and perfect rest of the parts. By Dr. Marcy's operation these are largely overcome. In the lateral splitting of the *velum* along the border of the cleft, the fresh surfaces are greatly increased, and by that much it would seem to add to the chances of successful union.

The method of stitching is unique, and the use of the buried tendon suture adds to the possibility of a successful result, though at first thought it would seem somewhat difficult to accomplish, except by instruments specially devised.

The result in the case reported is, however, no better, in fact, not so good, as in some cases which have been treated by the old methods of operating, as primary union through the whole extent of the wound is sometimes obtained by them. By the old methods about one in four are failures, but Dr. Marcy's method gives promise of better results, and until such time as it has received a fair trial we should withhold our judgment.

I trust Dr. Marcy will keep the profession advised in regard to all his future efforts in this direction, and I assure you it shall have a fair trial at my hands.

A CASE OF STATIC LENTICULAR ASTIGMATISM ACQUIRED BY THE LONG CONTINUED USE OF SPECTACLES HAVING A FAULTY POSITION.

Read in the Section of Ophthalmology at the Forty-first Annual Meeting of the American Medical Association, Nashville, Tenn., May, 1890.

BY GEO. E. FROTHINGHAM, M.D.,
OF DETROIT, MICH.

That dynamic astigmatism of the lens may exist has been recognized since Donders published his classical work in 1864, and it is now generally conceded that an unequal contraction of the ciliary muscle may exist, producing irregular curvature of the crystalline lens and often producing a sensation like that attending accommodation for the *punctum proximum*, with its accompanying fatigue and asthenopic symptoms. This astigmatism has often been observed in practice associated with corneal astigmatism, which it modifies in various degrees, sometimes increasing, sometimes partially, sometimes fully, and at other times over-correcting it. Owing to a cessation of this action as a result of loss of accommodation from age or from the use of mydriatics, corneal astigmatism that had previously been concealed, becomes manifest. Or what had appeared to be a myopic astigmatism may be shown to be a hyperopic corneal astigmatism. The question as to whether this dynamic astigmatism may lead to an altered form of the lens from a spherical to an ovoid form, so as to constitute a condition of

static lenticular astigmatism, is one which has not been plainly demonstrated, though from theoretical considerations we must accept it as a probable result of long continued action of this kind at a period of life when the eye is developing or while the lens responds actively to the contractions of the ciliary muscle. A permanent and symmetrical increase of the convexity of the crystalline lens, leading to myopia, has long been acknowledged as due to the excessive and long continued strain of accommodation. This kind of myopia, sometimes called *pleiopia*, was demonstrated in the early investigations of refraction and accommodation, and Stellwag credits Cramer with having been the first to demonstrate by suitable instruments an increased curvature of the lens in some cases of myopia, just such as is found in emmetropes when accommodating for a near object. While many of the ordinary pursuits of life have furnished abundant opportunity to observe the effect of an overstrained accommodation to produce myopia, only careful observation of cases both before and after, the use of improperly fitting glasses, can be expected to demonstrate the production of permanent lenticular astigmatism. Experiments with cylindrical lenses, for obvious reasons, would be highly improper and would not be submitted to. The faulty position of spherical lenses, so generally met with, and acting in the same way cylinders would, afford us the opportunities for observing the result, if only careful observation of the condition of refraction is made and recorded both before and after the prolonged use of such spectacles. In the following case such observation was made and as published reports of the kind have not come to my notice, I thought it worth while to put this case on record:

W. F. K., aged 19, of Grand Rapids, Mich., came to me on the 19th of October, 1881, suffering from asthenopia. Vision of each eye was $\frac{2}{3}$ +, and there was no manifest error of refraction on subjective test. Græfe's test showed 2° insufficiency of the internal rectus, though he could converge to 2 $\frac{3}{8}$ inches. In reading he found comfort from the use of +1 D. S., slightly decentered so as to act the same as weak prisms, base inward. I next saw him on March 1, 1882. He stated that he was much relieved by his glasses until a short time before this second visit, but that his symptoms had lately returned and he was as much troubled as formerly. His vision was still $\frac{2}{3}$ sharp, and there was no manifest error of refraction or muscular insufficiency. He could use his eyes with comfort for reading only when a convex spherical, 1.50 D. was supplied, and so these were temporarily prescribed and he was advised to rest his eyes by the use of atropia if his symptoms were not soon relieved. On the fourth day after this he returned as bad as ever, and the use of atropia was commenced. On the 6th of

March a careful test revealed hyperopia varying from 0.50 D. to 0.75 D. in each eye. No astigmatism was manifested. Atropia was continued and on the ninth and eleventh tests were carefully made with the same result. Atropia was continued and on the thirteenth an examination showed accommodation completely relaxed and the patient manifested no hesitancy in selecting glasses, H. = 0.75 D. in each eye with no astigmatism. With H. corrected vision of each eye was $\frac{20}{80}+$. Atropia was continued and on the fifteenth and seventeenth tests were made with the same results. Atropia was now discontinued and on the twenty-seventh a test showed H. 0.75 D. in each eye. Convex sphericals, 0.75 D. were prescribed for constant wear, and he was given +1.50 D. S. for reading and instructed to begin use of his eyes gradually by Dyer's method, holding his book at sixteen or eighteen inches distance. The patient was an industrious student of law, and read almost constantly.

I did not see him again nor did I hear from him until the 27th of September, 1886, when I was written to by Dr. R. J. Kirkland, an oculist of Grand Rapids, asking for my notes of his case. The patient had consulted Dr. K. on June 22, 1886, and as he had continued his excessive reading, was again suffering severely from asthenopia, and a test was made which did not call for the glasses he was wearing for distance at the time, *i. e.* +0.75 D. S., that I had prescribed for him more than four years before. At this date he rejected all glasses for distance, except a $-\frac{1}{80}$ C. ax. 90°.

The following notes of the examination on June 22, 1887, and subsequent treatment, have been kindly furnished to me by Dr. Kirkland: R. E. V. = $\frac{20}{80}+$, with $-\frac{1}{80}$ cyl. ax. 90 V = $\frac{20}{80}$; L. E. V. = $\frac{20}{80}+$, with $-\frac{1}{80}$ cyl. ax. 90 V = $\frac{20}{80}$. Nine instillations of a solution of atropia, eight grains to the ounce, were made within three days, and accommodation completely paralyzed. In this condition his refraction was changed to hyperopic astigmatism in the vertical meridian. Record showed R. E. V. = $\frac{20}{80}-$, with $+\frac{1}{80}$ cyl. ax. 0°, V = $\frac{20}{80}+$; L. E. V. = $\frac{20}{80}-$, with $+\frac{1}{80}$ cyl. ax. 0° V = $\frac{20}{80}+$. After the effects of the atropia had passed off an examination showed a like result, and these convex cylindrics were prescribed for constant use. After this no further trouble was experienced and two years afterward, when Dr. K. reported last to me, the refraction had continued the same and the patient could use his eyes as much as he desired without the least discomfort. In his first letter Dr. Kirkland informed me that the patient had broken his reading glasses soon after he last consulted me, and on applying to an optician, he had been given +3 D. S., which he had used for reading for the last four years and a half preceding Dr. K's examination. I wrote to Dr. K. stating my belief that

this astigmatism had resulted from the faulty position of these strong lenses, which as usually set by opticians, were probably more nearly vertical than they should be for reading. I requested him to examine with reference to this point and report to me the facts. Fortunately the spectacles had been preserved and a careful examination showed that in reading the visual axis formed a vertical angle of about 23° with the principal axis of the lens, the lenses having their horizontal axes parallel with the surface of the face. The strength of these lenses necessitated the approximation of the book to within about twelve inches of the eye. This would cause the angle between the rays of light and the principal axis of the lens to be about 6° in the horizontal meridian, leaving a balance of 17° for increase of refraction in the vertical meridian of the lens, with a consequent lessened demand on the refraction of the eye in this meridian. By experimenting at this reading distance (12 inches) with a convex lens of three dioptries, so placed before the eye that there is formed a vertical angle of 17° between its principal axis and the visual axis, I find the refraction increased in the vertical meridian to the extent of a lens of about 0.75 D. To compensate for this and avoid astigmatism, the crystalline lens must increase its refraction in the horizontal meridian to the same amount (0.75 D.). In a state of spasm of accommodation with the reading lenses off, this would appear, as it did in this case, as myopic astigmatism in the horizontal meridian. But when the spasm of the ciliary muscle was relaxed by the use of a mydriatic it would appear as hyperopic astigmatism in the vertical meridian.

In this case it appears that by this long continued exertion of the ciliary muscle to compensate for the artificial astigmatism, produced by the faulty position of these spectacles, the form of the crystalline lens was permanently changed so as to correct hyperopia of 0.75 D. in the horizontal meridian, while it left its refraction in the vertical meridian unchanged.

In the first series of tests the dioptric system of measurement was observed; in the second the inch system was followed, and in the latter case the 60-inch lens would come as near to the 0.75 D. as could be decided upon by a patient in making a subjective test. Prof. Zehender, who made a large series of experiments as to this effect of faulty position of lenses, found that a convex lens of 3 D. rotated at an angle of only 5°, caused decided blurring of vision, and he expressed his belief that permanent lenticular astigmatism could be produced by such faulty position of lenses. The above case, in my opinion, is one demonstrating the truth of this theory. The tests were made in the first instance with the greatest accuracy, both by Dr. J. G. Kennan, my assistant at that time, and by myself. Dr. Kirkland is a

very careful and competent oculist, and that the refraction of the eye had changed is shown not only by his findings in these tests, but by the fact that when asthenopic symptoms became so unbearable in 1886, the patient's distant vision was reduced to $\frac{3}{10}$ + and could only be raised to normal by supplying the cylindrical glasses.

That it was acquired static lenticular astigmatism is shown by the effect of the atropia, the former known condition of refraction, and the result obtained by supplying the required lens. Whether or not this case was of the nature I suppose, the question of proper position of lenses is one of the most important that can engage the attention of those who undertake refractive work, and a large proportion of the time of oculists, must of necessity, be devoted to such examinations. I have known of instances where a most conscientious and skillful examination of the eyes has been made and the whole object of the oculist thwarted by the optician who filled the prescription. Even the most noted opticians often pay little attention to the measurements for frames that are furnished by the oculist, and these measurements are often, I believe, far too hastily and imperfectly made. Almost no attention is paid to that rotation of the lenses that is required to bring their principal axis to correspond with the line of vision, and often we find them set half an inch or so farther forward than they should be, and elevated to the eyebrows, or set down upon the cheeks. In this way great injustice is done to the oculist, who is alone held responsible if annoyance results to the patient, who often never gives him an opportunity to examine the glasses, and correct the faulty position resulting from a disregard of his directions.

One of the most important aids to work of this kind will be the construction of such trial lenses and frames as to allow lenses to be placed in a proper position while tests are being made. Another will be the device of some more suitable adjustable frame for readily making the measurements for the guidance of the optician in making the frames and mounting the lenses prescribed. That some ingenious mechanic will apply himself to this task and give us that which many of us so long have sought, is earnestly wished by not a few whose time is so taxed by the present methods commonly adopted in practice. Whoever trusts this work of fitting the frames to an optician will often find his prescription nullified, and his reputation injured by the incompetence or unfaithfulness of the spectacle venders who style themselves opticians.

I have no doubt that many cases of astigmatism of a low degree may be acquired by a faulty position of spectacles, and that we fail to relieve many cases of asthenopia, either because we do not pay sufficient attention to the position of the lenses while making the test, or in measuring for

frames, or because the optician has disregarded our directions in the matter.

DR. RANDALL called attention to the fact that the change in astigmatism has been proved by the ophthalmometric measurement. Ciliary action is, therefore, excluded, as well as lenticular obliquity. It has been shown that "astigmatism against the rule" is extremely frequent in glaucoma; and further, both clinical and experimental study has shown increase or occurrence of this form of astigmatism with the rise of tension. It may, therefore, be an important prodromal sign of glaucoma.

DR. FROTHINGHAM in closing the discussion said: I have presented this case for the reason that I think it may be of some value in the settlement of this theory. I admit it wants the element of certainty that can only exist where the curvature of the lens is accurately measured both before and after the appearance of the astigmatism. In ordinary practice this measurement of curvature is not made. In this case, however, an altered form of the lens is the only rational explanation that harmonizes with all the observed facts. The paper will furnish my answer to most of the questions raised.

It may possibly be true that corneal astigmatism may have developed in this case, but the direction of the axes of greatest and least refraction do not correspond to what we would expect from corneal change while they do with the theory of acquired lenticular astigmatism from the cause supposed. The degree of astigmatism acquired also just corresponded with the theory advanced. It would be a strange coincidence if changes of the cornea should extend to just this degree, and in meridians to correspond to this.

LENS MEASURER.

Read in the Section of Ophthalmology at the Forty-first Annual Meeting of the American Medical Association, Nashville, Tenn., May, 1890.

BY ROBERT TILLEY, M.D.,
OF CHICAGO, ILL.

The instrument I have to exhibit to you is not my invention. It is a device for the practical ready and accurate measurement of the curvature of lenses, and indirectly, of course, the measurement of the focal lengths of lenses of the average size used in optical devices for the amelioration of defective vision. It is of interest to us in the ready means it affords of checking formulæ for glasses, and in readily and accurately determining the combination of lenses which may come under our observation in our daily dealings with patients. It is not an easy matter to determine, by the method of neutralization, the combination of a compound lens. At any rate, I do not blush to acknowledge that it is not an easy matter for