The Mechanics *of* Fitting Glasses

By

Robert D. Pettet

Giving complete information concerning fitting, adjusting and prescribing eyeglass and spectacle frames and mountings, and covering all mechanical work within the province of the refractionist.

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Introduction

THE purpose of this book is to impart to the refractionist information regarding the mechanical side of fitting glasses, principally the adjustment and fitting of eyeglass and spectacle frames and mountings. It is designed to meet the great demand for data of this kind presented in a practical way and which are omitted from text books on refraction. The descriptions and instructions are confined to modern types of eyeglasses and spectacles, and antique styles are not discussed except where they have some bearing on present day fitting.

The book has for its foundation the extended practical experience of the author and observation of the methods of others that have come to his attention.

Table of Subjects

Definitions

Frames: Fixtures that have rims going around the lenses.

Mountings: Fixtures that hold rimless lenses.

Spectacles: Fixtures that are held in position by means of bows (temples) that go around the side of the head and by a bridge that rests on the crown of the nose. When these have rims around the lenses they are known as spectacle frames and when there are no rims around the lenses they are known as spectacle mountings.

Eyeglasses: Fixtures that are held in position on the nose by springs and by guards that press on the sides of the nose. With rims around the lenses they are eyeglass frames and without rims they are eyeglass mountings.

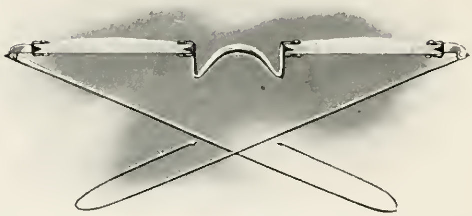
Spectacles

Temples: Attachments on spectacles that go around the side of the face and over the ears. Straight temples go straight back and do not circle the ears. Riding temples (sometimes called riding bows) go entirely around the back of the ears. Half-riding temples are half way between the straight temple and riding temple varieties, just turning slightly over the back of the ears.

Regular Temples: The ordinary wire temples.

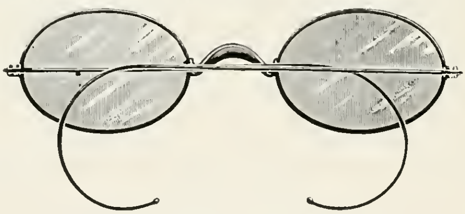
Cable Temples: Made by wrapping two pieces of pliable wire about each other.

Half-Cable Temples: The part from the frame to the top of the ear is of the regular stiff wire, the part



Spectacle Mounting.

going around the ears is cable. There are several varieties of this kind: Comfort Temples, Apex Temples, Velvet End Temples, etc.; these are very similar in construction and differ only in the manner in which the soft portion that encircles the ear is attached to the wire that goes to the frame. They are all very soft and pliable on the ear end and are intended to increase the amount of



Spectacle Frame.

comfort and eliminate the features of the regular wire temples that tend to make the latter uncomfortable about the ear.

Bridge: The part of a spectacle that rests on the nose and connects the two lenses. This is the central and most important portion of a spectacle.

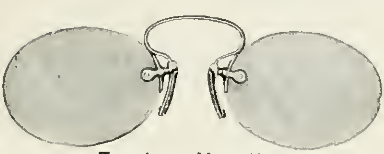
Shanks: The ends of the bridge that point outward from the nose and connect with the lenses.

Straps: The attachments at the end of the shanks and temples on rimless mountings by means of which the lenses are held to the mounting.

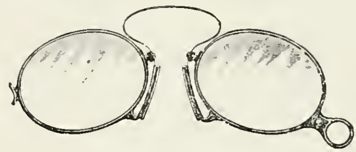
End-pieces: The parts to which the temples are attached in rimless mountings; they include the straps which are really a part of them. When spoken of in connection with temples they are familiarly known as "ends," for instance, we speak of "temples and ends."

Eye-wires: The rims that encircle the lenses on frames.

Eyeglasses (Regular).

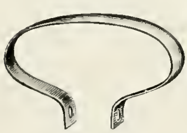


Eyeglass Mounting.



Eyeglass Frame.

Spring: The central part of the frame or mounting corresponding to the bridge of spectacles. There are several styles of springs as shown by the illustrations given here. In addition to the different varieties there are different sizes; the usual length of the oblong style is $2\frac{1}{8}$ inches, and of the hoop style 2 inches. Oblong springs are sometimes called "square" springs and hoop springs are sometimes called "oval."



Oblong.

Hoop.

Full.

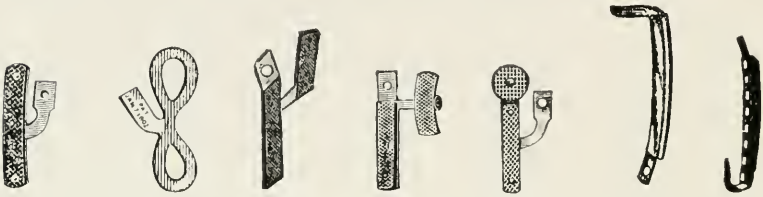
Reduced.

GRECIAN

Tilting.

Adjustable.

Guards: The parts that lie against the side of the nose and hold to the flesh; often called by the laity "clips." By consulting catalogs of the wholesale optical houses it will be seen that there are countless styles and designs. A few of the most common are shown here.



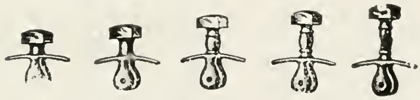
Wells. Lasso. Anchor. Schwab. Anatomical. Bausch. Solid.

Studs: The parts that hold the lenses to the mounting and which join the guards and the spring.

Open Studs: Those in which the nasal side of the studs is left open.

Box Studs: In these the portion into which the guard and spring fit is constructed like a box and the nasal side is closed, the stud-screw is countersunk, and thus there are no rough parts or exposed screws in contact with the flesh.

In addition to these two styles there are many sizes, that is, some have longer posts than others, the purpose of which is to regulate the distance between the lenses. There are also "drop" studs to lower the lenses; these are made in two sizes—1-16 and 1-8 inch.



A B C D E

From the illustration it will be observed that the sizes of studs (controlled by the length of the post) are indicated by the letters A, B, C, D, E, and F; A being the shortest and F the longest, with about one millimeter between each succeeding size.

Inset and Outset Studs: Confusion exists in the mind of every beginner in the matter of inset and outset studs, and it must be admitted that there is good reason for this, and the beginner cannot be criticized for any misunderstandings he may have in this regard, for the fact is there is so much difference of opinion in the minds of various opticians and wholesale houses that it is never safe to specify "inset" or "outset" until you know what the person or house to whom you are writing means by these terms. Most wholesale catalogs state that inset studs set the lenses farther from the eyes and that outset studs set the lenses closer to the eyes. To the mind of the average man who has not become accustomed to this translation of the terms they will seem to be reversed. Where this usage of the terms originated was with the idea that inset studs set the mounting in toward the face and consequently the lenses were set farther from the eyes, however when we realize that the mounting always stays in the same position on the nose and it is the lenses themselves that are moved it would most certainly seem that studs that set the lenses out should be termed "outset," but the term is not generally accepted this way, so that the safest plan in writing prescriptions, etc., that you are sending away to be filled is always to say "to set the lenses closer to the eyes" or "farther away," as may be wanted, for instance: "Inset studs, to set the lenses farther from the eyes" or whatever way you want to put it, so that what you want will be clearly understood.

Eyeglasses (Finger-Piece).

Bridge: Same as the bridge in spectacles. This usually includes the studs, as they are generally made in one piece.

Finger-pieces: The projecting ends in front that are grasped by the tips of the fingers in order to operate the spreading of the guards.

Springs: These connect directly with the guards and cause them to press inward toward the nose.

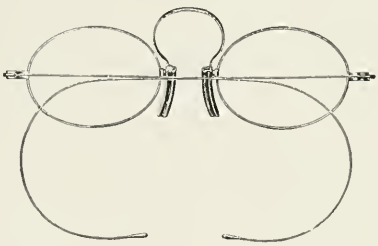
Finger-piece eyeglasses are made in a great number of styles and combinations and are given particular names by the various manufacturers. While eyeglasses of this design appear at first sight to be very much alike, closer inspection and study will show that there are several classifications. This subject is discussed in another portion of this book under the heading "How to Judge a Good Finger-piece Eyeglass Mounting."

Miscellaneous Frames and Mountings.

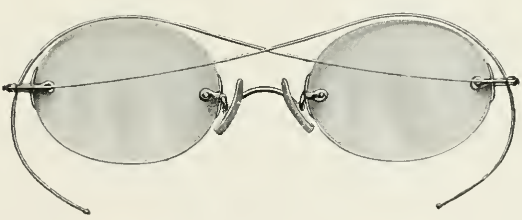
Grab fronts are fixtures to contain lenses, usually the addition for reading, which attach to the outside of spec-

tacles, and may be taken off and put on without removing the spectacles proper. Grab fronts may be either with rims or rimless. Grab backs are similar to grab fronts except that they attach to the back of the spectacles instead of the front.

Specalettes are a combination of eyeglasses and spectacles, that is they are eyeglasses with temples. These



are desirable where the patient has a straight and nearly vertical nose and experiences difficulty in retaining a spectacle bridge in the proper position and in cases where the skin on the front of the nose is very sensitive. There



are several forms of these mountings and catalogs of wholesale optical houses should be consulted on the matter.

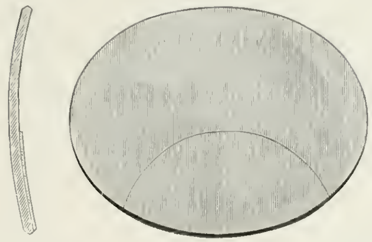
General Description of Different Kinds of Lenses.

It is thought that the simple forms, like double concave and convex and periscopic concave and convex, are so well known and understood they need no explanation, so we shall proceed at once to the more advanced types.

Toric: A lens having three curves. It has the appearance of a very deep periscopic, having one side deep convex and the other deep concave. By reason of its definition a toric lens can never be a sphere, but is always either a cylinder or sphero-cylinder. Torics are built on three base curves—the 3, 6 and 9 D.

Meniscus: A lens built on the deep periscopic form. This kind of lens is always a sphere and is often, though incorrectly, called a "spherical toric." This latter term has come into such common use that it is generally accepted without question, in fact there are many in the business who do not know that the term is technically wrong.

Bifocals: Any lenses that are composed of two parts or have two foci. Usually these lenses combine the distant and near correction, the upper part for distance and the lower for reading.

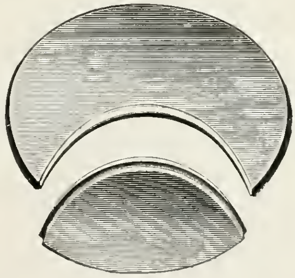


Cement Bifocals: Any bifocal lenses in which the reading or near correction segments are attached to the main lens by cement, but usually understood to mean bifocals where the segments (or scales) are not especially thin and which are elliptical in shape.

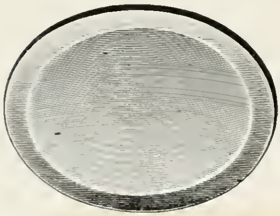
Opifex Bifocals: Lenses in which the reading segments are very thin, usually round, and attached to the main lens by cement. Sometimes called "semi-invisible" bifocals.

Kryptok Bifocals: Lenses in which the reading segments are practically invisible and in which the segment is fused to the main lens forming one piece of glass. The segment and main lens are of different indices of refraction. There are other makes of fused bifocals, but the Kryptok is the most widely known and used.

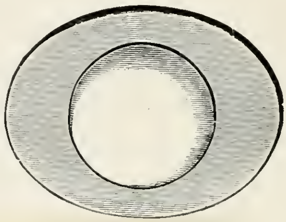
Perfection Bifocals: Lenses composed of two separate pieces of glass held in position by the rims of the frames.



Lenticulars: Lenses of a minus power in which the peripheral portions have been ground off flat or to a convex edge for the purpose of lightening the weight of the lenses and making them thinner on the edges.



Oval Lenticular



Round Lenticular

Colored Lenses: There are many different kinds and colors used, the prime purpose being to reduce the amount of light that enters the eye. Smoked lenses are made in varying shades and densities. There are also green and blue lenses. Much has been claimed recently for amber lenses with the idea that they reduce the number of ultra violet rays entering the eye. Likewise claims have been made for pink and amethyst shades. There are also lenses known by special trade names most of which are a combination of light green and light amber.

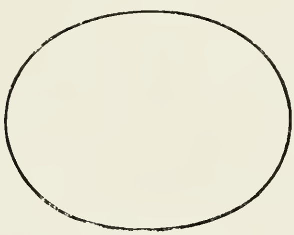
TABLE OF SIZES OF LENSES.

Eye	Inserts. mm	Rimless. mm	Short Oval Rimless.	Eye.	Inserts. mm
Jumbo	46 x38	46 x38	44.5x39.5	2	35x25.5
0000	44.3x36	44 x36	42.5x37.5	3	34x25
000	40.9x31.9	41 x32	39.5x33.5	4	33x24
00	39.7x30.7	40 x31	38.3x32.5	A	39x25
0	37.8x28.8	38.5x29.5	37 x31	B	40x26
1	36.5x27.5	37 x28	35.5x29.5	C	37x21

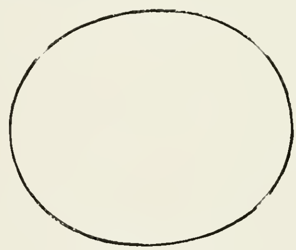
Shapes of Lenses.

In the majority of cases regular shape lenses should be used, but the short oval is very advantageous many times. Where the patient does a great amount of near work the short oval offers a large field of vision up and down, the direction in which it most needed. This shape is also desirable in cases of narrow P. D., for here it is usually necessary to use small lenses which naturally restrict the field of vision.

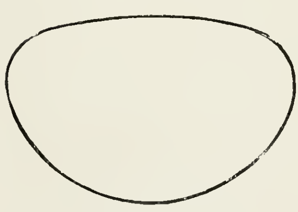
The leaf shape is designed for people having heavy protruding brows; it resembles the short oval with the top rounded off. Odd shapes of lenses—that is, any but the regular and short oval—should be generally avoided, for their appearance is far from pleasing and gives a suggestion of grotesqueness to the face.



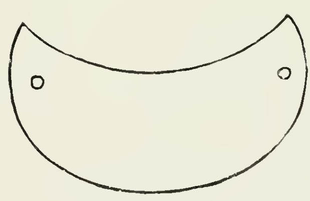
Regular Oval.



Short Oval.



Leaf Shape.



Crescent.

Ascertaining the Correct Frame or Mounting.

The Unit of Measure.

The English system of lineal measures has so long been used in our everyday life that it is natural that this system has been employed by American opticians in giving dimensions of spectacles, etc., but since we have arrived at a place where accuracy and definiteness are essential, this system is no longer practical. The continual use of fractions permits the occurrence of too many errors and a specification of 1-8 or 1-16 inch gives room for too much variation one way or the other, whereas, if we measure by the metric system when dealing with short distances we eliminate a large portion of the element of error both in calculations and in the matter of personal equation.

For instance, suppose we have $2\frac{1}{8}$ and $2\frac{1}{2}$ inches to compare. We have a general idea regarding the relation of these two quantities and after a little thought we realize there is a difference of $\frac{3}{8}$ inch. Now express the same dimensions in millimeters—we have 53 and 62 millimeters. At a glance we have a definite appreciation of the relation and know instantly that there is a difference of 9 millimeters. Then again, on a scale graduated in millimeters the divisions are comparatively close together and a slight variance around the mark becomes evident at once. Upon a moment's reflection and especially after we get deeper into this subject, you will readily appreciate the advisability of measuring in millimeters instead of inches.

Pupillary Distance.

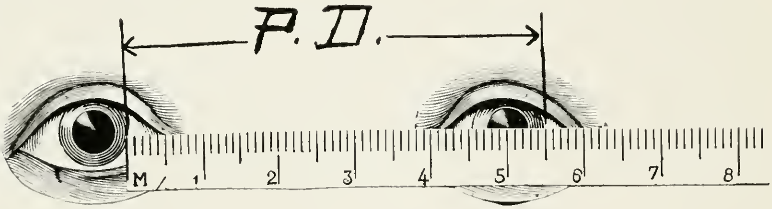
There is just one simple method of ascertaining the exact distance between the eyes.

Place yourself in a position directly facing the patient. Suppose you desire his P. D. for distance: Have the patient look over your head at an object on the wall opposite. Hold the rule in your right hand in the same manner as you would a pencil and steady your hand by placing your free fingers upon the side of the patient's head. Now, with your left eye (right eye closed) bring the zero of the rule opposite the line of demarcation between the iris and sclera, say, for instance in this case, on the nasal side of the eye. Holding the rule in this position quickly open your right eye and close your left and read off the graduation mark opposite the edge of iris (in this case temporal side) of patient's left eye. This reading will give the true width between the eyes. Of course if you measure from the nasal side of one eye you measure to the temporal side of the other eye and vice versa.

If you measure with both your eyes open your result will vary 2 or 3 millimeters, because you will not be sure which mark is opposite patient's eye. If you measure entirely with one eye the error of parallax will enter so much that your readings will always be from 2 to 5 millimeters too narrow.

To prove the veracity of the foregoing statements, make two marks about two inches apart on a piece of paper; lay the paper on your desk and resting your hand on it hold your rule one or two inches above it. First measure the distance with both eyes, then measure it entirely with one eye, and then with each eye separately (the zero with the left and the total width with the right eye) and you will find a decided variance in your three readings. By laying the rule flat on the paper and measuring the exact distance you will find your third measurement to be correct.

This cut shows the method of measuring the pupillary distance, the P. D. in this case being 55 millimeters, measured from the inside of the right iris to the outside of the left.



The Spectacle Bridge.

There are two ways of expressing the dimensions of a bridge: By giving each dimension in figures or by using the size letter and number. The dimensions considered are height, inclination of crest, angle and width of base. The following letters are used to designate the width of bridges, beginning with the smallest: L, M, N, O, P. The heights are expressed in combination with the letters by numbers, as ½, 1, 1½, 2, etc. The shanks are called regular, long and extra long. With the regular shanks the lenses are held a trifle closer to the eyes than the crest of the bridge; with long shanks the lenses and crest of bridge are on the same plane; with extra long shanks the lenses are further from the eyes than the crest of bridge is. Thus to set the lenses away from the eyes to escape the lashes, etc., we use long and extra long shanks. When no length shank is stated "regular" is understood. This is the way the different sizes of bridges are expressed: M, M½, N2 extra long shanks.

DIMENSIONS OF SADDLE BRIDGES.

(Upper figure Inches, lower figure Millimeters).

Bridge.	Height.	Crest.	Base.
L	0 0	0 0	$\frac{5}{8}$ 15
L½	$\frac{1}{16}$ $1\frac{1}{2}$	0 0	$\frac{5}{8}$ 15
L1	$\frac{1}{8}$ 3	0 0	$\frac{5}{8}$ 15
M	0 0	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{5}{8}$ 15
M½	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{5}{8}$ 15
M1	$\frac{1}{8}$ 3	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{5}{8}$ 15
M1½	$\frac{3}{16}$ $4\frac{1}{2}$	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{5}{8}$ 15
M2	$\frac{1}{4}$ 6	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{11}{16}$ 17
N	0 0	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{3}{4}$ 18
N½	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{3}{4}$ 18
N1	$\frac{1}{8}$ 3	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{3}{4}$ 18
N1½	$\frac{3}{16}$ $4\frac{1}{2}$	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{3}{4}$ 18
N2	$\frac{1}{4}$ 6	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{3}{4}$ 18
N2½	$\frac{5}{16}$ $7\frac{1}{2}$	$\frac{1}{8}$ 3	$\frac{13}{16}$ 20
N3	$\frac{3}{8}$ 9	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{13}{16}$ 20
O	0 0	0 0	$\frac{7}{8}$ 21
O1	$\frac{1}{8}$ 3	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{7}{8}$ 21
O2	$\frac{1}{4}$ 6	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{7}{8}$ 21
O3	$\frac{3}{8}$ 9	$\frac{1}{16}$ $1\frac{1}{2}$	$\frac{15}{16}$ 23
P1	$\frac{1}{8}$ 3	$\frac{1}{16}$ $1\frac{1}{2}$	1 25
P2	$\frac{1}{4}$ 6	$\frac{1}{16}$ $1\frac{1}{2}$	1 25
P3	$\frac{3}{8}$ 9	$\frac{1}{8}$ 3	1 25

When the sizes are not specified as above it is necessary to give all the dimensions in figures. The height of bridge is the distance above or below a line running through the center of the lenses to the lower edge of the center of bridge; the inclination of the crest is the distance from the inside plane of the lenses to the upper edge of the middle of the bridge and is specified "in" or "out," meaning in back or in front of the lenses, respectively. The angle of the bridge is considered with respect to the plane of the lenses, the latter being 90 degrees. The angle is measured at the center or crest of the bridge.

Temples.

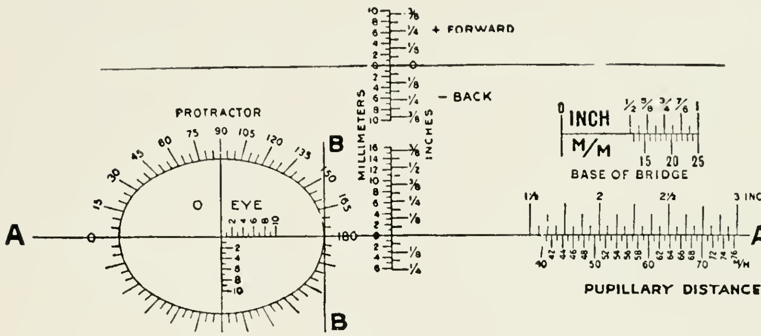
The length of temples is measured from tip to tip, that is, from the screw hole to the extreme other end. The average length is six inches, but they are also made in lengths of 5½, 6½ and 7 inches.

Sizes of Lenses.

"Size eye," as it is familiarly called, represents the outside measurement. The regular sizes are jumbo, 0000, 000, 00, 0, 1, 2 and 3, beginning at the largest and going to the smallest. The "size eye" of frames agrees with the size of the lenses.

"Pupillary Distance" is a term so often used in the business that we have come to know it familiarly by its abbreviation, P. D., so that in this book we shall always refer to this dimension as P. D. instead of writing the words out in full.

The cut on this page illustrates a measuring card used for measuring spectacle frames. Your wholesale house will supply you with one of these cards.



To measure P. D. and height of bridge, place end pieces on line A-A with inner edge of left eye at line B. The figure at right end of right lens indicates the pupillary distance and that at under edge of bridge crest indicates the height of bridge.

To measure bridge crest, forward or back, place lenses in slots, top down, with inner surface of lenses on lower edge of slots. That edge of bridge resting on card will indicate position of crest.

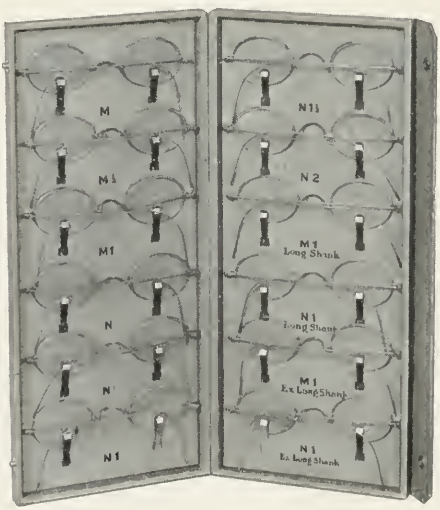
It will be noticed that in measuring the "pupillary width" of spectacles and eyeglasses, a similar plan is followed as when measuring over the eyes; that is, the distance is taken from the nasal edge of one lens or rim to the temporal edge of the other lens or rim. This is most conveniently accomplished by using the measuring card designed for this purpose shown here.

Measuring for Spectacles.

Be sure, before going further, that you know exactly all the details already given, otherwise you will get most unsatisfactory results. For instance, you may take the base of bridge to be from center of the turns of the shanks and the optician who fills your order will take it from the last points where the flesh touches the bridge, with the consequence that the spectacles you receive will always be from two to three millimeters too narrow. The same applies to all the other dimensions, but this is cited as being the most common error.

Provide yourself with a 6 or 6½-inch rule graduated in both inches and millimeters; a measuring card, and a fitting set of spectacle frames.

Seat yourself directly in front of the patient—do not stand, it is awkward and conducive to error. Measure



Spectacle Fitting Set.

the patient's P. D. and note it down. Select from the fitting set the bridge that comes nearest to fitting the patient's nose. Notice the use of the word "nearest" in the previous sentence—it is only once in a hundred times at least that you will find a stock size that will exactly fit.

Height of Bridge.

Now for the proper bridge dimensions: With the frame, just selected, on the patient's face, note whether the lenses set too low or too high, bearing in mind the use that the patient is going to make of his new glasses, whether for reading, distance or both. The average line of vision should be through the center of the lenses. Suppose, in the case before you, the lenses in the fitting frame set too low, say one millimeter. Now, if we move the bridge down the lenses will go up a corresponding amount, so in this case, the bridge we want should be one millimeter lower than the one on the fitting frame. Take the frame from the patient's face and measure the height of this bridge; suppose you find it to be four millimeters. We found this was one millimeter too high, so the bridge we want should be three millimeters in height. Mark it down on your prescription pad.

Position of the Crest.

Replace the frame on the patient's face. Note whether the lenses set too close or too near the eyes. Suppose you find the lenses touch the lashes and need to be set two millimeters farther out for the lashes to clear.

Take the frame off and measure the position of the crest of this bridge, using the measuring card for this purpose. Suppose you find it to be three millimeters out, then as with this bridge the lenses are two millimeters too close to the eyes, the bridge we want should be two millimeters farther back than it is, which gives us one millimeter out (or forward) that the bridge crest should be. Note this down under Position (or inclination) of Crest.

Width of Base.

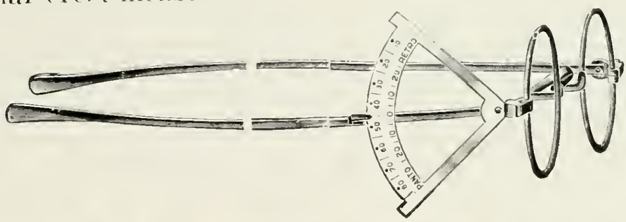
Place the fitting frame on the patient's face, using a bridge of sufficient width to allow the crest to strike the nose; push the frame to the right or left so that all the space between the bridge and nose will be on one side. By ascertaining how much this space is you know how much too wide the bridge is, and by measuring the bridge and making the deduction for oversize, you have the proper width.

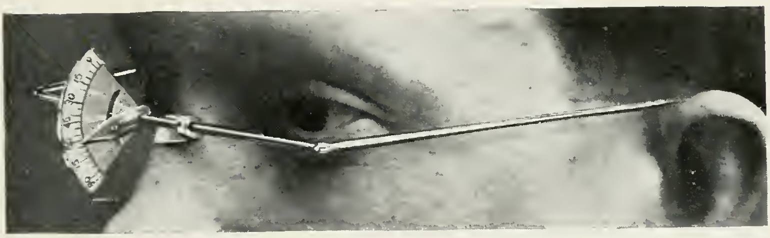
Remember, that the base width is measured from the point on each side where the flesh last touches and not from the middle of the turns of the shanks. The width of base is one of the most important dimensions of the bridge and decides to a large degree whether the spectacles are comfortable or not. The bridge should fit the nose just like a saddle, for if it touches all around it will help support the weight and relieve some of the strain at the back of the ears. At the same time a bridge too narrow at the base will press into the nose and be very uncomfortable.

Angle of the Crest.

The average angle subtended by the bridge of the nose is 45 degrees, the plane of the face being 90; in other words, the more vertical the nose the higher will be the number which represents its angle. To measure this angle hold a rule or card perpendicular to the plane of the face and note the size of the angle between the rule and the nose where the spectacle bridge will rest.

There are cards made to take this measurement, as well as other little contrivances. Here are shown two popular crest measures.





Length of Temples.

There are two ways of expressing the length of temples desired, i. e., the distance to back of the ear or the entire length of the temple from tip to tip. The first measurement is made with the fitting spectacles on the patient's face, the two extreme points being the plane of the lenses and the middle of the back of the ear. The other method is to notice how the length of the temples on the fitting frame suits, measuring the full length of these temples and then adding to or subtracting from this length as may be necessary.

The instructions given here apply to both rimless and frames. Some use four or five spectacles of different sizes to measure over, but the use of a complete set of 12 sizes is strongly advised.

Eyeglasses.

Finger-Piece.

Regular.

The finger-piece type has come into use within the last ten years and on account of neatness of appearance, the property of retaining its original shape and adjustment, and simplicity in fitting, it has become very popular and widely used. However, there are cases where the regular style is more desirable than the finger-piece and vice versa. For instance, a finger-piece mounting has a tendency to cause the nose to appear shorter and the face narrower, while the regular mounting gives rise to reverse impressions. This being the case if you put a finger-piece mounting on a short nose you make it seem shorter; a regular mounting would lengthen it. If you fit a finger-piece mounting where the pupillary distance is comparatively narrow, the eyes will seem still closer together, whereas a regular mounting will seem to put more space between the eyes.

"Regular" Style.

To ascertain the correct size of lens, length of stud, style of guard, etc., it will be quite necessary to have an eyeglass mounting to measure over.

First measure the patient's P. D. Then adjust your sample mounting as well as you can and place it in the correct position on the patient's nose. Now measure the P. D. of the glasses while on the face (measure from inside edge of one lens to outside of the other); this places you in position to know how large to make the lenses and how long the studs. Suppose, for illustration, that the sample mounting is equipped with regular B studs and 0 eye lenses, that your patient's P. D. is 60, and that the P. D. of the glasses, when on, is 58 millimeters. You see at a glance that these glasses would be too narrow and their P. D. must be increased 2 millimeters.

There are two ways in which this can be accomplished; by using longer studs or larger lenses. The next size studs to those on the sample mounting are known as C studs, there being a difference of one millimeter in the length of a B and a C. By using C studs in the case we are considering we will increase the P. D. of the glasses 2 mm. (1mm. on each stud), and thus obtain the desired width of 60 mm. By increasing the size of lenses 2 mm. and leaving the studs as they are in the sample (B size) we can obtain the same result. The lenses in our sample are 0 eye size and their length therefore is 39 mm.; adding 2 mm. to this gives 41, which is the length of 000 eye lenses, hence by using 000 lenses and B studs we obtain the desired P. D. With these two methods we can make several combinations and get exactly the dimensions we want. For instance, we have studs ranging from A to F (about 1 mm. difference for each size) and lenses ranging from 1 eye to jumbo, or in figures, from 37 to 46 mm. long, which we can combine in a great many different ways.

Notice when the mounting is in the proper position on the nose whether the lenses are too close to or too far away from the eyes. If they are too close use inset studs to put them farther out, if too far away use outset studs to bring them closer. Both of these styles are made in two sizes, 1-16 and 1-8 inch, and you can easily tell which size is required.

If the brows are prominent and press against the spring use a Grecian or a tilting spring. Oblong springs are usually used for men and hoop springs for women, but this is a matter of personal choice.

The guards selected should have a flat surface where they come into contact with the flesh—this is the first requisite of an efficient guard. In adjusting the guards it must be borne in mind that contact and adhesion count greater for desirable results than pressure, and for this reason the guard must be curved and bent to conform with the corresponding part of the nose.

You should have about six eyeglass mountings, complete with lenses, and having different styles of guards and springs. With this equipment you can select the style of guard that will be best for each particular case.

Some styles and angles of guards will set the lenses lower than others, but usually it is necessary to drill the holes in the lenses 1-16 or 1-8 inch above center to lower them, especially where the glasses are to be bifocal or reading lenses, in regular eyeglass mountings.

Finger-Piece Eyeglasses.

You must be provided with a complete fitting set of some good make of mountings. Do not make the common mistake of getting a few mountings of several kinds, but get a full set of some one particular style; if they are good mountings, with the proper adjustment, they can be made to fit any nose that could wear eyeglasses, and by getting a full set you have the entire range of numbers and sizes to select from.

With the fitting set at hand, select the mounting that comes nearest to fitting, take your pliers and adjust the mounting so that it will assume just about the same position that the mounting you order will when adjusted. Some manufacturers do not advise adjusting the mountings in the fitting set, but experience proves that it is better to do this, for you are then in position to know definitely whether the mounting can be made to fit or not, and to accurately ascertain the size of lenses and the kind of posts required.

Having decided what mounting fits the best, note the number it bears that represents its size. Measure the P. D. of the patient and then measure the P. D. of the glasses. If these two measurements are alike prescribe the same size lenses as those in the fitting mounting, which is usually 0 eye size. If the fitting glasses are too narrow in P. D. increase the size of the lenses until the proper P. D. is obtained, provided of course that it is not more than a few millimeters and does not make the lenses too large. The 00 eye lenses are one millimeter longer than 0 eye size and will increase the P. D. just one millimeter; 000 eye lenses are two millimeters longer than 0 eye and will increase the P. D. the same amount. You do not have to be controlled, however, by the standard sizes; 000 eye lenses have a length of 41 mm., you can use 42, 43, or 44 mm. lenses if you desire. There is usually about 9 mm. difference between the length and breadth of regularly shaped lenses, so you can specify 42 x 33 or 43 x 34, etc., instead of trying to convert these lenses to a standard size. Likewise where it is desired to give a short oval effect you may specify 42 x 34 or 42 x 35, etc., but always remember that when you measure the P. D. of a pair of glasses you measure from the inside edge of one lens to the outside edge of the other lens and in this way the length of only one lens is included in the total P. D. and consequently an increase in the length of both lenses of 2 mm. will increase the P. D. of the glasses only 2 mm. and not 4 mm. as might at first be supposed.

Let us say that, in order to cause the glasses to have the proper P. D. it would be necessary to use larger lenses than are desired. In this case you must use extended posts; these correspond to the C and D studs in regular eyeglass mountings and are made in just two sizes, 1-16 and 1-8 inch. Should you put on 1-16 extended posts you will increase the P. D. 1/8 inch or about 3 mm. and 1/8 inch extended posts would increase the P. D. 1/4 inch or about 6 mm. Here it will be seen that both posts must be considered in the P. D. as we include them both in the P. D. measurement.

Now observe whether the lenses are too close or too far from the eyes, if so prescribe inset or outset posts, whichever are needed, the same as when fitting regular mountings. Outset and inset posts are made in two sizes, 1-16 and 1-8 inch, and it will be found comparatively easy to judge which size is needed.

Summing up, the things we need to know in prescribing finger-piece eyeglass mountings are: The number or size of the mounting, extended, inset or outset posts and the size of the lenses.

Fitting Mountings and Frames to Contain Bifocal Lenses.

This is one of the most difficult branches of spectacle and eyeglass fitting, and at the same time one of the most important.

The greatest difficulty encountered by the wearer of bifocals is getting them adjusted high enough to be able to read without turning the eyes way down to escape the upper edge of the segment and yet low enough to be able to walk and to see distant objects. Right here is where good judgment and ability to properly fit frames come into play.

The vertical dimension of the bifocal segment should, under average conditions, be just a trifle less than half the height of the entire lens. The frame or mounting should be made so that, when the patient's head is upright and his line of vision is straight ahead, the upper edge of the bifocal segment is on a line with the lower edge of the patient's iris. This, of course, will be subject to variation, according to the distance the lenses set from the eyes. If it is necessary to set the lenses well away from the eyes, the lenses should be set lower and if they are to be worn close to the eyes they must be set higher.

To tell just at what height the lenses should be placed, put a pair of frames containing bifocals on the patient's face and have him look straight ahead, then hold your hand down in front of him at about the place he would read and instruct him to look at it; note whether his line of vision in each instance goes through the proper part of the lens. By moving the lenses up or down you will quickly see whether the frame you have on his face requires raising or lowering and from this you can judge how you want the holes drilled or what angle of guard how high you want the bridge, or in the case of eyeglasses you need.

In cases where the patient does a great amount of near work, it may be found advantageous to use larger bifocal segments, but of course, the larger the segment, the more restricted will the distant field be.

There are many shapes of segments, the most common being the elliptical and the half-round. Nearly all cement bifocals are of the former shape, while Kryptoks (invisible bifocals) are usually about two-thirds of a circle. While we are discussing Kryptoks it may be well to state that this form of bifocal is not restricted to one size and shape of segment. The regular size Kryptok segment is about 14 mm. high and 18 mm. across; larger sizes can be had as well as the elliptical, similar in shape to the regular cement bifocal.

In your practice you have come across many people who have told you they could not wear bifocals and you have also probably found that you have been able to satisfactorily fit them with this kind of lens by exercising care in the adjustment of the frame or mounting, and we venture to say that the majority of people who say they cannot wear bifocals would find the cause in the faulty adjustment of the mounting rather than in the construction of the lenses. With this in mind we would urge those who have experienced difficulty in fitting bifocals to make a particular study of frame fitting in connection with bifocals.

How to Adjust Spectacles.

Before considering the adjusting of spectacles let us analyze the conditions that must be presented by a properly fitting spectacle frame or mounting. The lenses must center before the eyes and sit just as close as possible to the eyes without touching the lashes. In glasses that are to be used for general work, i. e., both distant and near, the line of vision should be just a trifle above the center of the lenses when the eyes are directed straight ahead. Every part of the frame must give entire comfort; the bridge must fit all around the curve of the nose like a saddle on a horse's back, and the temples must be just the right length. Bear all the foregoing in mind when fitting spectacles and the results will invariably be decidedly better than when some of these points are ignored.

There are pliers that are specially designed to do particular kinds of work, and it will be advantageous to be supplied with the proper tools and to know their respective uses, for you cannot accomplish satisfactory results when you are not properly equipped in this regard. The following styles of pliers are necessary in adjusting spectacles: Snipe-nose (half round), full round, concavo-convex, bridge angling, and stud pliers. There are other styles that will facilitate the work, but these just enumerated are absolutely needed.

Much practice will be required before you will be able to do justice to a bridge in the matter of bending, and it is suggested that you make use of all available old frames or even buy some cheap frames to practice bending, etc.

Adjusting.

If the lenses are too high and it is desired to lower them bend the shanks of the bridge downward, but remember that in doing this you will lower the angle of the bridge and allowance must be made for this. If the lenses are too low bend the shanks upward, remembering that this will also alter the angle of the bridge.

The angle of the bridge may be varied by angling the crest with ordinary snipe-nose pliers or by curving the shanks upward or downward at the eyewire or strap, but the best way is to use pliers that are especially made for angling, for instance, the Berg pliers, by means of which the angle can be changed properly in a very short time.

The shanks may be lengthened or shortened to control the distance of the lenses from the eyes by changing the relative position of the point at which the bridge curves to make the shanks. First, with a pair of snipe-nose pliers flatten out the curve in the shank, then with a pair of full round pliers put the bend in the bridge just where you want the shanks to begin and continue to bend the shanks over until they are brought into the proper position. It is quite essential that pliers with full round jaws be employed for making these curves as the other pliers will mark and cut the covering of the bridge.

The pupillary width of the glasses should be controlled by the direction taken by the shanks without disturbing the width of the base of the bridge.

The width of the base should be altered by using pliers that have one jaw concave and the other convex. Changing the base will also affect the pupillary width. In bending a bridge it will be wisest to ascertain just exactly what alterations are necessary before making any, due to the fact that every dimension is dependent upon the other and a change in one will cause a corresponding change in some of the others.

To bend temples so as to angle the lenses or where one ear is higher than the other and one temple must be raised use two pairs of pliers; with stud-pliers grasp the end-piece close to the edge of the lens or eyewire and with a pair of snipe-nose pliers take hold of the outside end of the end-piece and bend the part of the end-piece to which the temple is attached so as to move the temple upward or downward as may be desired; in other words the end-piece is slightly twisted. Above all things do not curve or bend the temple itself, but confine your bending to the end-piece.

To curve the temples for the turn of the ear use a pencil or something else round and curl the temple as you would a feather, by drawing the end of the temples between your thumb and the pencil. Temples may be curved outward in a similar manner where they cut into the flesh on the side of the face.

If you find one lens sits higher than the other it may be that one ear is higher than the other and the trouble should be rectified by angling the temples as already explained in next to the last paragraph.

How To Adjust Eyeglass Mountings.

We shall consider here two kinds of eyeglass mountings in general, that is, those of the finger-piece type and those with the regular hoop springs. In differentiating between these two kinds the spring of the regular and the bridge of the finger-piece mounting are the essential points and the same rules will apply to both classes of mountings except where they apply to these two conflicting portions.

The first aim in fitting the eyeglass is to make it stay on securely with comfort, and in effecting this we cannot sacrifice correctness of position, so that many times we are confronted with a complex problem when we endeavor to make these three features work harmoniously. Let us first reason out the proper means of holding the mounting securely on the nose. Before we go farther try this experiment and get it impressed firmly upon your memory: Place the palms of your hands together and administer a slight pressure; notice when you do this that it requires considerable force to slide your hands apart. Now place the backs of your hands together and observe how hard you have to press to make it difficult to slide your hands on each other. Why is this so? It is so because in the case of your palms being laid together they presented a multiplicity of contact points, one fitted closely into the other and they adhered to each other.

Apply this same sort of thing to the eyeglass guard and you have solved both the problem of holding the glasses on securely and that of making it comfortable.

The guards themselves must present a smooth surface to the flesh and must be curved so as to conform to the contour of the portion of the nose over which they rest. To curve the guards in this manner it is quite essential to have the proper kind of pliers; the best for this purpose are those that have one convex blade and one concave so that by simply pressing the blades together the portion of the guard on which you are working assumes a corresponding curvature in degree depending on the amount of pressure you give the pliers. By using pliers of this kind the guards may be accurately curved without interfering in any way with the remainder of the guard or its general angle, etc. Suppose now after you have given the guards the proper curvature and granting the other parts of the mounting are evenly balanced and straight, that one lens is higher than the other. This is a trying puzzle to every beginner and to many who have been in the business a long time. We will say for instance that the left lens is higher than the right. Take the curved pliers and bend the bottom of the left guard out slightly, being careful not to bend it so far that it leaves the flesh. If this is not sufficient to lower the lens, bend the entire guard on its axis so that the bottom portion does not press so hard; this will bring the top of the guard in tighter, but care must be exercised not to bring this in too tight. Further lowering of the left may be accomplished by raising the right lens, which is done by bending the right guard in toward the nose slightly at the bottom. It is surprising how bending of the guards will effect the respective heights of the lenses. As was said at the beginning security, comfort and correctness of position must all obtain to the fullest possible degree and one must not be sacrificed for the others.

In all cases the top of the guard should be curved out slightly to agree with the curvature of the nose as it merges into the brows, if this curving is not done here the top of the guard will cut into the flesh and prove very uncomfortable. It is the bottom of the guard that supports the weight of the glasses and the top that prevents them from tilting over, so that the top of the guard must necessarily press a trifle harder than the bottom, and as a general thing more pressure can be stood here than at the bottom because there is nearly always a little cushion of flesh here. Wherever the guard rests on a bony part of the nose the contact must be very even and the pressure comparatively light, else the guard will cut the skin. By giving the guards the same curve as the nose they will stick to the skin and much less pressure will be required than otherwise. Another good plan is to bend the entire guard out from the back so that there is more pressure along the front or outside edge of the guard than in the back; this will cause the flesh to pile up slightly, as it were, in front of the guard and form a wedge of the flesh which prevents the mounting from slipping forward.

In the case of a regular mounting with the hoop spring sometimes it is desirable to have the spring tilting slightly at the top away from the forehead on account of heavy brows or high nose. There are springs that are made with this tilt but if the mounting you are adjusting is not tilting and you would prefer to have it so you can very easily bend it to have the desired tilt. To do this use what is known as stud pliers, taking them in one hand and gripping the strap of one of the studs with them. Grip the pliers tightly and with the thumb of your other hand press against the top of the spring and you will find that you can bend it outward. After doing this take hold of the other stud with the pliers in a similar way as before and repeat the operation on this side, thus evening up the tilt from both sides. It will be well to practice this so that when you want to do it you are sure that you know what you are doing and it will prove quite valuable in getting a good fit many times, for often the mounting cannot be set far enough back on the nose due to protruding brows.

When placing eyeglasses on a patient's nose do not hold the glasses by placing your fingers on the two sides of the lenses, but allow your fingers to touch only the edges of the lenses. This keeps the lenses clean, eliminates the possibility of sticking your finger in the patient's eye and is not so awkward as the other way.

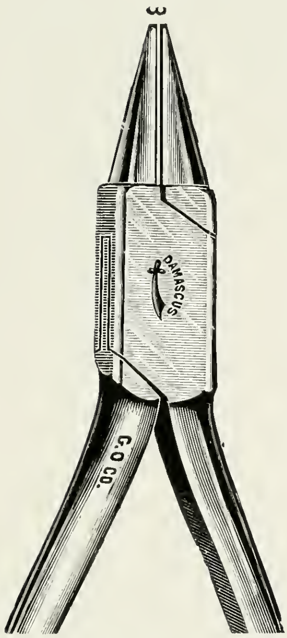
In handling finger-piece mountings do not grasp the finger-pieces with the thumb and forefinger, but use the thumb and middle finger and press the forefinger against the bridge; this steadies the mounting and gives you a secure hold on it. Your patients should be instructed to take hold of the mountings in the same manner.

If the guards are covered with shell, be sure to smooth off the edges all around, using a fine, flat file for the purpose. It will often be found in cases where the mounting is not comfortable and the guards are covered with shell or a similar substance that the trouble can be relieved by filing the edges of the shell on the guards.

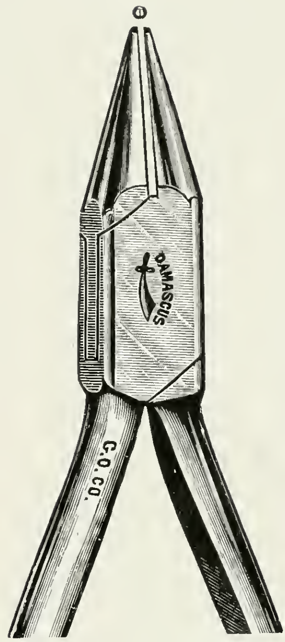
When mountings contain toric lenses the efficiency of the lenses may be increased by bending the lenses in toward the temples. This enables the patient to look sideways without being annoyed by the edges of the lenses.

One of the chief objections to finger-piece mountings is that they are apt to sit too high and to sit farther from the face at the bottom of the lenses than at the top. Great care must be exercised to prevent these two conditions and it will be well for you to understand how to overcome these difficulties. The standing away from the face at the bottom of the lenses can be rectified by spreading the guards at the bottom and by making them incline somewhat from the vertical. The custom of bending the ends of the bridge downward and drilling the holes above center is not advised in cases where it is desired to set the lenses lower, because it spoils the appearance of the mounting, narrows the base of the bridge and disrupts the proper working of the springs and finger-pieces. The better plan would be to fit mountings in which the guard-arms are so constructed that the guards may be raised without changing their angle or mountings that are supplied with drop-studs or "tangent" studs, as they are called by some. To increase the tension of springs on finger-piece mountings detach the long end of the spring, gripping it with a pair of pliers, and pull the spring tighter on the coil. To decrease the tension push back on the coil. In cases of springs of the lever variety in which it is not possible to adjust the tension of the coil, bend the long free end; to increase the tension bend it toward the side it presses, to decrease, press toward the opposite side.

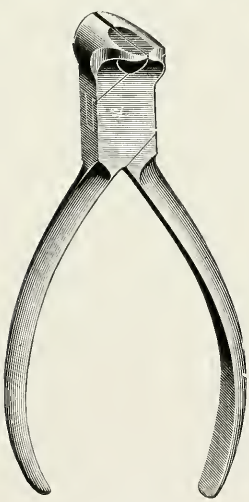
Pliers You Need.

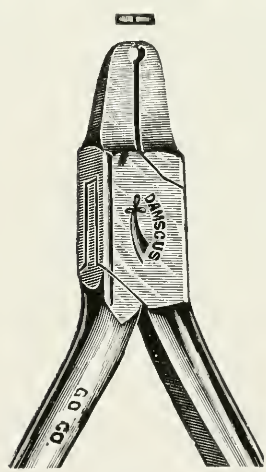


Full Round.

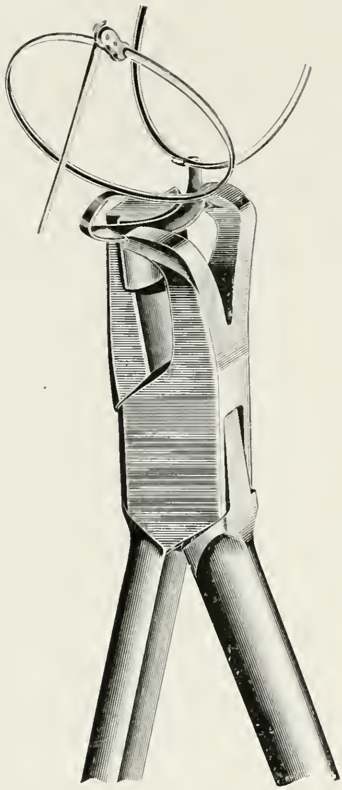


Half Round (Snipe Nose).

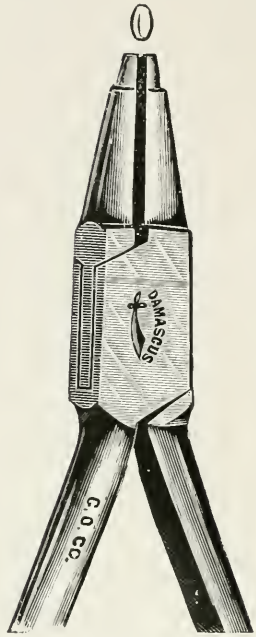

Cutting.



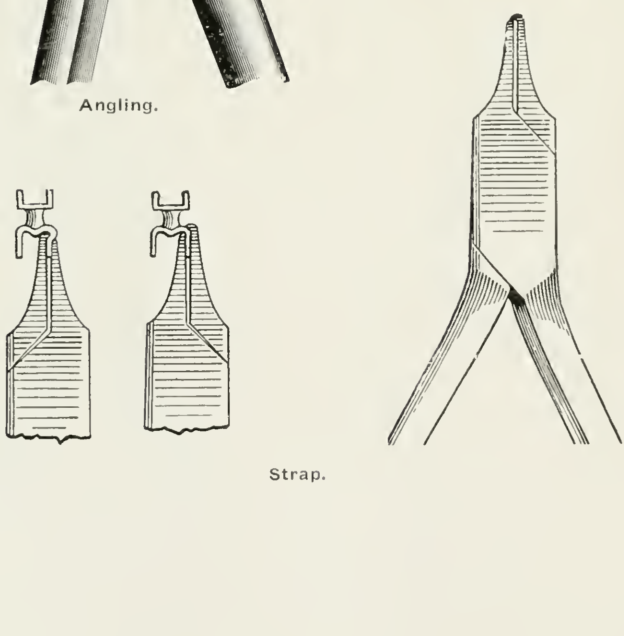
Stud.



Angling.



Concavo-Convex.



Strap.

How to Judge a Good Finger-Piece Eyeglass Mounting.

The two main things for consideration are the springs and the guards. There are, in general, three kinds of springs—coil, lever, and ribbon or flat; these are seen at times in combination and there are variations of each kind. In the spring we look for constancy, durability, and strength. In other words the spring should maintain an even pressure for a considerable time and not be likely to come off easily. Coil springs are the ones most likely to give trouble, especially if both ends are attached to the mounting; if one end is left free there is less likelihood of the spring playing out. Now then for the guard: The requisite of a good guard is that it present a smooth, flat surface to the flesh over a generous space, for a guard will hold with much greater comfort and less pressure if its powers of adhesion are well developed. To understand better just what is meant by this place the palms of your hands together and see how with a little pressure it is quite difficult to slide them on each other; now place the backs of your hands together and you will find that although you apply a great deal of pressure you can slide them with ease. Guards that are built like a crab's claw with twists and turns and parts touching here and there are by no means efficient, and there are many guards on the market just like this

—avoid them if you want your patients to wear the glasses you give them with comfort.

Another point for careful attention is the manner in which the guard is attached to the mounting and range of adjustments the general combination offers. If the guard is so attached that it cannot be moved higher or lower and closer or farther away from the bridge and the angle of the guard cannot be changed without interfering with the workings of the spring, the mounting should be discarded for one that does offer these necessary adjustments. Most of the standard mountings can be had in what is known as offset, inset, and extended posts, so as to accommodate cases where the nose is exceptionally high or low or where the P. D. is wide and the nose narrow; any mounting that cannot be had in these styles is not a good one to adopt.

Right here it might be well to repeat that it is recommended that you adopt one or two good styles of finger-piece mountings, have a complete fitting set of each and use these exclusively when fitting mountings of this type, for if you have one or two good styles of mountings and the full range of sizes from which to choose you will be able to fit any case where it is at all possible to fit an eyeglass. The fitting sets should be kept intact and complete always and the mountings should contain lenses, for without these it is difficult to tell just how a mounting will set and besides they offer a means indicating the different sizes of mountings by having the size of the mounting etched on them instead of having to use tags on the mountings, which are constantly in the way and have a very bad appearance.

How to Write Prescriptions to Be Sent to the Shop.

This is one of the most important chapters in this book and should receive very careful attention. A full understanding of the common terms used in the optical business and a knowledge of the construction of the various kinds of lenses, frames, mountings and parts, etc., is positively necessary, and it is just as essential to know the common names for the various parts and operations as it is to know of their construction, for without this you will be unable to order and get just what you want. One good plan is to take the general catalog of some standard wholesale house and study it as you would one of your most important text-books. If it were possible for you to spend about two hours in the prescription department of any wholesale optical house you would soon appreciate the importance to you of knowing how to order so that the man who fills the order will thoroughly understand what you want without taking chances at guesses and having to figure out some kind of enigma or some long-winded description. Remember that an order for a pair of special lenses, for instance, has to pass through the hands of several people, and if your orders are not clear and concise each man has to waste a great deal of time deciphering your specifications, thus delaying your work and that of others. As far as possible in describing the style of frames or mountings catalog numbers should be used. The following is an example of a prescription received by a wholesale house from a man who thought he knew all about optics and fitting glasses and took offense when corrected: The formulas for both distance and near were entered on the blank and this note appeared below: "Put scales on the inside; but I do not want bifocals." Another Rx gave the formulas for both distance and near without any explanation regarding what kind of lenses were desired and the natural inference was that bifocals were wanted, and so in accord with the custom the regular cement bifocals were supplied. From a letter from this customer the house learned that he did not want bifocals, but simply lenses for reading. But how were they to know? It is really surprising how few men know how to tell the wholesale house just what they want, but it is just the people who do not know how to order who experience the greatest trouble and delay and who are the most unreasonable when they do not receive what they thought "the wholesale house surely ought to know what they wanted." The instructions given in this chapter *refer mostly to orders sent in for filling*, records having been discussed in another section.

Fundamental Rules.

Use a separate blank for each order or each pair of glasses. Write clearly and avoid vague descriptions.

Never use ink or indelible pencil to write prescriptions that you send to the wholesale house for filling, as this Rx accompanies the job in its journey through the shop, and as water is used in grinding the lenses this gets on the paper and runs the ink, making it illegible.

When ordering lenses be sure to state size of eye and whether rimless or for frames.

Give each Rx a number or patient's name and the date.

Sign your name at the bottom. The house may recognize your handwriting, but most likely not, for your Rx is one among from 500 to 1,000 received daily.

Do not write instructions across printed matter, as this makes them very difficult to read.

Name or Number.

It is well to give each order a name or number, which will be useful when writing about an order or for other future reference.

Formulas of Lenses.

When the usual form is followed of writing the sphere first, the cylindrical value next, and the axis of cylinder next, it is not necessary to append the abbreviations "Sph.," "Cyl.," or "axis," even when not written on a tabulated blank, in which case the form should be thus: — 1.50 — .75 x 90.

When distance lenses only or reading lenses only are wanted give the formula for the particular correction you want and not both. When both formulas are given, as in cases where bifocals are desired, it is best to give the total reading correction in full and not the addition for the bifocal portion. In such cases where the addition is given you must be very particular to append the word "Add" after the amount to be added. It is because it is so easy to forget to affix this little word that it is much better to always give the full reading correction after the addition has been made; get into the habit of doing this and you will avoid many mistakes and misunderstandings.

Other Lens Specifications.

Always state whether you want "toric" or "flat" lenses. While, strictly speaking, there is no such thing as a "spherical toric," the correct term being "meniscus," the term "toric" is generally accepted as applying to all lenses constructed on a deep periscopic base. By "flat" lenses is meant all lenses that are not toric (or meniscus).

Give the "size of eye" in the proper space; this is the size of lens as has been described in another part of this book.

When lenses only are being ordered and you do not want them put into a frame or mounting, be sure to state whether they are to be rimless or inserts (for rims), and if rimless how many holes you want drilled in them. In specifying for the drilling of holes always specify the number of holes per pair, even in cases where only one lens is ordered.

Should you order just a single lens and do not send the other lens to be matched for thickness, be sure to give the thickness of the lens at the "strap," or, in other words, where it is attached to the mounting. This thickness may be ascertained by measuring with a millimeter rule or by using a strap gauge.

If you do not give any instructions regarding how the holes shall be drilled they will be drilled "on line"; in cases where you want the lenses to set lower when using eyeglass mountings, specify that you want the holes drilled above center, stating how much, thus: Drill one-eighth above, or drill one-sixteenth above, as the case may require.

The Frame or Mounting.

Know just what you want here and give specific instructions, for this part of the order is just as important as that part which refers to the lenses; remember the man who fills your order does not see the patient and must have definite dimensions by which to be guided if he is to make up a frame or mounting that will fit.

Eyeglasses.

In the proper space state what style of mounting you desire and what kind of material you want, such as gold filled, solid gold, nickel, etc. As far as possible it is well to give catalog or stock numbers because these are quickly read and understood, save space on the order blank and save time in the shop. When ordering finger-piece mountings remember that the numbers given in your fitting set refer to size of the bridge only and not to the particular style of mounting. For instance, let us say you are fitting from a set of mountings known as the "Staythere Mountings," and you decide that a No. 842 is the size you desire and the patient orders gold filled, on your order you would specify "G. F. Staythere 842." Thus you cover every point of style wanted, so that the man who fills your order knows positively just what you want. Figure out exactly what size lenses you want; do not give the pupillary distance and the bridge number and expect the workman to figure out the size lens required, because while it would be possible for him to do this, remember that the man who grinds the lenses does not pick out the mounting or adjust it to the lenses, and the prescription clerk has to figure it out and mark it on the order before it goes into the shop, and probably rather than delay the other orders that are all properly written he will lay your order to one side until the others are passed into the shop, thus delaying the filling of your order. It will take you but a moment to decide what size lenses you need and to mark it down on the order, so in your own interest do this. Remember that 000 eye size is just one millimeter longer than 00 eye, and that 00 eye is just one millimeter longer than 0 eye, and each change of eye size will make just one millimeter difference in the pupillary width of the glasses. In ordering eyeglasses of the finger-piece type the only data necessary are:

Material, Style, Size of Mounting and Size of Lenses. Pupillary width and "Spread of Guards" are superfluous when ordering any kind of eyeglass mountings or frames, because the pupillary width will be controlled by the size of lens and size of mounting, and the "Spread of Guards" will have to be effected by you when you fit the mounting to the patient's face, for eyeglass guards cannot be adjusted "by mail"; the patient must be right in front of you at the time.

Most of the foregoing applies to finger-piece mountings; hoop spring mountings must be ordered in a somewhat different manner. Give the kind of material, size of lenses, size and style of studs, style of guards, size and style of spring. This information definitely stated will get you just exactly what you want.

Specimen of the Usual Form of Rx Blank Supplied by Wholesale Optical Houses, Containing an Order for Spectacles.

DATE 10/14/12

PATIENT William Rice

℞ NO.

		SPH.	CYL.	AXIS	PRISM	BASE	LENS INSTRUCTIONS
DISTANT	RIGHT	+1.50	+.75	30			
	LEFT	+1.25	+.50	150			
READING	RIGHT	+2.50	+.75	30			TORIC / FLAT
	LEFT	+2.25	+.50	150			

MARK A CIRCLE AROUND STYLE WANTED AS INDICATED BELOW

KRYPTOK BIFOCAL	PERFECTION BIFOCAL	CEMENTED BIFOCAL	OPIFEX BIFOCAL	SPECTACLES 4 HOLES PER PAIR	EYE GLASS 2 HOLES PER PAIR	EYE GLASS 3 HOLES PER PAIR

DRILLING: Above Center | Below Center

FRAME INSTRUCTIONS:

#129 - 10K.

SIZE OF EYE 000 | BRIDGE NUMBER | PUPILLARY DISTANCE 60

DIMENSIONS FOR SPECTACLES	HEIGHT ABOVE	HEIGHT BELOW	POSITION OF CREST FORWARD	POSITION OF CREST BACK	ANGLE OF CREST	WIDTH AT BASE
BRIDGE MEASMTS.	4		2		50	18

WIDTH BETWEEN TEMPLES	LENGTH TO BACK OF EAR	TOTAL LENGTH	ANGLE OF JOINT
		6"	

DIMENS FOR EYE GLASSES	SPREAD OF GUARD AT TOP	SPREAD OF GUARD AT BOTTOM	STYLE OF POST	STYLE OF GUARD	STYLE OF SPRING

REMARKS Mail to me today sure

U. C. Wright
Chicago, Ill

Spectacles.

State the style of frame or mounting and what kind of material wanted, the size eye, pupillary width; give the bridge dimensions regarding height and position of crest either in figures or by a bridge number; state the angle of crest and width of base. The length of temple may be expressed either by giving the total length from tip to tip or by giving the distance in a straight line from the plane of the lens to the middle of the back of the ear; the former is preferable, because it is definite. The style of temple should be stated at the same time you are specifying the style of the mounting.

There are stock sizes of bridges that have stated dimensions and these various sizes are designated by letters, such as M, N, O, etc. Where the dimensions of the bridge wanted are not given in figures the letter representing the size desired may be given in the space on the blank usually headed "Bridge Number"; it is much more desirable to give the dimensions in figures, however, as this insures a well fitting bridge. Where the letter is used to denote the size of bridge wanted it is not necessary to enter the figures for Height, Position of Crest or Base, as these dimensions are covered by the letter you give as the bridge number.

After you have written the order out look it over carefully to see that you have given all the necessary data and have given them correctly and in a manner that will be understood. These are things to see that your order contains and which may often be inadvertently left out:

Rimless or insert lenses.

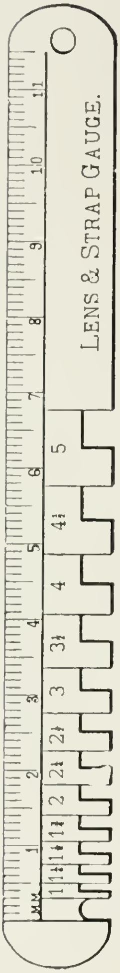
Drilling of holes.
Size Eye.
P. D.
Material for frame or mounting.
Size of finger-piece mounting.
The date.

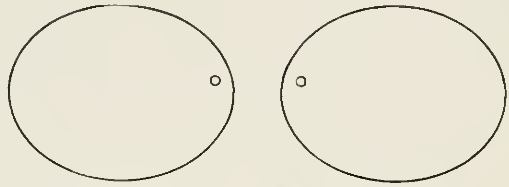
If you cultivate the habit of inspecting your orders after they have been written to make sure that you have included the above points, in a short time a quick glance over the order will reveal any existing omission.

Drilling Holes in Lenses

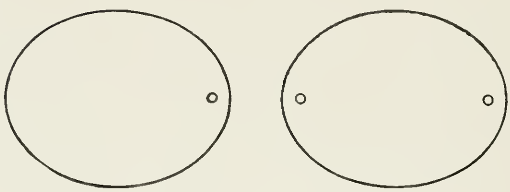
When specifying for the drilling of lenses it is well to remember that the number of holes per pair is always considered. For instance, if you should order a lens drilled "two holes" it would be understood that you meant two holes per pair, one hole in each lens. When no further instructions are given it is implied that these holes will be drilled on the line. When it is desired in the case of eyeglasses to have the lenses set lower than on line drilling will set them the instructions for drilling should state drill one-sixteenth above or one-eighth above, according to how much lower you desire the lenses to be. When a hole is wanted for a cord or chain simply say "Hole for cord."

Illustration of strap gauge for ascertaining thickness of lenses, and how drilling of lenses is specified.

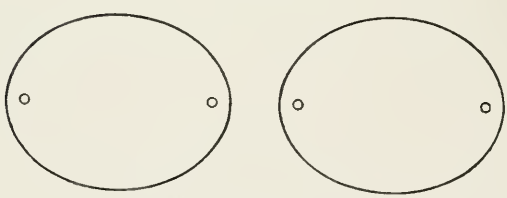




2 Holes Per pair "1/16 above line."



3 Holes Per Pair "on line."



4 Holes Per Pair "on line."

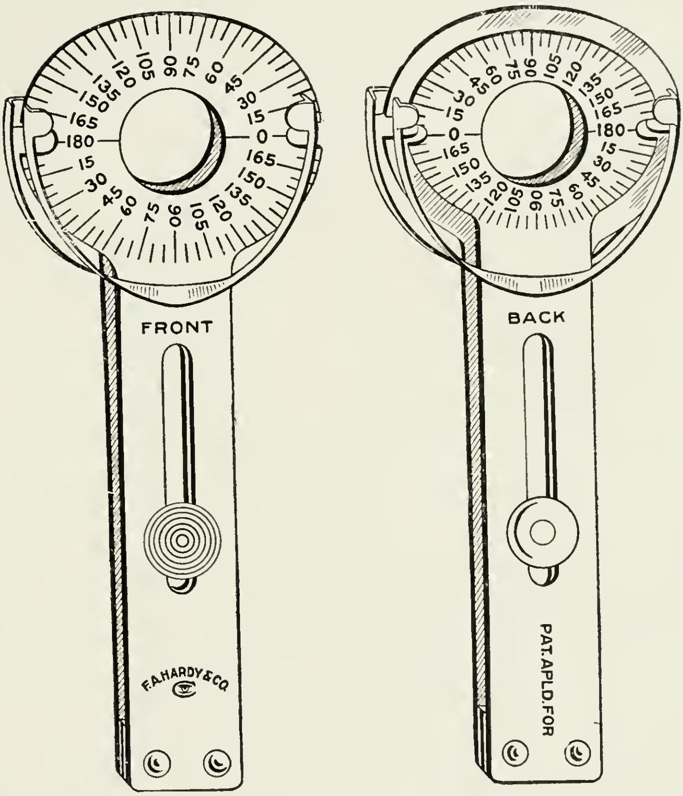
Ascertaining the Power of Lenses.

There are two ways in which to find the power of a lens, viz., by using a lens measure and by neutralization. The lens measure (see illustration) is about the size of a man's watch and resembles it somewhat in general shape. At one side there are three short pointed rods, the center one being movable in the manner of a plunger, and the other two stationary. By depressing the central rod a corresponding movement will be noticed in the hand that operates over the dial. When all three rods are of equal length the dial will indicate zero; when the central rod is depressed below this level the hand will indicate plus powers on the dial, and when the central rod is allowed to protrude further than the other two the hand will stand over numbers on the dial indicating minus powers. To measure the power of a lens the lens should be held in one hand and the lens measure in the other with the dial in full view; press the points of the measure against one face, rotate the lens so that the points pass over several meridians of the lens and note whether the reading of the dial changes as the measure is placed over different meridians of the lens. If it remains constant the surface is a spherical one; now do the same thing on the other side of the lens, and if you determine both sides to be spherical, algebraicly add the two readings and you have the power of the lens. For instance, suppose one side of the lens is plus 2.00 diopters and the other side is minus 1.25, then the lens is a plus .75 D. If one side should be plus 1.00 and the other plus 1.50, then the lens would have the power of plus 2.50 D.

Now suppose when you rotate the lens the measure shows a varying power over its surface, then there is indication of the presence of a cylindrical power. In

Lens Measure.

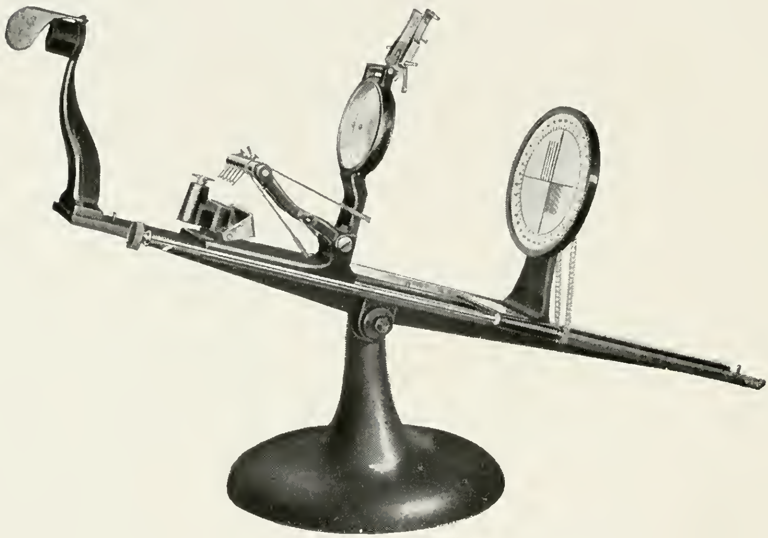
regular (not toric) lenses one meridian of such a surface would indicate zero on the dial and the opposite meridian would give the power of the cylinder; the axis of this cylinder would, of course, be where the reading is zero. If the lens is a sphero-cylinder one side will show the sphere and the other the cylinder. Toric lenses are measured in the same way, except that in measuring the cylinder it must be remembered that there is both a spherical and a cylindrical power on one side. For instance, if a toric lens is ground on a plus 6 D. base and contains a cylindrical power of plus 1.00 D. this side will show plus 6 in one meridian (the axis of the cylinder) and plus 7 in the opposite meridian. In measuring the concave side



Neutralizing Device.

of this lens it must be remembered that the spherical of the other side of the lens is plus 6 and the minus power of the concave side must be algebraicly added to or arithmetically deducted from plus 6.

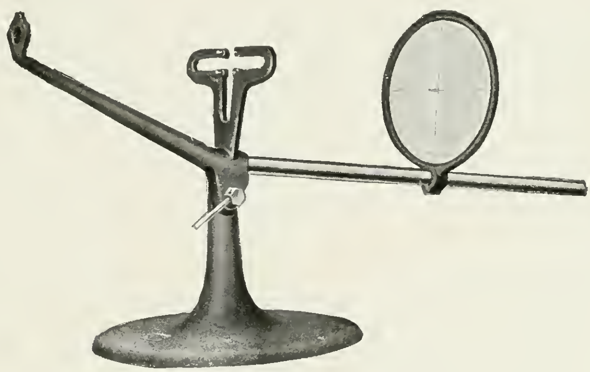
The process of neutralization is simply taking lenses from the trial case and placing them over the lens in question until when looking through the lens it shows no power. The opposite of the trial lenses used for this purpose will be the power of the lens. In other words, to neutralize take lenses of the corresponding opposite power—plus to neutralize minus and vice versa. Remember when looking through a plus lens and moving it



Stoco Lens Centering and Axis Finding Instrument.

from side to side that things viewed will appear to move opposite to the direction in which the lens is moved, and when looking through a minus lens things will appear to move in the same direction in which the lens is moved, and that when the zero is reached no movement will be discernible. In placing cylinders over the lens the power will be the opposite of the test lens, but the axis will be the same as that indicated by the test lens.

In these two tests the lens measure if properly adjusted will be reasonably accurate, but when absolute precision is demanded the process of neutralization must be employed. It will be found advantageous to use the lens measure first and then the test lens for neutralizing, as the lens measure will show approximate results and having used it first will save much time in selecting the proper lenses for the neutralizing.



A. O. Co. Centering and Axis Finding Instrument.

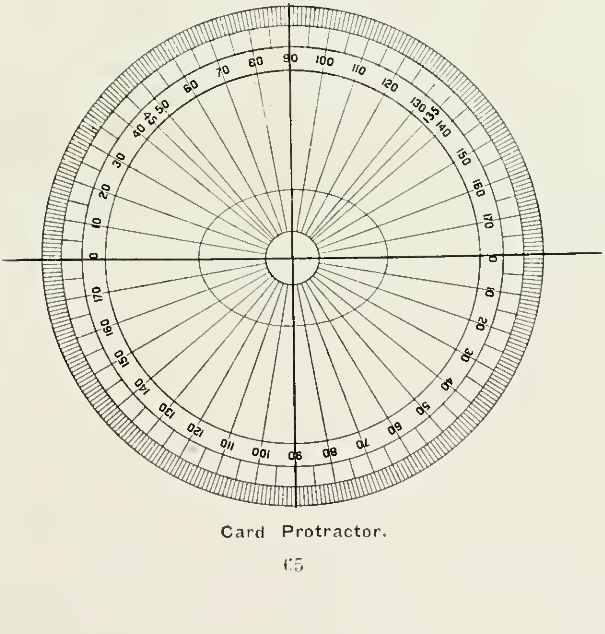
Having determined the focal power of the lens it is always well to make a test to see whether the lens contains a prismatic power. To locate the presence of a prism proceed as follows: Look through the lens at a vertical straight line on the wall or drawn on a piece of paper. Hold the lens at such a distance from this line that it is clearly visible; in cases of high power lenses it will be necessary to approach quite close to the line. Hold the lens so that its 90th meridian is absolutely vertical and move it over the line so that the lens is centered over it and notice whether the portion of the line that is viewed through the lens is a direct continuation of the line viewed outside of the lens; in other words, note whether there is a displacement of the line to one side or the other of the ends of the line that approach the two sides of the lens. If the line is continuous without displacement there is no prismatic power in the lens, but if

Lloyd Axometer.

there is a displacement there is a prism there. The apex of the prism will be in the direction the line is displaced. There are two ways of measuring the power of the prism: Charts are made to hang on the wall which indicate the power of the prism by the amount of displacement and there are mechanical prism measures for the purpose.

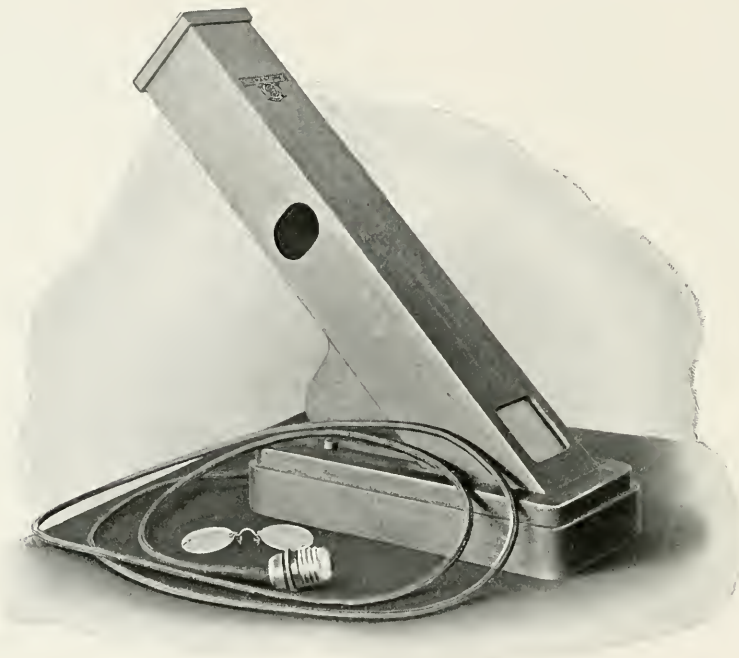
To Ascertain the Position of the Plus and the Minus Cylinder in a Compound Lens by Simple Inspection.

You may pick up a lens that is a sphero-cylinder and see that the cylinder is present and by rotating the lens tell when you have the two principal axes, but there are few who know the following simple truth: When a sphero-cylinder is rotated on its optical center objects viewed through it will appear to move against the movement of the lens at the axis of a plus cylinder and with at the axis of a minus cylinder. Thus a lens of the power + 50 Sph. + 50 Cyl. axis 90, will show an against move-

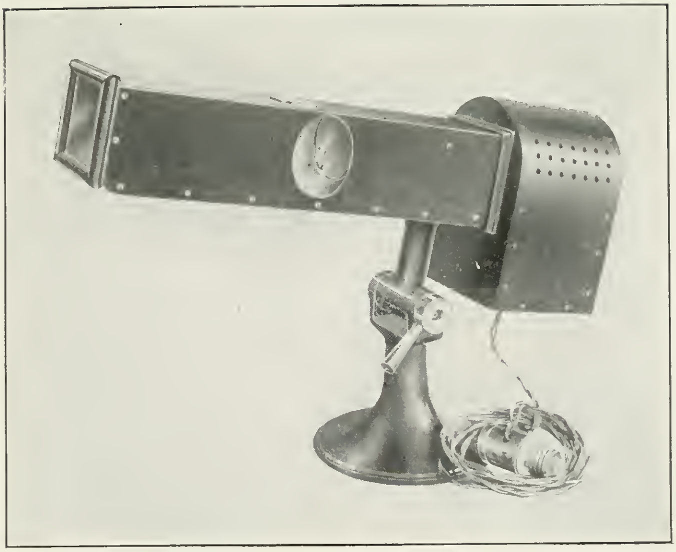


Card Protractor.

ment when rotated across the 90th meridian and a with movement when rotated across the 180th meridian. Knowing this will enable you to quickly approximate the power of a lens and to know exactly which is the principal meridian when plus cylinders are reckoned on and which is the principal meridian when minus cylinders are considered.



Colmascope.



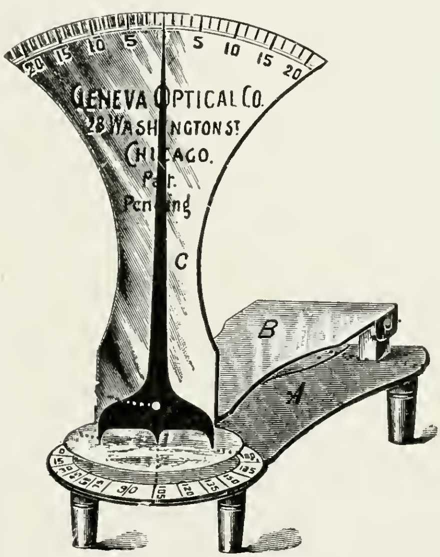
Kryptoscope.

The Colmascope, shown on Page 66, and the Kryptoscope on this page are instruments used for detecting strain and striae in mounted rimless lenses.

Simple Method of Measuring Prismatic Power in a Lens.

It very often occurs that a lens containing a prism is brought to you for duplication and unless you have some means of detecting the presence as well as the power of the prism you will duplicate many lenses incorrectly. A simple but remarkably accurate prism measuring device may be made as follows:

On a strip of paper about 15 inches in length draw a vertical line about four inches long close to the left hand edge of the paper; at the top of and perpendicular to this upright line draw a horizontal line to run the length of the paper. Starting one inch to the right of the vertical line draw other vertical lines about two inches high upward from the horizontal line, all just one inch apart, until you come to the end of the horizontal line. Number the vertical lines consecutively, calling the first line at the left, which runs down from the horizontal, Zero, and the next line to the right, which runs upward, No. 1. These figures should be about one-half an inch high and should be distinctly made, so as to be visible at a distance of nine feet. When the chart is complete, place it on the wall and stand just nine feet from it when neutralizing lenses. By holding a lens up so that the zero line runs through the physical center of the lens and noting the amount of displacement as viewed through the lens and observing the number on the chart to which the zero line is displaced, you will have a very accurate indication of the power of the prism. The base of the prism will be just opposite to direction of the displacement. The quickest and easiest way to understand this will be to construct a chart and try the method suggested with a prism from your trial case.



A Mechanical Prism Measure.

A Method for Simplifying Transpositions.

The rules we have for the transposition of lens values are so long and complicated that there are very few who memorize them and it frequently occurs that just when we want to transpose is just the time we are in a hurry or need to know right away and cannot recall or find the rule to fit the case.

To simplify this and to show you how you can have the rule you want always at your finger tips, we have evolved a few simple rules.

First of all, to eliminate the constant reference to changing signs let us employ the algebraic method of combining quantities, which is the same as the arithmetic or common way when adding plus to plus or minus to minus, but when combining plus and minus we take the difference and use the sign of the larger number. For instance, +3 added to —2 equals +1. In subtracting algebraically we always change the sign of the number subtracted and then proceed as in addition. Examples: +3 subtracted from +4 is the same as —3 added to +4 which equals +1. —2 subtracted from —4 is the same as +2 added to —4 which equals —2.. —1 subtracted from —3 is the same as +1 added to —3 which equals —2.

By using this method we are able to resolve all the rules for the transposition of sphero-cylinders into one simple rule:

To transpose sphero-cylinders always add the sphere to the cylinder (algebráically) for the new sphere, the power of the cylinder remains the same, but change its sign and use the opposite axis.

Examples:

+3 +1 Ax 90 = +4 —1 Ax 180
—2 +1 Ax 90 = —1 —1 Ax 180
+1 —2 Ax 90 = —1 +2 Ax 180

It all simplifies itself when you remember that adding +1 to —2 equals —1. By a thorough understading of this basic truth and remembering to always add you will have the method firmly fixed in your mind and will not have to memorize a complicated set of rules or even one rule.

In combining two cylinders we pursue just the opposite course from that for sphero-cylinders, in that instead of adding we always subtract. Suppose we have the two cylinders +1.00 ax 180 and +3.00 ax 90 which we wish to combine in a sphero-cylinder form, the result is +1.00 +2.00 ax 90.

The rule for combining cylinders is:

Take the power of the first cylinder for the sphere; subtract (algebraically) the first cylinder from the second for the new cylinder and use the same axis as that of the second original cylinder. Examples:

—1 Ax 90 and +2 Ax 180 = —1 +3 Ax 180
or +2 —3 Ax 90

Also

—4 Ax 90 and —2 Ax 180 = —4 +2 Ax 180
or —2 —2 Ax 90

To reduce a sphero-cylinder to two cylinders we do just the reverse of the above. The rule is: For the first new cylinder add (algebraically) the sphere and original cylinder and use the same axis; for the second new cylinder use the original sphere with same sign and an axis opposite to that in the original compound.

Examples:

+1 +2 Ax 90 = +3 Ax 90 and +1 Ax 180

Also:

—2 —2 Ax 90 = —4 Ax 90 and —2 Ax 180

Likewise:

—1 +3 Ax 180 = +2 Ax 180 and —1 Ax 90

Decentering Lenses for Prism Values.

The base upon which these formulas have been constructed is the simple fact that a 1 diopter lens decentered 9.4 millimeters will have a prism power of 1 degree.

Formulas:

$$\frac{9.4 \times \text{Prism}}{\text{Lens}} = \text{Decentration.}$$

$$\frac{\text{Lens} \times \text{Decentration}}{9.4} = \text{Prism}$$

From which we have the following rules:

To find the amount of decentration (in m.m.) needed: Multiply 9.4 by the strength of the prism in degrees and divide by the strength of the lens in diopters.

To find the strength of prism (in degrees) for a certain decentration: Multiply the power of the lens in diopters by the amount of decentration in millimeters and divide by 9.4.

These rules apply to both convex and concave lenses, but it must be remembered that the base of prism will be opposite in plus and minus lenses. Another point for emphasis is in determining the amount of prism or decentration in sphero-cylindrical lenses the dioptric power in the meridian of decentration is the value to be used in making these computations.

Estimating the Power of Lenses with Calipers.

Taking the glass ordinarily used in the manufacture of lenses, it is possible to estimate the power of a lens by the difference in thickness of the periphery of the lens as compared with the thickness at the center. Suppose the lens is 40 millimeters in diameter, then a difference in thickness of two-fifths of a millimeter means that the lens is one diopter, or if the lens is not so wide as this the proper deductions must be made accordingly. For instance, suppose the thickness at the center, as measured with calipers, is 2 mm. and the thickness at a point 10 mm. from the thickest point is 2 4-5 mm., this would mean that the lens is minus 4 D., for at 10 mm., which is the radius corresponding with a diameter of 20 mm., 1-5 mm. difference in thickness would correspond to 1 D., and since the difference in this case is 4-5 mm., the lens must be 4 D., and since the center is thinner than the periphery, it must be a minus lens. When we consider the exactness of some of the calipers that are made, it is easy to see how, by this method, a very close approximation to the actual power of a lens may be made.

What to Do for Loose Screws.

By loose screws in this sense is meant screws that require frequent tightening and which appear to refuse to stay tightened.

Screws may be chronically loose for several reasons, principal of which are stripped threads, enlarged hole or a screw that is not designed for the particular threads of the straps.

If the threads are stripped on the screw the remedy, of course, is a new screw, but if the threads are stripped in the straps another plan must be followed which will also apply to cases in which the hole has become somewhat enlarged. Provide yourself with what is known as a repair screw tap which differs from the ordinary screw tap in that it is a trifle thicker, its purpose being to make new threads in a hole slightly larger than the regular size. Take out the old screw and the lens and turn the repair tap in the hole until it projects from the other side of the straps. Now you will need what is called a repair glass screw, a screw that is somewhat larger than the usual size glass screw. A supply of repair glass screws should always be kept on hand for just these cases.

Should you have a steel screw that you can't keep tight and cannot duplicate, it can be tightened once for all by dipping in cyanide of potassium or anything else that will cause rust to form and then replacing it in the mounting. To remove such a screw all that is necessary is after having removed the lenses to heat the part containing the screw to a high temperature and to pack bees' wax around this part and let it stay this way for a few minutes; the wax will melt and run in around the screw and cut the rust and the screw can be turned in the threads just the same as when it was first put in.

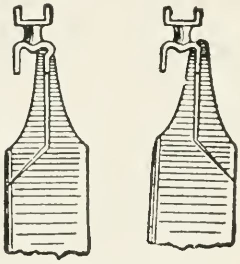
How to Mount Rimless Lenses.

The first requisite in the successful mounting of lenses is to have the proper tools. In addition to a good screwdriver and strap bending pliers it is necessary to have a screw tap and a rat-tail file.

A screw driver should be selected that is short enough to permit the top of it to rest in the palm of the hand and this top should be revolving so as to allow the driver to be turned without your losing a purchase on it. It is a very common occurrence to see someone who is putting a screw into a pair of glasses holding a screw driver by the first three fingers and the screw driver pointing upward past the forefinger. This is a questionable method, for it is too easy to let the screw driver slip when held in this position and you do not have a good hold on the screw itself. Some prefer to pick up and insert screws with a pair of tweezers, but while at times it is advantageous to use tweezers usually after a little practice it is found surer and quicker to pick up and insert screws with the thumb and forefinger.

The secret of mounting rimless lenses properly lies in having the straps of the mounting lying flat on the lenses, and in having the three holes—the one in the lens and the two in the straps—in perfect alignment both in regard to being one right over the other and in being parallel so that the threads in the two straps will coincide with the threads of the screw.

The first step is to arrange the straps so that they will lie flatly on the lens and so that the distance between them will correspond to the thickness of the lens. To accomplish this it is necessary in most cases to bend the straps slightly closer together or farther apart. This bending of the straps can be done with ordinary snipe-nose pliers but it is best to use strap pliers that are especially designed for this purpose, for by using these



Strap Pliers.

special pliers the bending and paralleling of the straps can be done all at the same time without likelihood of breaking the straps.

Having the straps properly bent, the next step is to insert the lens between them and to try the holes through the straps and lens with a screw tap to make sure that all three holes are in line and the threads on the straps will take the screw without forcing. In trying the threads with the screw tap turn the tap a few times in the hole (with the lens in the straps) until the end of the screw tap projects slightly through the other side like a screw would do. If you find the tap turns without requiring much force or without binding, you may insert the screw and turn it down, but if the tap binds in the threads it indicates either that the sides of the straps are not parallel or else the hole in the lens does not center properly over the holes in the straps or perhaps both conditions exist. If the hole in the lens does not line up properly with the holes in the straps, ascertain by inspection where the lens hole binds on the screw tap and which way the lens needs to be moved or the hole needs to be enlarged so as to admit the screw without pressing against the glass. Often it will be found possible to move the lens in the proper direction by bending the edge straps down on the lens or away from it. By "edge straps" is meant the upright straps that press against the edges of the lenses. These edge straps should be bent so that they lay firmly against the edge of the lens, following its contour as closely as possible. If it is not found possible to line up the hole in the lens by moving the entire lens and adjusting the straps then the hole must be enlarged at the place where it binds on the screw, but this should be the last resort as a hole that is larger than necessary will cause the lens to loosen easily and to require frequent tightening of the screw.

To enlarge the hole use a round rat-tail file. Moisten the file slightly and having inserted it in the hole file against the glass where the screw binds. Usually a little filing will suffice and it is better to make the screw tap test after one or two strokes of the file than run the risk of filing away too much glass.

When the holes are properly aligned and the straps correctly adjusted insert the screw and turn it down firmly but if you find it binds even a trifle take the lens out and endeavor to discover the cause, for while you may be successful in getting the screw all the way in without breaking the lens if it binds at any point the lens will crack "all by itself" as your patients will tell you, within a few hours or perhaps a day or so after you mounted it.

The proper way to hold a mounting and the lens you are setting up is to place your forefinger under the strap and lens and your thumb on top of the mounting, in other words, hold the mounting in your hand with your finger right under the strap that the screw last goes through and if the straps are properly bent the combined pressure of the straps and your finger will be sufficient to hold the lens in position.

After the screw is in place the pointed end should be cut off with cutting pliers close to the strap. If end-cutting pliers are used you will usually get a clean cut, but if you use side-cutting pliers it will be necessary to smooth off the end of the screw with a fine flat file, and in doing this care must be exercised not to file away the surface of the straps, for if the latter is gold filled filing its surface will expose the base metal and that portion of the strap will be likely to corrode.

In summing up the mounting of rimless lenses just one point must be emphasized: It is not hard if you reason it out and above all things do not force a screw, remembering that if you have to force it there is indication that it binds somewhere, most probably against the glass and the lens will break at the first jar and you will have what is known as a "screw-crack" or a lens that broke mysteriously.

Record Systems for the Refractionist.

One of the most important departments in the business of the refractionist is the records, and it will be well worth the time required to study into this matter.

In the first place, the records must be in such shape that they will offer the greatest convenience and simplicity when it is found necessary to consult them. In installing a record system this is one of the very first things to be considered, because the reason you keep records is that you want the information for future reference and you want to obtain it accurately and quickly.

There are two general forms of record keeping; one is the book in which the leaves are permanently bound, and the other is the loose-leaf or card-index system. Both of these have their respective advantages and disadvantages. The bound book is secure and pages cannot be lost out of it without being torn out; at the same time it is rather bulky and much space must be kept idle for considerable time if it is desired to keep the full history of a case together and when the full history cannot be kept together conditions become complicated and there is likelihood of error or else much additional work in making notations on every record, necessitating a long search when a case is to be traced. The only objection to the card system, is that cards may be mislaid or lost, but this difficulty can be easily overcome.

The writer is very decidedly of the opinion that the loose-leaf or card index systems are the most satisfactory and efficient. Some find it convenient to combine the loose-leaf and card-index systems, by using light weight cards in a loose-leaf binder and when these records are no longer needed for immediate reference to remove such cards and place them in a filing cabinet or drawer especially made for the purpose. Others find it more convenient to use loose cards and when the record is complete, and the prescription has been transferred to an order blank for transmission to the manufacturing optician, the record card is placed in the filing cabinet at once. This is simply a matter of detail and can be arranged to your own preference without materially affecting the system in general as recommended in this article.

Cards for this purpose, already printed, may be bought, but in the long run it may prove more economical to have the cards especially printed to meet your own particular requirements. Every man has different ideas in regard to what he wants recorded and it is these little details that make the stock printed cards unsatisfactory. There are certain things, however, that all cards must show, and they are as follows:

The patient's name, address and age.

The date (this is of utmost importance).

The formula for the lenses prescribed to be worn (both the distance and near correction should be given).

The frame measurements.

The kind of glasses supplied on the original order and the price.

The following information will prove of value:

The patient's complaint when coming to you for treatment or glasses and a description of any peculiarities not shown by the refraction record.

The patient's occupation.

The formula of the lenses previously worn.

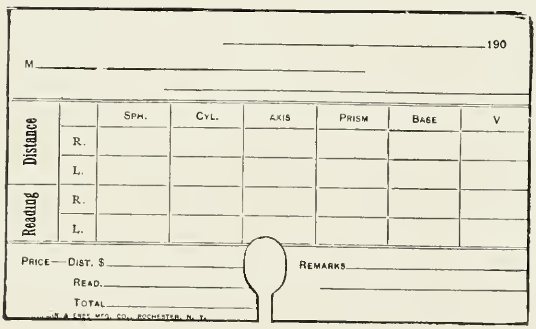
The result of the retinoscopic test.

The patient's full correction (this often will differ from what you prescribe to be worn).

The condition of the extrinsic muscles.

Did the patient come to you through an advertisement, or recommendation of a friend—if so, the name of same.

Having completed such a record, should the patient return at some later date and you find the condition of the eyes to be different, a new card should be made out



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M

		Sph.	Cyl.	Axis	Prism	Base	V
Distance	R.						
	L.						
Reading	R.						
	L.						

Price—Dist. $

Read.

Total

Remarks

and attached to the front of the old card, and a notation should be made on the old card showing that a new prescription has been written.

A portion of the card, usually on the reverse side, should be reserved for a record of business transactions with the patient. For instance, suppose Mr. Lynn C. Doyle should procure a pair of glasses from you on January 15th and on May 1st he breaks a lens in the glasses he uses for distant vision, and come to you to have it replaced. You have classified and indexed the drawer that contains the cards so that all you have to do is to look under the Letter D and find Mr. Doyle's card. This will show exactly what his lenses should be and all doubt in this regard is eliminated. Here is where the extra space will be of use: enter here something like this: "May 1, 1915, one right lens (D. V.), $2.00." The next time he comes in for a repair, or to have a lens replaced, make an entry on the card showing the date, what he got and what the price was. This method will be of value in two ways; it will obviate the possibility of doubt or controversy regarding the price and you will have a detailed record of just how much business he does with you and at any time you can run through your cards and ascertain just how much business you have done during a specified period. It will also prove advantageous where there are more persons than one in your office to use the records.

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