p> <p>Do. turgida.</p> <p>Eunotia gracilis.</p> <p>Do. undulata.</p> <p>Eupodiscus Argus.</p> <p>Fragilaria capucina.</p> <p>Do. minima.</p> <p>Do. virescens.</p> <p>Gephyria media.</p> <p>Gomphonema acuminatum.</p> <p>Do. geminatum.</p> <p>Do. gracile.</p> <p>Do. olivaceum.</p> <p>Do. robustum.</p> <p>Grammonema striatulum.</p> <p>Homocladia Martiniana.</p> <p>Isthmia enervis.</p> <p>Do. nervosa.</p> <p>Do. do. <i>in situ</i>, on Seaweed.</p> <p>Licmophora flabellata.</p> <p>Do. Pappenna.</p> <p>Mastogloia Braunii.</p> <p>Melosira arenaria.</p> <p>Do. varians.</p> <p>Meridion circulare.</p> <p>Do. constrictum.</p> <p>Navicula amphibiaena.</p> <p>Do. Clepsydra.</p> <p>Do. didyma.</p> <p>Do. gibba.</p>	<p>Navicula hemiptera.</p> <p>Do. major.</p> <p>Do. mesolepta, var. stauroneiformis.</p> <p>Navicula oblonga.</p> <p>Do. radiosa.</p> <p>Do. serians.</p> <p>Do. splendida.</p> <p>Nitzschia Amphioxys.</p> <p>Do. obtusa.</p> <p>Do. Sigma.</p> <p>Do. Schweinfurthii.</p> <p>Odontidium hyemale.</p> <p>Do. longissima.</p> <p>Do. mesodon.</p> <p>Odontodiscus subtilis.</p> <p>Podosira maculata.</p> <p>Pyxidicula cruciata.</p> <p>Rhabdonema Adriaticum.</p> <p>Do. arcuatum.</p> <p>Schizonema Grevillei.</p> <p>Scoliopleura tumidum.</p> <p>Solfium exculptum.</p> <p>Stauroneis gracilis.</p> <p>Do. lanceolata.</p> <p>Do. Phoenicenteron.</p> <p>Stephanodiscus Niagarae.</p> <p>Suriella striatula.</p> <p>Synedra affinis.</p> <p>Do. familiaris.</p> <p>Do. pulchella.</p> <p>Do. splendens.</p> <p>Tabellaria fenestrata.</p> <p>Do. flocculosa.</p> <p>Terpsinoë musica.</p> <p>Toxonidea insignis.</p> <p>Triceratium membranaceum.</p>
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3871.—Selected Diatoms. (From 1 to 12 Specimens on each Slide.)  
Each, 60 cents; per dozen, \$6.00.

Aetinoocyclus dubius.	Campylodiscus Clypeus.	Navicula Johnsoniana.
Do. Ehrenbergii.	Do. latus.	Do. Lyra.
Do. moniliformis.	Do. limbatus.	Do. notabilis.
Actinopterychus Hallonyx.	Do. Ralfsii.	Do. pandurata.
Do. hexagonalis.	Cerataulus turgidus.	Do. Smithii.
Do. splendens.	Cestodiscus ovalis.	Do. strangulata.
Do. undulatus.	Cocconeis punctatissima.	Nitzschia panduriformis.
Amphitetras antediluviana.	Corinna elegans.	Orthonais splendida.
Do. ornata.	Coscinodiscus concavus.	Pleurosigma elongatum.
Arachnoidiscus Ehrenbergii.	Do. Normanii.	Do. formosum.
Do. ornatus.	Do. oblongus.	Solium exsculptum.
Asterolampra Marylandica.	Do. patelliformis.	Stictodiscus Californicus.
Aulacodiscus Combesii.	Do. tuberculatus.	Do. Kittonianus.
Do. Crux.	Craspedodiscus elegans.	Surirella lata.
Do. formosus.	Creswellia superba.	Do. opulenta.
Do. Johnsoni.	Endyctia oceanica.	Synedra robusta.
Do. Kittoni.	Euodia Barbadense.	Do. ulna.
Do. mammosus.	Do. gibba.	Do. undulata.
Do. margaritaceus.	Eupodiscus Argus.	Triceratium Arcticum.
Do. scaber.	Do. radiatus.	Do. Favus.
Auliscus Macrenus.	Heliopelta Metil.	Do. Do. var. septan-
Do. sculptus.	Hemiaulus alatus.	gulare.
Biddulphia aurita.	Do. Polycystinorum.	Triceratium megastomum.
Do. Baileyi.	Isthmia enervis.	Do. orbiculatum.
Do. pulchella.	Do. nervosa.	Do. Robertianum.
Do. reticulata.	Navicula clavata.	Do. scitulum.
Do. Roperiana.		Trinacria Regina.

3872.—Test Diatoms. (Thin-covered, Dry or in Balsam.) Each,  
75 cents; per dozen, \$7.50.

Amphipleura pellucida.	Nitzschia curvula.	Pleurosigma formosum.
Cymatopleura elliptica.	Do. sigmoidea.	Do. Hippocampus.
Fragilaria capucina.	Do. obtusa, var.	Do. macrum.
Frustulia Saxonica.	Pleurosigma acuminatum.	Do. quadratum.
Navicula cuspidata.	Do. aestuarii.	Do. Spencerii.
Do. rhomboides.	Do. angulatum.	Rhizosolenia styliformis.
Grammatophora marina.	Do. attenuatum.	Striatella unipunctata.
Do. subtilissima.	Do. Balticum.	Surirella Gemma.
Hyalodiscus Stelliger.	Do. elongatum.	Triceratium Favus.
Do. subtilis.	Do. fasciola.	

MOLLER'S ARRANGED DIATOMS.

No.		PRICE.
3873.	Slides, with 6 to 18 Specimens, in Balsam, . . . . .	\$1 50
3874.	Do. do. 18 to 36 do. do. . . . .	3 00
3875.	Do. do. 36 to 50 do. do. . . . .	4 50
3876.	Do. do. 50 to 65 do. do. . . . .	6 00
3877.	Do. do. 65 to 80 do. do. . . . .	7 50
	Groups similar to the above may also be had dry-mounted, on a dark background, for the Lieberkuhn.	
3878.	Diatomaceen Typen Platte, No. 1, contains 392 typical species and varieties, arranged in four quadrangles, the classification being that of Professor A. Grunow, of Vienna. A printed and bound catalogue is furnished with it, which gives the names of the different species, stating whence obtained, whether fossil or recent, salt-water or fresh. Mounted in Balsam. Price, in morocco case, . . . . .	30 00
3879.	Diatomaceen Typen Platte, No. 2, contains 100 species, and is accompanied with a printed catalogue. Mounted in Balsam. Price, with morocco case, . . . . .	12 00
3880.	Diatomaceen Typen Platte, No. 3, is similar to No. 2, but has the name of each Diatom photographed beneath it, so that specimen and name may be seen at one view. Contains 100 individual Diatoms, but only 80 species. In morocco case, . . . . .	13 00
3881.	Diatomaceen Probe Platte, No. 1, is a collection of twenty Diatoms, arranged in a single line, and graduated according to their value as test objects. In Balsam. Price, with morocco case and printed catalogue, . . . . .	6 00
3882.	Diatomaceen Probe Platte, No. 2, the same as No. 1, but mounted dry, . . . . .	7 50

Division III.—THE MINERAL KINGDOM.

3889.—Fossil Sections. Each, 75 cents; per dozen, \$7.50.

<p>COAL— Australian. Chinese. Derbyshire, England. Dudley, England. Lancashire, England, containing very rare and some unknown fossil plants: Calamites, Calamodendron, Dictyoxydon, Sigillaria, Stigmara, Lepidodendron, etc. 75 cts. to \$4.00. Oldbury, England. Pennsylvania. Cannel Coal. White Coal from Australia.</p> <p>COPROLITES from Lyme-Regis.</p> <p>FLINT with various organic remains, Spiculae, Xanthidia, Corals, etc.</p>	<p>Fossil BONE, <i>Dinornis giganteus</i> (New Zealand). Do. do. <i>Iguanodon</i>. Do. do. <i>Man</i> (Guadaloupe). Do. do. <i>Mastodon</i>. Do. do. <i>Pterodactyl</i>.</p> <p>Fossil CORAL, <i>Cladopora</i>.</p> <p>Fossil FERN, Rhizome. Do. do. Spores, in Coal.</p> <p>Fossil FORAMINIFERA in Limestone.</p> <p>Fossil PALATE of Ray.</p> <p>Fossil PYXIDICULA (?) in Flint.</p> <p>Fossil TOOTH of Shark.</p>	<p>Fossil WOOD from Australia. Do. do. do. California. Do. do. do. India. Do. do. do. Maidstone, England. Do. do. do. Stafford, England. Do. do. do. West Indies, Palm. Do. do. <i>Schleidenites compositus</i>, St. Thomas.</p> <p>JET, Whitby.</p> <p>LAURENTIAN SERPENTINE containing <i>Eozoon Canadense</i>.</p> <p>NUMMULITIC LIMESTONE, Foundation of Egyptian Pyramid.</p> <p>OOLITE, Secondary formation.</p>
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3890.—Mineral Sections. Each, 75 cents; per dozen, \$7.50.

<p>Agates, various.* Aragonite.* Asbestos.* Asbestiform Serpentine.* Avanturine.* Barytes.* Basalt from Fingal's Cave.* Do. do. Giant's Causeway.* Breccia Marble from Labrador.* Carrara do.* Chalcedony, Cornwall, Eng.* Conglomerate.* Dolerite. Feldspar, from Labrador.* Gneiss.* Granite from Aberdeen.* Do. do. Greenland.* Do. do. Virginia.* Greenstone from Guernsey.* Greywacke, various, Germany. Heliotrope, Bloodstone. Hornblende. Hypersthene, from Labrador. Italian Alabaster.*</p>	<p>Lapis Lazuli. Lava from Vesuvius. Lepidolite.* Limestone from an Aqueduct. Do. do. Himalayas. Do. do. Niagara. Do. Magnesian, from Dudley, Eng. Do. Oolitic, from Clifton, England. Do. Oolitic, from Normandy, France. Malachite from Russia.* Mica.* Moss Agates, various.* New Red Sandstone, Cumberland, England.* Old Red Sandstone, Scotland.* Obsidian, Mexico. Do. Mount Hecla. Do. do. Shasta. Do. Vesuvius. Opaline from Labrador.</p>	<p>Pitch-stone from Isle of Arran, Scotland. Porphyry from Cumberland, England. Do. Artificial (Porphyryne). Quartz.* Do. showing fluid in cavities. Satin Spar.* Selenite, Fibrous.* Serpentine, Green. Do. Red. Slag, from Copper furnace. Do. do. Iron do. Spherulitic Felsite, Isle of Arran Stalactite from English Cave. Sun-stone from Norway. Syenite from Dresden. Tale, with Manganese crystals <i>in situ</i>. Wavellite from North Carolina* Zeolite from Giant's Causeway*</p>
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3891.—Chemical Crystals. Each, 50 cents; per dozen, \$5.50.

<p>Esculine.* Alum. Amygdaline. Antimony (needles), opaque. Arsenious Acid (White Arsenic). Asparagine. Berberine, opaque. Bichromate of Potash.* Binoxalate Do. * Bitartrate of Ammonia.* Do. Potash.* Do. Thallium.* Boric Acid.* Borate of Ammonium.* Do. Potash.* Borax.* Bromo-cyanide of Mercury and Potassium.*</p>	<p>Cadmium.* Cantharidine, from Spanish Fly. Carbozotate of Urea.* Chlorate of Barium.* Do. Potash.* Chloride of Barium.* Do. Cadmium.* Do. Sodium.* Citrate of Soda.* Citric Acid.* Copper, Native Crystals, opaque. Fatty Acid, Cholesterin.* Do. Margarie.* Do. Palmitic.* Do. Sebacic.* Do. Stearic.*</p>	<p>Gold, precipitated, opaque. Indigo, opaque. Kinate of Quinia.* Lactate of Zinc. Meconine.* Mercury, from Mercurial Vapor. Molybdate of Ammonium.* Monoxalate of Potassium.* Morphine, from Opium. Murexide, Dichromatic crystals. Muriate of Barytes.* Naphthaline.* Narcotine.* Nitrate of Cobalt.* Do. Lead. Do. Potassium.* Nitro-prusside of Sodium.*</p>
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Oxalate of Ammonia.*	Saffeine.*	Sulphate of Lime, moving in fluid.* 75 cents.
Do. Soda.	Silver, arborescent crystals, opaque, 75 cents.	Sulphate of Magnesium.
Do. Thallium.*	Strychnine.	Sulphate of Nickel and Potassium.*
Oxide of Lead, iridescent, opaque.	Sugar, from Beet Root.*	Sulphate of Strychinine.
Phloridaine.*	Sugar of Milk.	Do. Thallium.
Picrate of Ammonia.	Sulphate of Ammonia and Magnesia.*	Do. Zinc.*
Do. Magnesia, opaque.	Sulphate of Brucine.*	Sulpho-cyanide of Potassium.*
Platino-cyanide of Ammonium	Do. Cadmium.	Sulphur.*
Do. Barium.*	Do. Cobalt and Potassium.*	Sulphuret of Iron, for Lieberkuhn.
Do. Calcium.*	Sulphate of Copper.*	Tartaric Acid.*
Do. Lithium.*	Do. Copper and Magnesium.*	Tartrate of Lime.*
Do. Magnesium.*	Sulphate of Copper and Potassium.*	Do. do. moving in fluid.* 75 cents.
Platino-cyanide of Potassium.*	Sulphate of Lime.*	Tartrate of Potassium.*
Do. Strontium.*		Do. Thallium and Potassium.
Do. Yttrium.*		
Prussiate of Potash.*		
Pyrogallie Acid.*		

## Division IV.—ARTIFICIAL MICROSCOPIC OBJECTS.

**3898.—Micro-Photographs. Each, 50 cents; per dozen, \$5.00.**

Apollo and Daphne.	Map of North America.	The Declaration of Independence. \$1.00.
Balmoral Castle.	Do. United States.	The Horse Fair (Rosa Bonheur)
Bank Note, £1000.	Melrose Abbey.	The London Times, 14,000 words, 75 cts.
Blue Grotto at Capri.	Niagara Falls.	The Lord's Prayer.
Captain Recce, R. N.	Norwegian Waterfall.	The Moon.
Cathedral of Milan.	Origin of Species made Easy.	Do. do. Two Phases, Full and Gibbous. 75 cts.
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Fingal's Cave.	Planet Saturn, Rings and Moons	The Sermon on the Mount. 75c.
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Gray's Elegy.	Pyramid of Ghizeh.	The Ten Commandments.
Group of Elephants, from life.	Signing of the Declaration of Independence.	The Three Graces.
Hagar and Ishmael.	Slave Traffic on the Coast of Africa.	The Yarn of the Nancy Bell.
Hanlet's Soliloquy.	Song of the Shirt.	Title-page of <i>Punch</i> .
Happy as a King.	Taking Down from the Cross.	Un Portrait Mal Paye.
Head of Christ.	The Blind Fiddler.	Una and the Lion.
Hindoo Mosque.	The Crucifixion (M. Angelo).	View in Norway.
Jesus and the Children.		Yerk Minster.
Do. bearing the Cross.		
Lincoln Cathedral, interior.		
Main Building, Centennial Exhibition.		

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This standard Test consists of a series of nineteen bands, each band being composed of fine lines, which divide it into equal spaces of from about 1-11,000 of an inch (in the first band) to 1-112,000 of an inch in the nineteenth. See Dr. Carpenter's "Microscope and its Revelations," Fifth Edition, page 209.

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3906. Do. do. 19 do. do. 1-100 to 1-6,000 of a millimetre (approximately 2,540 to 152,400 per inch), . . . 15 00

Nos. 3901 to 3905 may be furnished of Prof. W. A. Rogers's make, if preferred.

For list of Stage Micrometers, which are Microscopic Accessories rather than Microscopic Objects, see page 143.



## CHEAP EDUCATIONAL OBJECTS.

The uses and pleasure of a Microscope are greatly increased by having at hand a collection of well-mounted specimens, since, however desirable it may be to prepare one's own objects, or to study the same without any special preparation, there are thousands of highly interesting and instructive objects which cannot be obtained in the raw state (if we may so express it) by every one, or at a moment's notice, when needed. The unavoidably high price of the finest preparations has long been a serious hindrance to many who would gladly possess a comprehensive collection, but find the cost a serious tax upon their pockets.

In order to meet this want, we, some years since, introduced our "Cheap Educational" series of objects, which at once met with universal favor, and the demand for which has steadily grown until it taxes all our ability to meet the same. These objects are all clean and excellent specimens of their various classes, embrace an endless variety of animal, vegetable and insect subjects, diatoms, minerals, metals, etc., and are guaranteed to be correctly named, a matter of great importance for educational purposes. The Microscope having become an indispensable adjunct to every well-regulated school, it follows that the specimens shown the scholar should be good and reliable ones.

We divide these objects into two series or classes. The *first*, or *School Series*, are mounted on slides measuring  $2\frac{3}{8}$  by  $\frac{3}{4}$  inches, and are best suited to the smaller and cheaper kinds of Microscopes, which have not sufficient *stage room* to allow of the larger slides being conveniently used. The *second*, or *Student's Series*, are mounted on slides measuring 3 by 1 inches, the same size as the most expensive objects. This series is more extended in variety than the former, containing many large insect, vegetable, polariscope and opaque specimens which cannot be mounted on the smaller slides. The quality of the specimens is the same in both series, which are catalogued as follows:

3912. School Series of Educational Objects, on slides $2\frac{3}{8}$ by $\frac{3}{4}$ inches, in neat rack boxes,	
each containing one dozen specimens,	\$2 00
Single slide,	20
3913. Student's Series of Educational Objects, on slides 3 by 1 inches, in neat rack boxes,	
containing one dozen specimens,	3 00
Single slide,	25
Assortment of six dozen, in mahogany case, with lock (3808),	20 00
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3912; per dozen	1 25
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3962.	WOOD, J. G. Common Objects of the Microscope. With upwards of 400 illustrations, printed in colors, . . . . .	50
3963.	WYTHE, J. H. The Microscopist; a Manual of Microscopy and Compendium of the Microscopic Sciences, Micro-Mineralogy, Micro-Chemistry, Biology, Histology and Pathological Histology. Third Edition. Rewritten and greatly enlarged. 205 illustrations. Philadelphia, 1877, . . . . .	4 50

## CLINICAL THERMOMETERS.

The normal temperature of the human body, at completely sheltered parts of its surface, amounts to 98.4° FAHR. or a few tenths more or less: and a rising above 99.5° FAHR., or a depression below 97.3° FAHR., are sure signs of some kinds of disease, if such increase or depression is persistent.

The average temperature of the trunk of the body in the Tropics is nearly one degree higher than in temperate regions.

The increase of temperature above 99° FAHR., as measured by the Thermometer, is the best index of the amount of fever present in any disease.

The temperature of the body in disease, is much more readily and rapidly influenced than either the pulse or respiration.

The co-relation of the pulse respiration and temperature, is of the utmost importance to be known in many diseases. For example, in *pneumonia*, if the mean of the temperature is not above 104° FAHR., and that of the pulse is not above 120 in a minute, and the mean of the respirations not over 40 in the same time, the case must be considered a slight one; and if the patient is otherwise healthy, he will surely begin to get well in from eight to twelve days, without any medical treatment beyond attention to diet and rest.

Each disease which runs a definite course (e. g., *scarlet fever, measles, small pox, typhus fever, typhoid fever, rheumatism, acute phthisis*, and the like) has a characteristic and distinctive range of temperature.

## CLINICAL THERMOMETERS, (Self-registering.)

With patent constricted tube, entirely preventing the union of index and column of Mercury.

CLINICAL THERMOMETER, (3½ in., 4 in., 5 in. and 6 in.) in lined boxwood or ebony case, . . . . .	\$2 50
CLINICAL THERMOMETER, in German Silver case, . . . . .	3 25
CLINICAL THERMOMETER, in ivory case, . . . . .	4 50
CLINICAL THERMOMETER, in ebonite case, . . . . .	4 00
CLINICAL THERMOMETER, (8 in.), in square or round end, boxwood case, . . . . .	4 50
CLINICAL THERMOMETER, (4 in.), in aluminium gold, engine-turned, or fluted case, . . . . .	4 00
CLINICAL THERMOMETER, (5 in.) do. do. do. do. . . . .	4 50
CLINICAL THERMOMETER, (3½ in.), silver case, . . . . .	5 00
CLINICAL THERMOMETER, (4 in.), silver case, . . . . .	5 25
CLINICAL THERMOMETER, (3½ in., 4 in., or 5 in.), in DR. HILLARD'S round sliding pocket case, silver plated, . . . . .	5 50
CLINICAL THERMOMETER, (4 in.), aluminium gold case, engine-turned or fluted, spirally propelled, . . . . .	6 25
CLINICAL THERMOMETER, (6 in.) curved tube, ivory scale, self-registering, in morocco case, . . . . .	3 00
CLINICAL THERMOMETER, (5 in.) straight tube, ivory scale, not registering, in morocco case, . . . . .	2 25

## HYGROMETERS.

These instruments are employed for estimating the amount of moisture in the air. In our climate the amount of aqueous vapour held in suspension is very variable. This fact has important bearings on many branches of industry, as also on the hygienic qualities of the atmosphere. The consideration that a certain amount of moisture in the air is necessary to the continuance of health, will suggest the importance of maintaining that due proportion in the atmosphere of sick rooms, where the artificial heat so injudiciously used, often disturbs the healthful hygrometric condition of the air. The medical profession should enforce, as far as lies in their power, the use of this simple and effective instrument, which gives indications so important to the comfort of the patient.

MASON'S HYGROMETER, boxwood scales, . . . . .	\$4 50
MASON'S HYGROMETER, opal glass scales, in white japanned metal case, . . . . .	8 00
MASON'S HYGROMETER, incorrodible porcelain scales, on Mahogany or oak board, divided and figured on the scales, . . . . .	9 00

MASON'S HYGROMETER, incorrodible porcelain scales, on mahogany or oak board, tubes engine divided on stem, and figured on the scales, . . . . .	10 00
MASON'S HYGROMETER, best standard, incorrodible porcelain scales, on mahogany or oak board, tubes engine divided on stem and figured on the scales; largest size, very superior, . . . . .	17 50
LOWE'S GRAPHIC HYGROMETER. In this instrument the relative humidity, dew point, and absolute amount, are indicated by a dial and index hand, and can be read at a glance as readily and correctly as the indications of an ordinary thermometer, . . . . .	15 00

URINOMETERS.

The Urinometer indicates the departure of urine from its healthy, normal standard. One side of the scale is marked with degrees, and the reverse side with the following letters:—W, showing the point at which the instrument rests when immersed in pure water; H, the point for healthy, normal urine; S, indicating an increase of strength, or specific gravity, but a diminution of health; the last division showing the point at which the disorder known as "Diabetes" has set in, its *progress* is indicated by the instrument floating at lower divisions of the scale.

URINOMETER, in pull-off paper case, . . . . .	\$1 25
URINOMETER, in pull-off paper case, with jar, . . . . .	2 00
URINOMETER, in pull-off leather case, with graduated jar, . . . . .	3 00
URINOMETER, in pull-off leather case, with graduated jar and thermometer, . . . . .	5 00
HICKS' PATENT URINOMETER is an elegant and superior form of instrument which is figured and divided in <i>black</i> on the <i>white</i> enamel stem itself, thus avoiding all errors arising from shifting of scale, as with paper and ivory; corrosion, as with metal, or alteration of form as with vulcanite. In pull-off leather case, . . . . .	3 00
URINOMETER, ivory scale and graduated trial glass, in double pull-off leather case, . . . . .	3 50
URINOMETER, ivory scale, graduated trial glass, and test papers in hinged morocco case, with snap, . . . . .	4 50
URINOMETER, &c., same as preceding, ivory scale and Thermometer, . . . . .	6 50
URINARY CABINET, containing Urinometer, Thermometer, spirit lamp, two small bottles, test tubes, pipette, graduated trial glass and test papers, . . . . .	9 00
URINARY CABINET, containing Urinometer, graduated trial glass, Thermometer, spirit lamp, three small bottles, test tubes, pipette and test papers, . . . . .	10 50
HIGHLEY'S URINARY CABINET, containing Urinometer, graduated trial glass, Thermometer, spirit lamp, three cut glass bottles, test tubes, pipette and test papers, . . . . .	15 00
BEALE'S URINOMETER CLINICAL CABINET, containing ivory scale Urinometer in pull-off leather case, graduated glass trial jar, glass pipette, test tubes, stirring rods, watch glasses, strips of glass, thin microscope glass covers, glass spirit lamp, test papers, test tube holder, divisions for seven improved capped dropping bottles, to contain acetic acid, nitric acid, ammonia, potash, barytic nitrate, argentic nitrate and ammoniacal oxalate, . . . . .	21 00

ANEROID BAROMETERS.



1118.



1125.

Pocket Aneroid Barometers, with silvered enamelled Dials, in morocco cases.

No.	Description	Price
1118.	Plain Pocket Aneroid, 1 3/4 inches diameter, . . . . .	\$15.50
1119.	Do. do. 2 1/4 do. . . . .	16.50
1120.	Do. do. 1 do. with Thermometer, . . . . .	20.00
1121.	Do. do. 2 1/4 do. do. . . . .	21.00
1122.	Do. do. 1 do. open face, with Thermom., . . . . .	20.00
1123.	Do. do. 2 1/4 do. do. do. . . . .	21.00

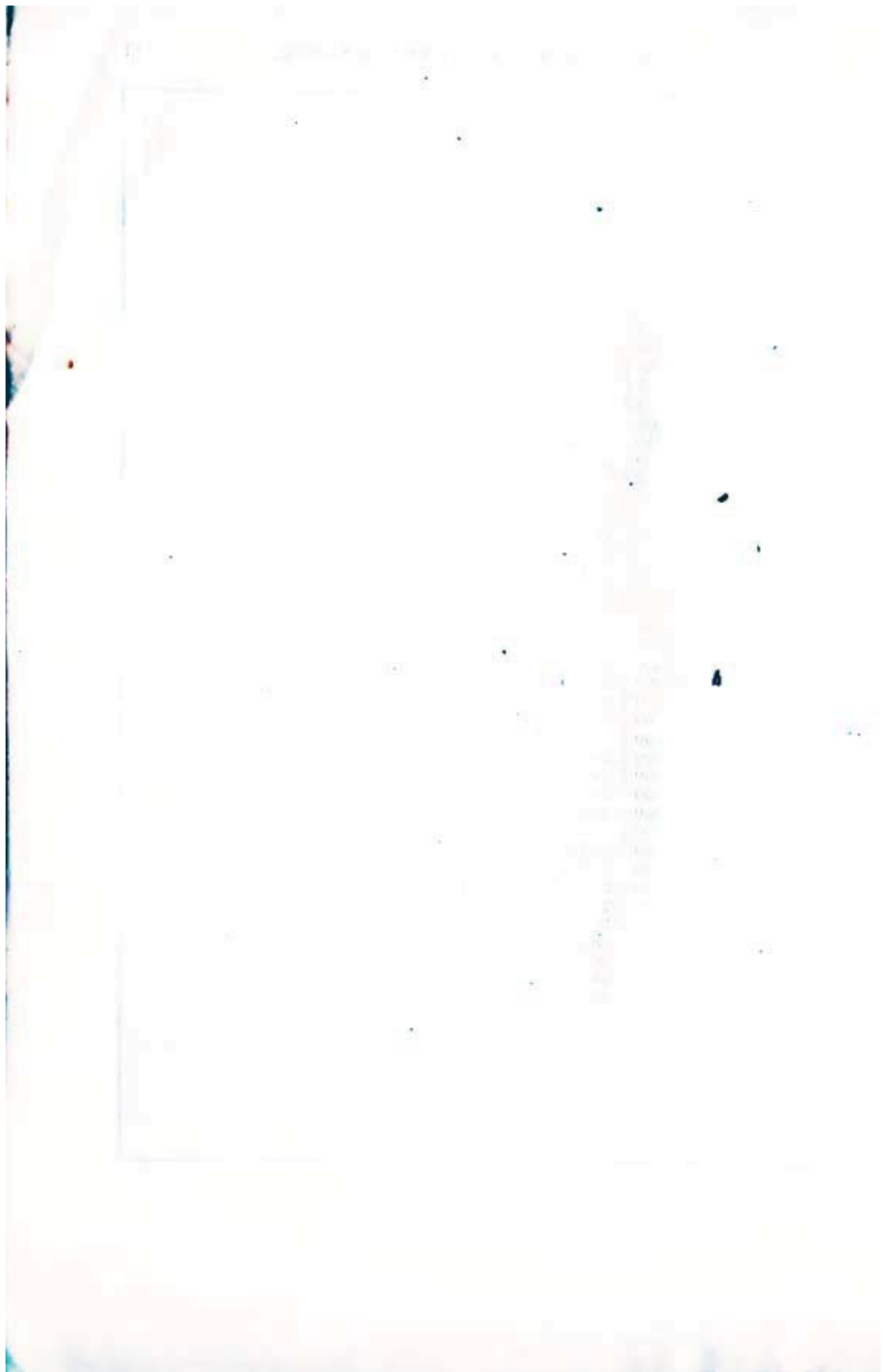
Mountain Aneroid Barometers, compensated for Temperature, with silvered Dials, in morocco cases.

1125.	Pocket Aneroid, 1 3/4 inches diameter, with Altitude Scale to 8000 feet, . . . . .	18.00
1126.	Pocket Aneroid, 1 3/4 inches diameter, with Altitude Scale to 8000 feet, with Raised Ring and Thermometer, . . . . .	20.00
1127.	Pocket Aneroid, 2 1/4 inches diameter, with Altitude Scale to 8000 feet, . . . . .	20.00
1128.	Pocket Aneroid, 2 1/4 inches diameter, with Altitude Scale to 8000 feet, with Raised Ring and Thermometer, . . . . .	25.00
1129.	Pocket Aneroid, 1 3/4 inches diameter, Altitude Scale to 15,000 feet, . . . . .	25.00
1130.	Do. 2 1/4 do. do. do. do. . . . .	26.50
1131.	Do. 1 3/4 do. Raised Ring and Altitude Scale to 20,000 feet, . . . . .	27.00
1132.	Pocket Aneroid, 2 1/4 inches diameter, Altitude Scale to 20,000 feet, . . . . .	27.50

These Barometers are carefully tested under the receiver of an air-pump before shipment.

1133.	The Aneroid Barometer; How to Buy and How to Use it, with Altitude Tables, . . . . .	.50
-------	--	-----

Height in Feet.		Aneroid or Corrected Barometer.		Height in Feet.		Aneroid or Corrected Barometer.		Height in Feet.		Aneroid or Corrected Barometer.	
ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
0	31-000	2400	28-387	4800	25-994	7200	23-803	9600	21-797		
50	30-943	2450	28-335	4850	25-947	7250	23-760	9650	21-757		
100	30-886	2500	28-283	4900	25-899	7300	23-716	9700	21-717		
150	30-830	2550	28-231	4950	25-852	7350	23-673	9750	21-677		
200	30-773	2600	28-180	5000	25-804	7400	23-629	9800	21-638		
250	30-717	2650	28-128	5050	25-757	7450	23-586	9850	21-598		
300	30-661	2700	28-076	5100	25-710	7500	23-543	9900	21-558		
350	30-604	2750	28-025	5150	25-663	7550	23-500	9950	21-519		
400	30-548	2800	27-973	5200	25-616	7600	23-457	10000	21-479		
450	30-492	2850	27-922	5250	25-569	7650	23-414	10050	21-440		
500	30-436	2900	27-871	5300	25-522	7700	23-371	10100	21-401		
550	30-381	2950	27-820	5350	25-475	7750	23-328	10150	21-361		
600	30-325	3000	27-769	5400	25-428	7800	23-285	10200	21-322		
650	30-269	3050	27-718	5450	25-382	7850	23-242	10250	21-283		
700	30-214	3100	27-667	5500	25-335	7900	23-200	10300	21-244		
750	30-159	3150	27-616	5550	25-289	7950	23-157	10350	21-205		
800	30-103	3200	27-566	5600	25-242	8000	23-115	10400	21-166		
850	30-048	3250	27-515	5650	25-196	8050	23-072	10450	21-128		
900	29-993	3300	27-465	5700	25-150	8100	23-030	10500	21-089		
950	29-938	3350	27-415	5750	25-104	8150	22-988	10550	21-050		
1000	29-883	3400	27-364	5800	25-058	8200	22-946	10600	21-012		
1050	29-828	3450	27-314	5850	25-012	8250	22-904	10650	20-973		
1100	29-774	3500	27-264	5900	24-966	8300	22-862	10700	20-935		
1150	29-719	3550	27-214	5950	24-920	8350	22-820	10750	20-896		
1200	29-665	3600	27-164	6000	24-875	8400	22-778	10800	20-858		
1250	29-610	3650	27-115	6050	24-829	8450	22-736	10850	20-820		
1300	29-556	3700	27-065	6100	24-784	8500	22-695	10900	20-782		
1350	29-502	3750	27-015	6150	24-738	8550	22-653	10950	20-744		
1400	29-448	3800	26-966	6200	24-693	8600	22-611	11000	20-706		
1450	29-394	3850	26-916	6250	24-648	8650	22-570	11050	20-668		
1500	29-340	3900	26-867	6300	24-602	8700	22-529	11100	20-630		
1550	29-286	3950	26-818	6350	24-557	8750	22-487	11150	20-592		
1600	29-233	4000	26-769	6400	24-512	8800	22-446	11200	20-554		
1650	29-179	4050	26-720	6450	24-467	8850	22-405	11250	20-517		
1700	29-126	4100	26-671	6500	24-423	8900	22-364	11300	20-479		
1750	29-072	4150	26-622	6550	24-378	8950	22-323	11350	20-441		
1800	29-019	4200	26-573	6600	24-333	9000	22-282	11400	20-404		
1850	28-966	4250	26-524	6650	24-288	9050	22-241	11450	20-367		
1900	28-913	4300	26-476	6700	24-244	9100	22-200	11500	20-329		
1950	28-860	4350	26-427	6750	24-200	9150	22-160	11550	20-292		
2000	28-807	4400	26-379	6800	24-155	9200	22-119	11600	20-255		
2050	28-754	4450	26-330	6850	24-111	9250	22-079	11650	20-218		
2100	28-701	4500	26-282	6900	24-067	9300	22-038	11700	20-181		
2150	28-649	4550	26-234	6950	24-023	9350	21-998	11750	20-144		
2200	28-596	4600	26-186	7000	23-979	9400	21-957	11800	20-107		
2250	28-544	4650	26-138	7050	23-935	9450	21-917	11850	20-070		
2300	28-491	4700	26-090	7100	23-891	9500	21-877	11900	20-033		
2350	28-439	4750	26-042	7150	23-847	9550	21-837	11950	19-996		
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Philadelphia, February 1st, 1879.

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