is called a lens of one dioptre—1 D.—a lens twice as powerful has a focal length of half a metre and strength 2 D.; a lens of 5 D. has a focal length of one-fifth metre.

If the patient cannot read any of the letters of Snellen's type he may be able to count fingers held close to him or recognise light from darkness.

Sometimes the curvature of the cornea is not equal throughout; thus a vertical section may show a curve whose radius is considerably smaller than that of the horizontal meridian. In this case rays of light coming from a point in front do not form an image as a point behind the cornea; but the rays in the vertical meridian come to a focus before those of the horizontal, and thus form at the focus of the vertical meridian a horizontal line; at the focus of the horizontal meridian the vertical rays have crossed and are diverging, and the image is a vertical line.

This condition is called astigmatism (*a*, negative; and *stigma*, a point), because the rays never come to focus at a point, and naturally interferes very seriously with vision.

The term "shortsighted" is very often used by patients as equivalent to defective sight. It does not, therefore always mean myopia. In true "shortsight" (myopia) the visual acuity is normal within some finite distance, and reduced beyond this. "Farsighted" is not a good term to apply to hypermetropics, though it is often used; a normal sighted (emmetropic) person can see at an infinite distance.

Besides the power of seeing at a distance, a normal eye has, until advanced years, the faculty of altering its refractive powers so as to focus for near objects—accommodation. The mechanism by which the alteration is affected is the lens and the ciliary muscle.

The lens is a very elastic body and is compressed by its supensory ligament into the hollow anterior surface of the vitreous humour. The tension of the lens capsule and suspensory ligament keeps the anterior surface of the lens flat.

If the ligament is relaxed, the lens bulges and becomes convex, thus the refractive power of the whole eye becomes greater, and rays of light which strike the eye divergent can be brought to a focus on the retina. Accommodation, therefore depends on the elasticity of the lens and the contraction of the ciliary muscle; if either of the two act imperfectly the power is lost in whole or part. The muscle remains fairly constant throughout life, but the elasticity of the lens steadily diminishes from ten years, until at the age of sixty-two none usually remains.

There is, therefore, a steady decrease of accommodative power between these limits. In an emmetrope we can readily measure the amount of change possible by finding the shortest distance at which a fine line, such as a hair, can be seen distinctly. Thus if it can be seen up to ten inches from the patient but not closer, the amount of change necessary to bring the position of the conjugate focus from infinity to ten inches is equivalent to the addition of a lens of ten inches focal length, approximately, 4 D. This is the lowest amount of accommodation in an emmetrope which will allow comfortable reading, and is usually found about the age of forty.

From this age onward the loss continues at about 1 D. in every five years until at the age of about sixty-two all accommodation power is lost and the eye remains with a fixed focal length.

This change is called presbyopia, "old sight."

Not uncommonly defective vision can be increased to normal by the use of suitable glasses. Let us suppose, for example, that the vision of the right eye, which was only half of normal, had been by the use of a lens of 1 dioptre raised to normal. This would be noted as follows: RV $\frac{6}{12}$ c. + 1.0 D=$\frac{6}{6}$.

On the other hand, glasses may be required to compensate for the loss of accommodative power only or the two conditions may exist in the same patient.

Even though the image on the retina be perfect, this does not necessarily mean perfect vision. We do not see this picture, but in some way the sensation is conducted along the optic nerve, and eventually reaches the brain, where in some way perception takes place. The course of the fibres is by the optic nerve to the chiasma, thence by the optic tracts to the mid-brain, and thence by the optic radiation to the cortex. All these fibres and their connections on the surface of the brain must be in good order.

The optic nerve obviously contains all the visual fibres of its own eye, but behind the chiasma the optic tract no longer represents a single eye, but part of both eyes, since the fibres of the optic nerves partially cross at this point.

The right optic tract consists of fibres which come from the right half of both retinæ, but fibres pass from both macular central regions to each optic tract. There results from this a great difference in symptoms of disease of an optic tract and nerve. If the nerve is divided or destroyed one eye is wholly blind and the other is unaffected; if, however, a tract is divided or destroyed, half the retina of both eyes on the same side is functionless, and therefore the visual field is diminished on the opposite side. A complete lesion of the left optic tract, for example, renders the left half of both retinæ inactive, and causes right hemianopsia (half blindness). Similarly a lesion still higher in the course of fibres in the brain or at the visual centres of the cortex will cause hemianopsia.

(*To be continued.*)

previous page next page