The Genothalmic Ophthalmometer

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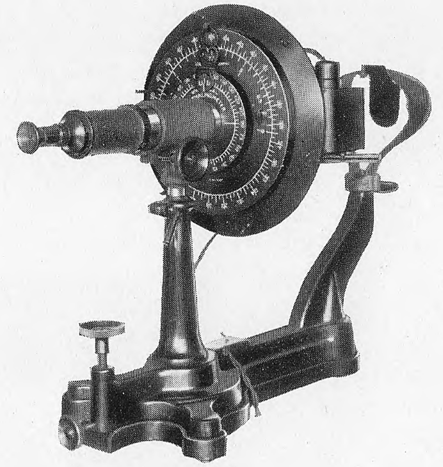
MODEL 3240



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The Genothalmic Ophthalmometer

THE VALUE OF OPHTHALMOMETRY

THE Ophthalmometer affords measurements so basically different from those of all other refracting instruments that no ocular examination may be considered complete without its help.

At the anterior corneal surface is found the greatest refracting power of the eye; a malformation here is of far more significance than a similar curvature malformation at any other refractive surface; all other refractive surfaces are inside the eye and therefore protected, even during the prenatal period, and because of the stress it must withstand throughout life, the cornea in a healthy eye is the most resistent and therefore the least variable factor in the entire refractive apparatus;

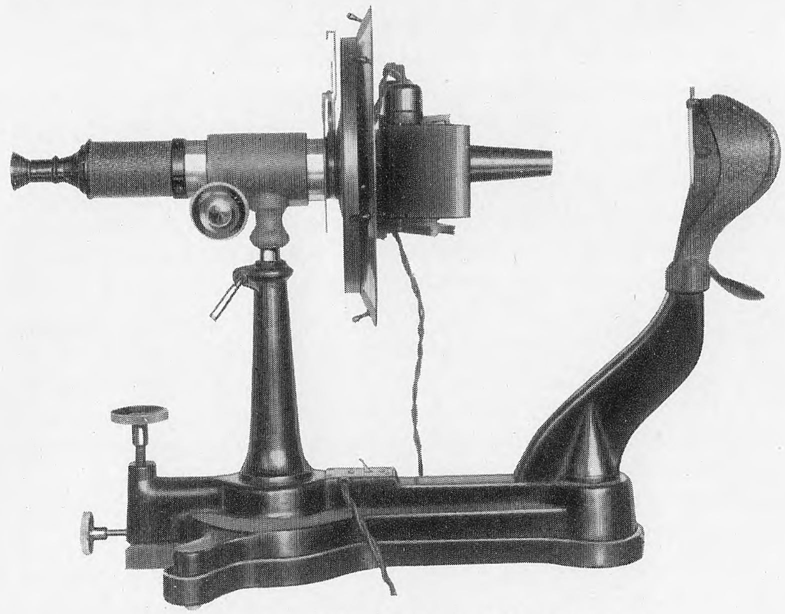


Fig. A—Genothalmic Universal Ophthalmometer and the peculiar value of the Ophthalmometer is at once evident in that it measures this most important refractive surface with mathematical precision.

THE UNIQUENESS OF THE OPHTHALMOMETER

The Ophthalmometer has no substitute. It holds the pivotal position in the analysis of refractive anomalies. Its findings are unique. It enhances the value of all subjective tests. It enhances the value of all forms of retinoscopy. It enhances the value of kratometry.

In every other test, with any other instrument, subjective or objective, the vagaries of accommodation play a disturbing part, but the Ophthalmometer affords exact data free from these influences.

In all subjective tests at least three forms of error are inherent: (1) The eye may be functioning under test as it does not function under ordinary use; (2) The patient may misjudge or misstate his visual sensations; and (3) The examiner may misinterpret the answers given to his questions.

In retinoscopy the patient's judgment and interpretations are eliminated, but the accommodative vagaries remain and must be reckoned with lest the examiner's judgment go astray.

In measuring the corneal astigmia with the Ophthalmometer the patient's judgment is totally eliminated. The action of the ciliary does not affect the curvature of the cornea nor therefore the value of the reading, and the examiner is called upon to use no judgment other than that involved in noting when two straight lines become continuous and two straight edges touch each other. The use or non-use of a cycloplegic has no bearing on the corneal measurement.

The unique ophthalmometric readings are thought by some to be of limited value if taken by themselves, but the fact must not be overlooked that, when from the very nature of the whole problem of ocular examination one must arrive at a conclusion from a mass of more or less uncertain data, it is of

prime importance to have precise knowledge of the chief refracting medium of the eye, and the cornea is the chief refracting medium, and the Ophthalmometer the means by which a precise determination of its dioptric value may be ascertained.

THE PRECISION OF THE OPHTHALMOMETER

The Ophthalmometer is one of the most precisely constructed instruments used in the measurement of the eye. The precision of its readings is a most noteworthy characteristic. With it one may measure the difference between the principal meridians of the cornea in eighth-diopter graduations.

Two factors contribute toward precision, the instrument itself is precise, and precise readings are possible because practically no judgment is called for in taking those readings—the mire edges either touch or do not touch, and that is all there is to it.

With such definite readings for an anchorage we may use all other readings to far better advantage when without them we are more or less adrift in a sea of conflicting figures. For instance, when retinoscopic findings differ materially from subjective, the experienced examiner entertains a wholesome doubt as to which to favor until he uses the Ophthalmometer as the determining factor. Take a concrete case wherein one principal meridian measures 45 D. and the other 46 D. We know positively that one diopter of astigmia is present on the anterior surface of the cornea; we also know, albeit many are prone to forget, that other factors must be considered in determining the correction to be worn, but the important point about ophthalmometry lies right here, namely, that regardless of various other factors which must enter, here is one definite piece of information that never should be left out of our calculations. The rule for applying this finding will be taken up later, the purpose at this point being to stress the fact that the Ophthalmometer gives precise knowledge of any existing corneal astigmia which in a positive way guides us to a more accurate estimation of the eye's true values, and in a negative way puts us on our guard if our estimation does not reconcile these ophthalmometric readings.

All tests, except ophthalmometry, must take into account the possible disturbing influence of the accommodation, and the freedom from this source of error enjoyed by the Ophthalmometer alone gives it a unique value and places its readings in a class matched by no other.

The specific character of ophthalmometric readings added to their unequalled precision places the obligation upon every refractionist of giving every patient the benefit of ophthalmometry.

THE SIMPLICITY OF THE OPHTHALMOMETER

Of all the instruments used in the examination of the eye the Ophthalmometer is not only unique and the most precise but is withal the simplest in application.

There is no more to measuring the cornea with the Genothalmic Universal Ophthalmometer than to measuring a lens with a lens-measure.

If the cornea could tolerate such treatment, we could use a small lens-measure, properly calibrated, to measure it directly just as we measure the glass lens. But the cornea cannot tolerate the application of the three sharp points of such an instrument; so, we modify our instrument and use the images of two mires, and these reflections of the Ophthalmometer do for us on the cornea what the steel points of the lens-measure do for us on the glass lens.

If the surface of the glass lens be spherical, toroidal, or irregular in curvature, the lens-measure will show it, but no more simply than will the Genothalmic Universal Ophthalmometer show the anterior surface of the cornea to be spherical, toroidal, or irregular.

As the difference between the two principal meridians read from the scale of the lens-measure represents the cylindrical

element of a lens surface, so the difference between the two principal meridians read from a corresponding scale of the Genothalmic Universal Ophthalmometer represents the corneal astigmia and with a precision not to be disputed.

THE DEVELOPMENT OF THE OPHTHALMOMETER

The General Optical Company has been most intimately associated with the development and refinement of the Ophthalmometer. Its technical engineers in consultation with expert practitioners have found no reason for altering the incomparable Javal-Schiötz optical system of their Genothalmic Universal Ophthalmometer.

It has consistently improved the mechanical features and design (witness the base of the latest model), until today it presents to the profession an instrument of supreme accuracy, of simple and smooth manipulation, and of beauty.

A patented feature of the Genothalmic Universal Ophthalmometer is the spiral track on the face of the dial by means of which the slightest turn of the dial is transmitted to the mires without lost motion and registered on the scales with extreme accuracy.

The parallelogram and stepped mires are those originally designed by Javal and Schiötz, and for simplicity and accuracy have never been surpassed. Each step of the stepped mire represents one diopter which may be read directly from the corneal image or from the scale on the dial.

The pointers and scales are constructed on so simple a principle that both the power and the axis may be read at a glance.

The principles of precision optics are employed in constructing all lenses and prisms of the Genothalmic Universal Ophthalmometer. Surfaces are pitch-polished and subjected to the Newton's rings test for accuracy of foci. The absolute optical center of each lens is determined by a special device which maintains that center while the lens is edged.

Each instrument is tested at various stages of construction, but before emerging as a finished product a final most rigid test is exacted on a master glass cornea whose precision is of the highest order.

But while every detail of the Ophthalmometer is important from the lenses of objective and ocular of the telescope to the least mechanical point, the most essential part of any Ophthalmometer is its doubling system. Ophthalmometry rests upon this doubling principle. Many most ingenious systems have been devised, but it is conceded in scientific circles that the Javal-Schiötz system is superior to all others.

THE INCOMPARABLE DOUBLING SYSTEM OF THE GENOTHALMIC UNIVERSAL OPHTHALMOMETER

The Javal-Schiötz doubling system consists of two doubly-refracting quartz prisms cemented together after being cut in such a way as to produce two entire cones of light. In all other systems the incident cone is divided into two half-cones. This is very significant, because with the doubly-refracting crystals of the Javal-Schiötz Genothalmic Universal Ophthalmometer the same doublement, both in amount and intensity, is obtained no matter what part of the entire prism is looked through—hence any slight maladjustment or misplacement of the eye does not affect the reading, whereas with other systems correct contact reading depends too much upon the exactness of the adjustment; and, further, false axis readings will result if the eye be displaced the least bit.

The refractionist who grasps the full value of ophthalmometry will not fail to realize that nothing else about an Ophthalmometer is as fundamentally important as its doubling system, and in consequence will study most carefully the principles of doubling before selecting the Ophthalmometer he will use.

Taking the consideration of this basic feature entirely out of the realm of commercial claims, we place it upon a purely scientific plane by referring to Tscherning who, in his famous treatise *Physiologic Optics*, has the following to say about methods of doubling in Ophthalmometry:

"A first method consists in dividing the luminous cone which meets the objective into two halves, an upper and a lower, and displacing each half laterally, one to the right and the other to the left, we can obtain this effect:

"1. By placing before the upper half of the objective a weak prism, apex to the right, and before the lower half another, apex to the left.

"2. Instead of prisms we can use plane parallel plates, placed obliquely but in a symmetrical manner in relation to the axis of the telescope. Such plates placed obliquely have the effect of displacing the object laterally, each on its own side; the effect is, therefore, the same as that of prisms, and the plates give better images. This is the system employed by Helmholtz, who made the doubling vary by changing the inclination of the plates, and later by Leroy and Dubois, who used a constant doubling by making the object vary.

"3. We can saw the objective in two and displace the upper half a little to the left, the lower half a little to the right. It is easy to see that this method must produce a doubling of the image, since the optic center of the objective is, so to speak, divided into two halves, displaced laterally in relation to each other. This method gives very good images and less light is lost, since we obviate the reflection on the surfaces of the prisms and plates, but the instrument is very difficult to construct; the displacement of the two halves of the objective in relation to each other, must be made, indeed, with an exactness that is expressed in hundredths of a millimeter.

"None of these methods are very practical, because all of them call for a very exact adjustment of the instrument to find the meridians of the astigmatic eye. If the eye is displaced a little during the measurement, we may find false directions for these meridians. Helmholtz remedied this inconvenience by placing himself very far (at 1 or 2 meters) from the patient, which calls for a room prepared for this purpose and makes measurement pretty difficult.

"A second method consists in dividing the objective into two *lateral* halves, and displacing laterally each half of the incident luminous cone. Such an arrangement can be obtained:

"1. By placing in front of the objective a double prism with apex vertical.

"2. By placing before each half of the objective a plate with plane, parallel surfaces, forming an angle with the axis of the telescope. These are the plates of Helmholtz which are placed side by side instead of being placed one above the other.

"3. We can obtain the same effect by removing a vertical band from the middle of the objective and cementing together the remaining parts.

"Systems of this order offer no difficulty in finding the meridians, but they have another inconvenience; contact depends much on the exactness of the adjustment. If, after having obtained contact, the observed eye is displaced a little, so that the instrument is no longer exactly in focus, contact ceases. We may thus obtain totally false measurements of astigmia if the observed eye is displaced between the two measurements.

"This inconvenience is partly got rid of in the model of the Javal and Schiötz Ophthalmometer, which the optician Kagenaar, of Utrecht, constructed. It uses a combination of two very weak prisms, forming an angle between them; the apex of the prisms is inwards.

"The third and best method, however, is to employ doubly-refracting crystals. Coccius had recourse to a plate of spar; Javal and Schiötz used a Wollaston prism. This prism is composed of two rectangular quartz prisms, which are cemented together so as to form a single, very thick, plane parallel plate. The two prisms are cut differently in the crystal; one has the apex parallel to the axis of the crystal, the other perpendicular to it. Each ray which passes through the prism is divided into two, and each of the two new rays is deviated a little so that they are nearly symmetrical in relation to the

incident ray. By all other systems which I have mentioned the incident cone is divided into two half cones, which are a little displaced in relation to each other; the prism of Wollaston on the contrary produces two entire cones of half the intensity.

"It is only by the labors of Javal and Schiötz that Ophthalmometry has become a clinical method.

"Thus it may be seen that by far the most favored method of doubling is that finally designed by Javal and Schiötz."

This is the system used in the Genothalmic Universal Ophthalmometer, and to the serious minded worker this must be ever a most important consideration.

THE RAMSDEN EYEPIECE

A great many overlook the importance of a good eyepiece. The two achromatic objectives with the Wollaston prism between produce the all-important doubled images of the mires, but these images must be viewed through an eyepiece. The Ramsden eyepiece of the Genothalmic Universal Ophthalmometer with its spider's thread enables the eyepiece to be set accurately for the eye of the examiner. If the examiner sets the eyepiece for his eye, by merely focusing the spider threads clearly, he will always get uniform readings; and, furthermore, if another or any number of others will each set the eyepiece for the individual eye, all will get uniform readings. Still further, if one examines an eye in one locality with a Genothalmic Universal and another examines that same eye elsewhere with another Genothalmic Universal, the respective readings may be compared, because they are similar for each examiner, regardless of their refractive conditions, provided the eyepiece of each instrument has been focused for its user's eye.

This is not true of any Ophthalmometer whose eyepiece has no spider thread cross-lines.

ADVANTAGE OF THE TWO-POSITION OVER THE ONE-POSITION INSTRUMENT

Much may be said in favor of each type, but one major disadvantage in the use of the one-position instrument causes it to take second place. This is not a fault in the instrument itself, but is due to the fact that in many eyes the two principal meridians do not lie exactly at right angles to each other.

With the two-position instrument an eye, wherein the principal meridians are not at right angles to each other, is measured just as easily and just as accurately as an eye wherein the two principal meridians are at right angles.

With the one-position instrument complications and confusion arise in these cases wherein the two principal meridians, each of which must be measured, are not at right angles, while the two sets of mires of such an instrument are unalterably set at right angles.

Thus when the principal meridians of an eye are not at right angles to each other, both sets of mires of a one-position instrument cannot be aligned at the same time, which is the basis of the claims made for such an instrument, and it becomes necessary to use this one-position instrument in an awkward way as a two-position instrument.

Any advantage this inflexible right-angled construction of the one-position instrument might offer, in cases where the two principal meridians of the cornea are similarly at right angles, is more than counteracted by the flexibility of the two-position instrument measuring with equal ease and precision all cases whether or not the principal meridians be at right angles.

In cases of irregular astigmia, the advantage lies decidedly with the two-position instrument.

Hence, the Genothalmic Universal Ophthalmometer with its flexible two-position principle and its unequalled doubling optical system, must command the attention and win the respect of experienced refractionists who appreciate the value of dependable corneal measurements.

THE OPHTHALMOMETER ESSENTIAL IN EVERY WELL-PLANNED EXAMINATION

Whatever the examination routine may be it is weakened by the omission of the Ophthalmometer.

In retinoscopy, static or dynamic, the logical cylinder with which to start is that indicated by the Ophthalmometer.

In subjective work, upon which so much depends, time and energy are wasted and successful results jeopardized if not based on the definite knowledge given by the Ophthalmometer of the amount and principal meridians of the corneal astigmia.

As kratometry advances, it shows more and more the value of the cylindrical finding of the Ophthalmometer. It has proved in many cases that the ophthalmometric reading may be accepted with greater safety than that of either the retinoscope or the subjective test. It has been proved that, as the convergence and accommodation are relaxed by kratometric training, the eye accepts more readily the ophthalmometric cylindrical finding, and from this it has been shown that if the ophthalmometric cylindrical correction were applied at once the convergence and accommodation responded that much quicker to kratometric influence.

There is a marked difference between a hurried examination and an examination which moves quickly and smoothly to a successful issue without undue fatigue, confusion or waste of time, and the Ophthalmometer, requiring barely three minutes, gives information that no fair-minded examiner should deny himself and his patient.

Is the cornea normal or is it spherical, toroidal, conical, irregular, fine-textured, coarse-textured, or scarred? Are the miral reflections pink, blue, or white? Are the principal meridians at right angles to each other or not? What a difference a knowledge of these conditions may make in an examination!

How the old-time trial case worker flounders among them, wasting time, exhausting himself and patient, groping in a maze of doubtfulness when one sweep of the mires differentiates the irregular, the conical, the scarred cornea from the normal or regular astigmic cornea! It is only the examiner unacquainted with or unmindful of the true usefulness of the Ophthalmometer who attempts to work without it.

SCOPE OF THE OPHTHALMOMETER

Much has been said about the Ophthalmometer being limited in scope, and many looking at it superficially believe that it gives only the cylindrical correction of the corneal astigmia, but while this alone would justify its use in all routine examinations it has been conclusively demonstrated by Ryer in his *Ophthalmometry* that ophthalmometric findings are extremely helpful not only in the correction of astigmia but in incipient cataract, amblyopia, aphakia, anisometropia, irregular astigmia, conical cornea, stye, chalazion, pterygium, cyclophoria and in group examinations.

After the ophthalmoscope comes the Ophthalmometer in the well-ordered ocular examination.

RATIONAL INTERPRETATION OF OPHTHALMOMETRIC READINGS

The clinical thermometer gives a definite measurement of a patient's temperature, but judgment must be exercised in applying that reading.

The sphygmomanometer gives a definite measurement of arterial tension, but judgment is called for in applying that reading.

The retinoscope, ophthalmoscope, perimeter, campimeter, kratometer and refractor all give valuable measurements but call for judgment in their application.

The Ophthalmometer gives a definite, in fact the most definite, measurement obtainable in all eye work, but judgment is called for in its application.

Fever can be recognized by laying the hand on the forehead; hypertension in blood-vessels offers subjective symptoms, but the careful worker prefers to know the exact amounts and uses the appropriate instruments. So, astigmia may be estimated by many tests, but the careful worker appreciates the value of a definite knowledge of the corneal curvature which, mixed with judgment, forms the safest basis from which to build any refractive correction.

Incidentally, the extremely careful worker, conceding at once the value of the Ophthalmometer, takes the trouble to investigate the various types and selects accordingly that which best meets his requirements. He will no sooner accept the first type presented than he would wish his physician to accept the first clinical thermometer presented, upon which so much may depend, without investigating its relative dependability.

Great injustice has been done the Ophthalmometer by exaggerated claims. It is not a "nickel-in-the-slot" prescription writer. We make no such claim for it. We do know that it gives data which, mixed with brains, afford every patient and every examiner a far greater chance of success.

What judgment is called for in applying ophthalmometric measurements?

First, it should be borne in mind that the readings indicate the exact cylinder that would correct the corneal astigmia if that correcting lens could be placed directly on the corneal surface. But inasmuch as the correcting lens, in order to clear the lashes, must be set away from the cornea, its power must be modified so as to produce an equivalent effect. Then, too, an allowance must be made for the physiologic astigmia and the angle alpha. *This is true of every Ophthalmometer made.*

RULE FOR PRESCRIBING FROM GENOTHALMIC UNIVERSAL OPHTHALMOMETER

All this is taken care of by the Javal rule which is: For astigmia "with" the rule, using minus cylinders, the ophthalmometric reading is multiplied by 1.25 or, which is the same thing, is increased by one-quarter of itself, and from this is deducted 0.50 D. Thus, if the Ophthalmometer records 1.00 D., increasing this by one-quarter of itself gives 1.25 D. and deducting 0.50 D. leaves 0.75 D. as the cylinder to prescribe.

For astigmia "against" the rule, using concave cylinders, the ophthalmometric reading is likewise increased by one-quarter of itself, but 0.50 D. is added instead of deducted as in astigmia "with" the rule. Thus, if the Ophthalmometer records 1.00 D., increasing this by one-quarter of itself gives 1.25 D. and adding 0.50 D. to that gives 1.75 D. as the cylinder to prescribe.

All who have made these calculations one by one in the past will feel deeply indebted to Dr. Oscar L. McCulloch for his table which eliminates all these calculations and shows at a glance the cylindrical equivalent of all ophthalmometric readings from 0.12 D. to 6.00 D. in eighth-diopter graduations and for both astigmia "with" and astigmia "against" the rule.

Reading "with" the rule	Nearest Prescription Cylinder	Reading "against" the rule	Nearest Prescription Cylinder
0.00 cyl.	0.50 cyl. at reverse axis	0.12 cyl.	0.62 cyl. at same axis as instrument records
0.12 "	0.25 " " " "	0.25 "	0.75 " " " "
0.25 "	0.12 " " " "	0.37 "	0.87 " " " "
0.37 "	0.00 " " " "	0.50 "	1.12 " " " "
0.50 "	0.12 cyl. at same axis as instrument records	0.62 "	1.25 " " " "
0.62 "	0.25 " " " "	0.75 "	1.37 " " " "
0.75 "	0.37 " " " "	0.87 "	1.50 " " " "
0.87 "	0.50 " " " "	1.00 "	1.75 " " " "
1.00 "	0.75 " " " "	1.12 "	1.87 " " " "
1.12 "	0.87 " " " "	1.25 "	2.00 " " " "
1.25 "	1.00 " " " "	1.37 "	2.12 " " " "
1.37 "	1.12 " " " "	1.50 "	2.37 " " " "
1.50 "	1.37 " " " "	1.62 "	2.50 " " " "

Reading "with" the rule	Nearest Prescription Cylinder	Reading "against" the rule	Nearest Prescription Cylinder
1.62 cyl.	1.50 cyl. at same axis as instrument records	1.75 cyl.	2.62 cyl. at same axis as instrument records
1.75 "	1.62 " " " "	1.87 "	2.75 " " " "
1.87 "	1.75 " " " "	2.00 "	3.00 " " " "
2.00 "	2.00 " " " "	2.12 "	3.00 " " " "
2.12 "	2.12 " " " "	2.25 "	3.25 " " " "
2.25 "	2.25 " " " "	2.37 "	3.50 " " " "
2.37 "	2.37 " " " "	2.50 "	3.50 " " " "
2.50 "	2.62 " " " "	2.62 "	3.75 " " " "
2.62 "	2.75 " " " "	2.75 "	3.75 " " " "
2.75 "	2.75 " " " "	2.87 "	4.00 " " " "
2.87 "	3.00 " " " "	3.00 "	4.25 " " " "
3.00 "	3.25 " " " "	3.12 "	4.25 " " " "
3.12 "	3.25 " " " "	3.25 "	4.50 " " " "
3.25 "	3.50 " " " "	3.37 "	4.75 " " " "
3.37 "	3.75 " " " "	3.50 "	4.75 " " " "
3.50 "	3.75 " " " "	3.62 "	5.00 " " " "
3.62 "	4.00 " " " "	3.75 "	5.00 " " " "
3.75 "	4.00 " " " "	3.87 "	5.25 " " " "
3.87 "	4.25 " " " "	4.00 "	5.50 " " " "
4.00 "	4.50 " " " "	4.12 "	5.50 " " " "
4.12 "	4.50 " " " "	4.25 "	5.75 " " " "
4.25 "	4.75 " " " "	4.37 "	5.75 " " " "
4.37 "	4.75 " " " "	4.50 "	6.00 " " " "
4.50 "	5.00 " " " "	4.62 "	6.25 " " " "
4.62 "	5.25 " " " "	4.75 "	6.25 " " " "
4.75 "	5.25 " " " "	4.87 "	6.50 " " " "
4.87 "	5.50 " " " "	5.00 "	6.75 " " " "
5.00 "	5.75 " " " "	5.12 "	6.75 " " " "
5.12 "	5.75 " " " "	5.25 "	7.00 " " " "
5.25 "	6.00 " " " "	5.37 "	7.00 " " " "
5.37 "	6.00 " " " "	5.50 "	7.25 " " " "
5.50 "	6.25 " " " "	5.62 "	7.50 " " " "
5.62 "	6.50 " " " "	5.75 "	7.50 " " " "
5.75 "	6.50 " " " "	5.87 "	7.75 " " " "
5.87 "	6.75 " " " "	6.00 "	8.00 " " " "
6.00 "	7.00 " " " "		

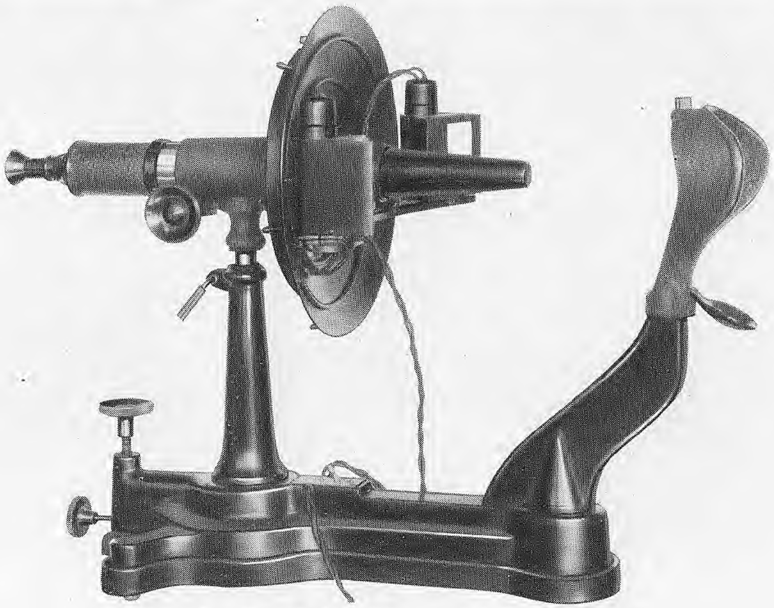


Fig. B—Genothalmic Universal Ophthalmometer

GENERAL CARE OF THE GENOTHALMIC UNIVERSAL OPHTHALMOMETER

Precision instruments deserve careful handling.

The most delicate part of the Genothalmic Universal Ophthalmometer is the spider thread cross-lines of the eyepiece. The slightest touch will break these, but they are fully protected so long as the eyepiece is left in place. Hence, the eyepiece should not be removed.

If the silk cover supplied with the instrument is used when the instrument is not in use, dust will be kept off the lenses and out of the bearings.

Lubricants should be used sparingly on the few moving parts. If needed, apply a small quantity of vaseline or almond oil in preference to a thin oil that may spread to the lenses. Too much lubrication will cause gumming.

The leather cap should be kept on the end of the telescope whenever possible, especially when the whole instrument is not covered.

Keep the head-rest and the chin-rest clean by wiping them with some mild liquid antiseptic.

Keep an extra set of lamps on hand; you will rarely need them, but if the lamps should burn out this extra set becomes priceless.

THE GREEN AND THE RED MARKER

The green and the red marker are purely auxiliary. If the readings are recorded on paper, the double white marker is the only one needed, the red and the green being ignored. But some operators, who do not write down their readings, use the green marker to denote the first principal meridian and the red to retain its dioptric value as the dial is moved to the secondary reading.

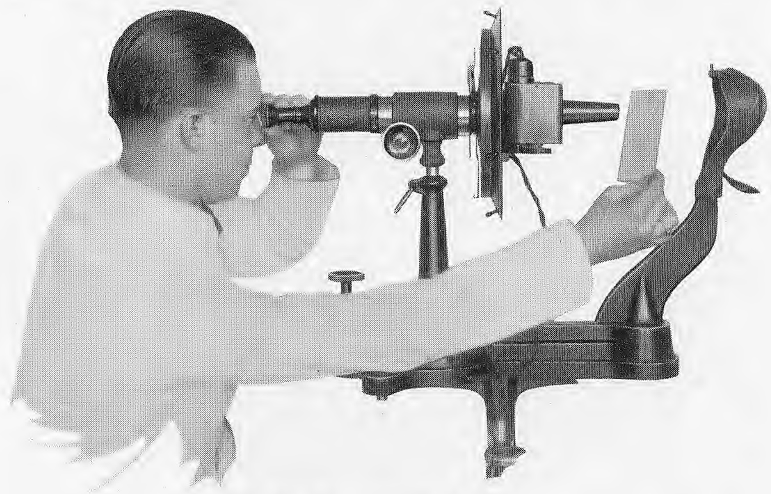


Fig. C—Focusing the Hair Lines

INSTRUCTIONS FOR APPLYING THE GENOTHALMIC UNIVERSAL OPHTHALMOMETER

First: Holding the prescription blank before the telescope, as shown in Fig. C, focus the eyepiece cross-lines sharply for the eye you use in taking the measurements. See Figs. D and E.

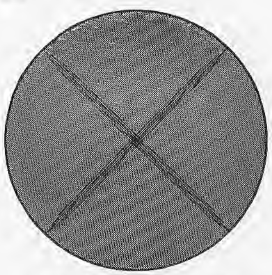


Fig. D—Cross hairs out of focus

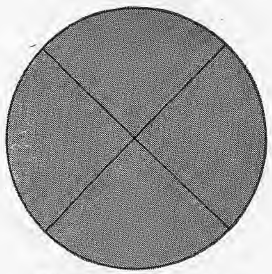


Fig. E—Cross hairs in focus

Second: Switch on the lights (part 10, page 24) before the patient is placed in the instrument, otherwise the snap of the switch and the sudden flash of the light in the mire boxes will startle and cause movement that will require readjustment.

Third: Get the patient comfortably placed in the instrument with the outer canthus of each eye in exact alignment with the white dots of the head-rest as in Fig. F. The instrument itself is raised or lowered on its table or other support by the coarse adjustment, the fine adjustment being made by the chin-rest control (part 13, page 24). Head and chin must be pressed in the rests with sufficient firmness to secure immobility throughout the measurement.

Fourth: Turn the dial so the two sight holes (parts 14-14) are horizontal. This brings 45 D. to the top of the dial. Swing the blinder (part 3) before the patient's left eye. Instruct patient to look steadily into the middle of the tube. The vertical adjustment is controlled by part 12. The mires should be centered over the cross-lines as in Fig. G, the left hand grasp-

ing telescope (part 7), and the right hand focusing (part 8) as shown in Fig. I. When the mires are centered in the eyepiece, lock the telescope snugly (part 9).

Fifth: Fig. I shows the instrument in primary position, and Fig. H shows the mires in primary position as seen through the eyepiece with the axis lines continuous and the mires in exact contact. These axis lines are aligned by rotating telescope (part 7), and the mires brought into contact by turning the dial by one of its handy pegs (Fig. L). Fig. J shows how the mires may appear before brought into contact, and Fig. K shows them overlapped.

The white double-pointer (part 16) now registers the first principal meridian on the small dial and its dioptric value on the large dial. This reading may be trusted to memory, recorded on blank or retained by means of the idler or red marker (part 15). If recorded it would be, for example:

45. D. (in meridian) 0°

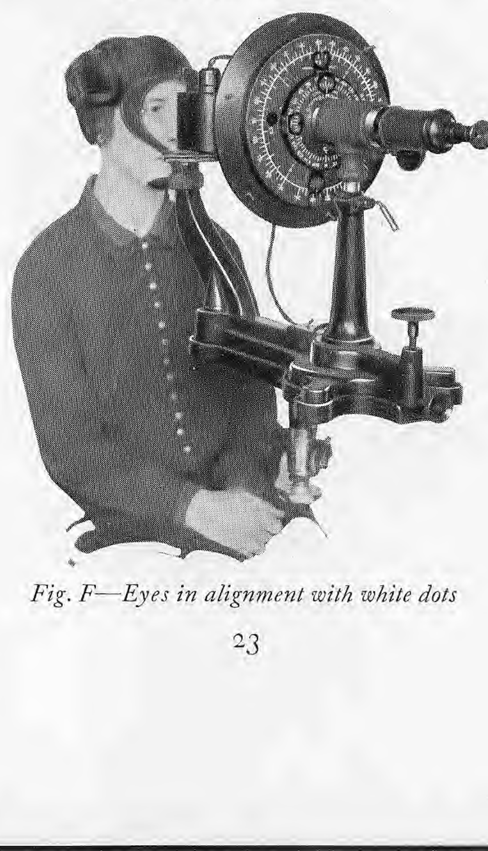
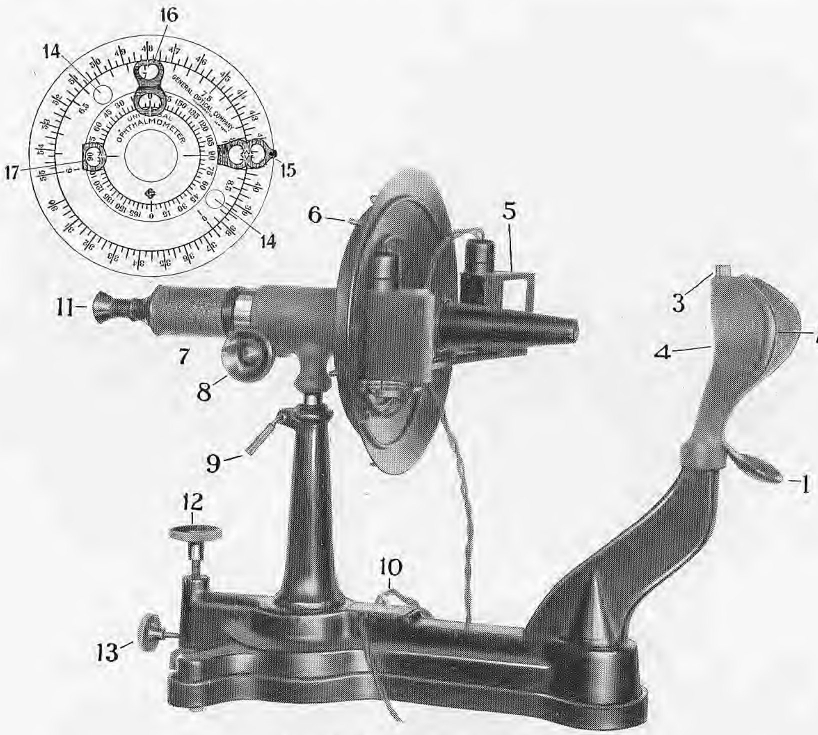


Fig. F—Eyes in alignment with white dots



KEY TO DIAGRAM

1. Chin Rest
2. Head Rest
3. Eye Blinder
4. White Dots on Head Rest
5. Mire Boxes
6. Pegs for Rotating Disc
7. Rough Grip Section of Telescope
8. Focusing Wheel
9. Locking Handle
10. Light Switch
11. Eyepiece
12. Large Raising and Lowering Screw (for Telescope)
13. Small Raising and Lowering Screw (for Chin Rest)
14. Sight Holes
15. Red Marker
16. White Double Pointer
17. Green Marker

Sixth: Locate the second principal meridian by revolving the telescope until the black axis lines running through the middle of each mire form a straight line. During this operation the mires may remain in contact but usually overlap or separate. Remaining in contact indicates a spherical corneal surface and would be recorded as 45 D. all or on McCulloch table as 0.00 and calling for the prescribing of a 0.50 D. Cyl.

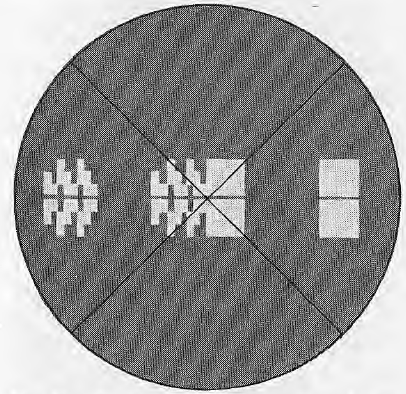


Fig. G—Images centered on cross hairs

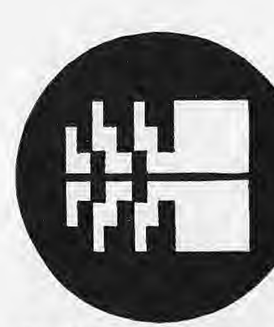


Fig. H—Mires just touching

axis "against" the rule. In the case of overlapping (of more than half a step), astigmia "with" the rule is indicated and of separating astigmia "against" the rule. In either case, obtain contact by again moving dial by one of its pegs (part 6). The white double-pointer (part 16) now registers the second principal meridian on the small dial and its dioptric value on the large dial. Record this as, for example:

47. D. (in meridian) 90°

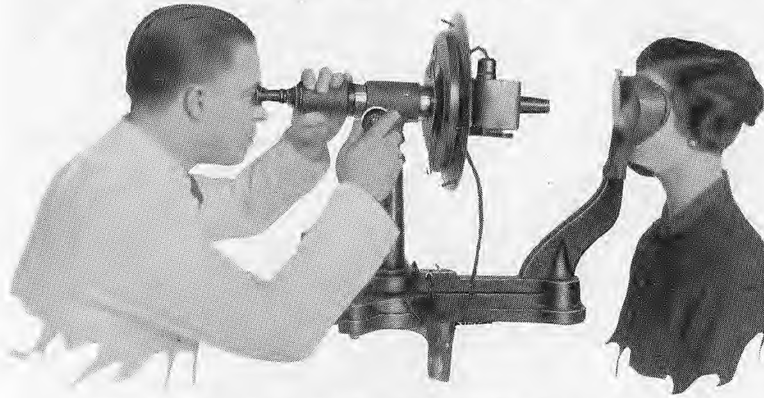


Fig. I—Centering and focusing Genothalmic Ophthalmometer

The following diagram, Fig. N, represents these findings, and confusion will be avoided if all further calculations be made from it, according to one of the following rules:

Seventh: If you use minus cylinders, the power of the minus cylinder will be the difference between the two dioptric values on the diagram, and the axis will be that of the meridian associated with the lower dioptric value. In the above example, −2.00 D. Cyl. axis 0°.

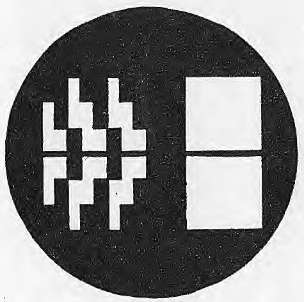


Fig. J—Mires separated

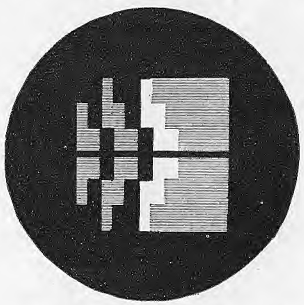


Fig. K—Mires overlapped

If you use plus cylinders, the power of the cylinder will be

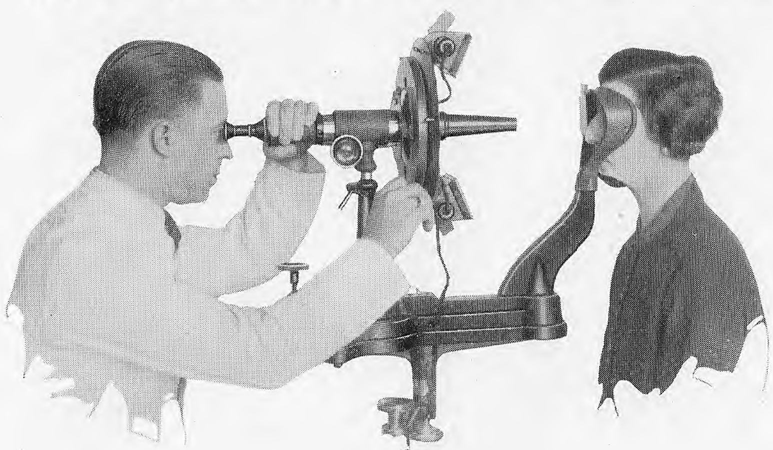


Fig. L

the difference between the two dioptric values on the diagram, and the axis will be that of the meridian associated with the higher dioptric value. In the above example + 2.00 D. Cyl. axis 90°.

These figures represent actual corneal curvature values, and in all cases must be turned into the equivalent prescription cylinder by referring to the McCulloch table or applying the Javal rule yourself.

(Necessarily in a descriptive booklet of this sort, limited space permits only the most concise outline of ophthalmometer technique. For a complete treatise on the entire subject of applied ophthalmometry, we suggest a study of *Ophthalmometry*, by Ryer, which may be obtained from your own wholesaler. *Ophthalmometry* is the most comprehensive work published on this interesting subject. The price is $3.50. A copy of it is furnished without charge to every purchaser of the new Genothalmic Universal Ophthalmometer.)

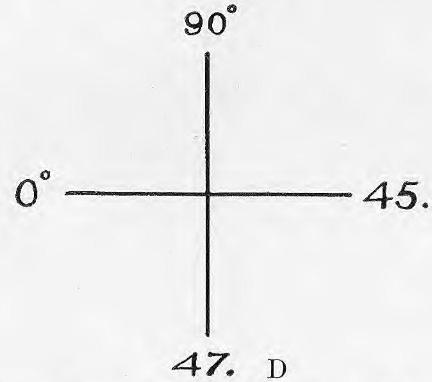


Fig. N—Diagram representing Ophthalmometer findings