

THE PRESERVATION OF EYESIGHT.

BY A FAMILY DOCTOR.



ALL that need be known about the structure of the human eye, in order the better to understand the subject-matter of the present paper, is very simple and soon told. A glance or two at Fig. 1 will assist the reader and spare me many words.

The eye, then, is a spherical body consisting of transparent fluids contained in membranes called the coats of the eye. It is at the same time one of the most complete and wonderful optical instruments in existence. The first or outer coat is called the sclerotic (A, Fig. 1), and this covers about four-fifths of the eye; the remaining fifth (B, Fig. 1) is situated in front, and is called the cornea; it is set into the front portion of the sclerotic coat, after the manner of a watch-glass, which it may be said to resemble. The front part of the sclerotic is covered by the conjunctiva, better known as the white of the eye, which also lines the eyelids, and even passes over the cornea, but is there exceedingly thin, and of course transparent. Of the gland which secretes the tears, to moisten the eye, I need not here speak.

The cornea is extremely smooth and transparent, as well as beautifully curved, and it is that which gives brightness and lustre to the eye. The cornea and sclerotic, then, are the principal coverings of the eye, and they are maintained in shape by the fluids which fill the globe, and of which we will now say a word or two.

For simplicity's sake let me imagine that I have a fine needle in my hand, and mean to transfix the eyeball from the front right through to the back. I will first, then, pierce the transparent part of the conjunctiva (a piece of this covering may be seen turned up at C, Fig. 1). I will next pierce the delicate cornea, or watch-glass, and get through into D, the anterior chamber of the eye. The contents of this retain the cornea in its curvature, any flattening of which, as will be presently seen, would result in injury to sight, and this chamber is filled with what might be called the purest and most pellucid of water. The needle would then enter the pupil, being surrounded by the beautiful coloured circular curtain

called the iris, E. This curtain may be said to float on the water that fills the posterior chamber, F; it is extremely sensitive to light, dilating or contracting the round centre space or pupil, and regulating the amount of light necessary for perfect sight. The pupil itself in young and healthy eyes is brightly black. Passing onwards, my needle would now transfix the crystalline lens G, and find its way into H, the largest chamber of the eye, and one which is filled with a transparent homogeneous-looking substance resembling the white of an unboiled egg. The needle, after transfixing this substance, would fall directly upon the retina or

inner lining of the eyeball, I. Now the optic nerve K, as soon as it enters the eye, as one glance at Fig. 1 will be sufficient to show you, simply spreads out to form the retina, which therefore consists of nerve fibres. The retina, indeed, is the curtain at the back of the eye on which the picture of external objects is displayed; the retina takes cognisance of the picture, and conveys its impression through the optic nerve to the brain.

The whole eye might be compared to the box of the photographer. While waiting for a friend having his like-

ness taken, and for the operator to reappear from his dark room, we have each of us, I suppose, had a peep in under the black cloth at the back of the camera, and there beheld the well-known little picture in colours focussed upon a ground-glass screen; well, the retina in your eyeball represents that ground-glass screen; the picture of whatsoever you look at is really and truly thrown upon your retina in all its colours. In a recently-killed pure white rabbit, the image of what the animal has looked its last upon may be for a short time distinctly seen.

In passing through the retina the needle would next pierce the centre coat of the eye, L. This is called the choroid, and consists chiefly of a net-work of blood-vessels, which nourish the eyeball, and a reddish or reddish-brown pigment, intended by nature to absorb the rays of light that have passed through the retina, reflection of which from one portion of the interior of the eye to another would render the picture confused and obscure.

The needle would finally transfix the sclerotic coat,

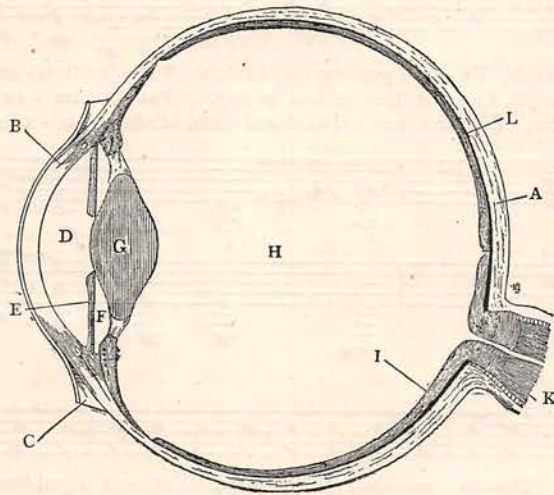


FIG. 1.

and find its way into the cushion of fat which lines the socket of the eye, and gives it soft support. It is the absorption of this fat which gives to the eyes of those who have for some time suffered from wasting disease their peculiarly sunken or hollow appearance. The eyeballs are moved by a beautiful arrangement of muscles, a description of which would, however, take up too much space.

Now good vision depends upon the perfect forma-

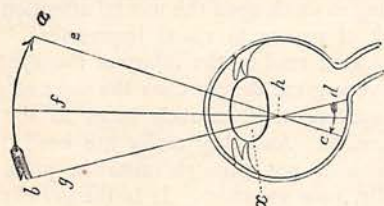


FIG. 2.

tion upon the retina of images, by light reflected from the object looked at. If the reader will cast his eye for a moment on Fig. 2 he will easily see how this image is formed.

Rays of light diverging from any object, when they fall upon the cornea, are refracted by its convexity. They converge, but as they pass through the pupil they are brought still more closely together by the crystalline lens. By the refractive power of the latter and the influence of the vitreous fluid behind it, the rays from the object seen are brought to a focus on the retina. The rays, for example, from *a, b* in the figure will converge on their passage through the eye until they cross each other about the point *h*, and be focussed on the retina at *c, d*; but as light proceeds in straight lines the rays from *a* will be focussed at *c*, and those from *b* at *d*; the picture will thus be a completely inverted one.

If the focal length of the eye of any subject and the length of axis be the same, the sight will be good, because, as seen in Fig. 3, the picture will then be

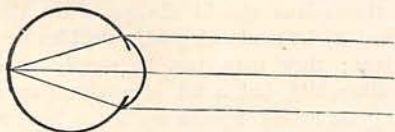


FIG. 3.

focussed directly on the retina; the eye is then said to be "in measure." But there may be a disparity between the focal and axial lengths; the eye may be out of measure. There may be, for example, as seen at Fig. 4, a flatness of the eyeball; the focus would fall too far back, parallel rays would not be united upon the retina. There would be in this case imperfect vision, print could not be distinctly seen, the words would appear to run into each other, nor could distant objects be clearly discerned: a state of affairs that on the whole is distressing enough, and only to be remedied by the use of carefully-chosen convex glasses. On the other hand, what is called *myopia*, or short-sightedness, depends upon another malformation, if I may so term it, of the eyeball. It

is elongated (see Fig. 5) so that the focus of vision falls in front of the retina instead of upon it.

A really healthy eye possesses in a wonderful degree the power of adjusting itself to the viewing of objects at different distances; if, for example, you hold up in front of you between your eye and the distant horizon any small object, such as a penholder, you will find that no effort of yours will enable you to see both well at the same time—if you gaze at the one, the other immediately becomes indistinct. This is called the power of accommodation, and depends upon the elasticity of the crystalline lens. Its convexity is increased when we fix our eyes and attention on a near object, and diminished when we look at something farther off. In old age there is considerable curtailment of this power of accommodation, depending upon a hardening of the crystalline lens. Things close at hand can then not be discerned so well as those farther away. This state is called *presbyopia*, or long-sightedness. It usually commences from the forty-fifth to the fiftieth year, and I would here strongly urge those who are only even slightly presbyopic to commence the use of suitable spectacles forthwith, and not to forget that the glasses must be strong enough to be quite

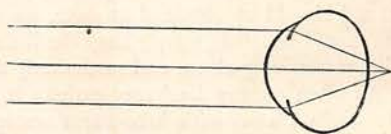


FIG. 4.

effectual. You need hardly be afraid of getting too strong ones, they cannot be so if they suit the sight. And again, in course of time, when even more power is needed, stronger ones must be worn, although for some time at first the old ones will be found powerful enough in the day time.

There is a condition of the eyes from which many people suffer, generally known by the name of weak sight; it may have been produced from over-study or fatigue. There is entire inability to read or write for any length of time, and the trying to do so produces giddiness, and even headache, palpitation, &c. In such cases attention to the health and a due portion of rest may do good, but it cannot be too well known that hundreds of people who have been sufferers from weakness of sight, have not only been relieved, but even cured, by the wearing of proper spectacles. But let me here remind sufferers from this complaint, that even the cleverest opticians are not as a rule the men to be advised by as to the kind of spectacles to be worn. A cure is never immediate, but indeed often tedious, and the advice of the best oculist or ophthalmic surgeon should, if possible, be obtained.

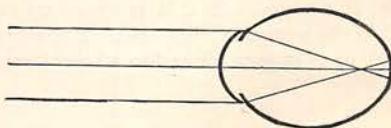


FIG. 5.

Short-sightedness is often hereditary, and the worst of it is that it has a tendency, if its influence be not quickly counteracted, to increase as the child gets older. A case of this kind should never be neglected, and spectacles should be worn, especially when reading, writing, &c. The apartment, too, in which studies are conducted should be airy, well lighted, and clean, and the desks high enough to prevent a stooping position being at all necessary. Plenty of out-door exercise, by strengthening the body, will tend to prevent the increase of the ailment, and if these instructions are followed to the letter it is not at all unlikely that upon attaining the age of twenty, or a little over, spectacles may be gradually dispensed with.

Very great care should be taken of the eyes of infants and children. From its birth the eyes of a baby should be the first part washed or cleaned; the water should be soft and gently warm, the bit of sponge used of the finest quality. Never expose an infant to a bright or dazzling light, nor allow it to sleep in such a light. Exposure to draughts and cold, on the other hand, is highly detrimental to the sight, and so is impure air from whatever cause.

Purulent ophthalmia in children is very likely permanently to injure or even entirely destroy the sight. Medical aid should be obtained at once, no domestic remedies should be tried; simply keep the little sufferer in a quiet, warm, very clean, and moderately darkened room. As often as any discharge gathers it is to be carefully washed away with luke-warm water, poured from a small soft sponge. After the eyes are softly dried, a folded linen rag dipped in cold water may be laid over each, and changed when it gets warm. The nurse should take care not to touch her own eyes until she has well washed her hands.

Parents ought to put themselves to some little trouble with regard to their children's eyesight. Never overtask them, and see that they do not sit at their tasks with heads falling forwards. If signs of any weakness of sight or abnormal vision be noticed, surgical advice should immediately be had. The hand-writing children are taught ought to be large, the books they read to have a wide margin and clear good type, and the light be amply sufficient. Again, the tasks they have to perform should not be of a kind to distress the eyes, nor should, in my opinion, they be punished by having work imposed upon them—such as lengthy writing exercises—which strain both brain and eye. "All work and no play makes Jack a dull boy." So runs the proverb, but it might have gone further and added—and a pale, feeble, weakly, and often half-blind boy.

Grown-up people should be careful of their eyesight if they would live long and be happy. We should all remember the things which are likely to cause injury to the eyes, such as working or reading in bad light. Daylight is an eye-tonic; it is as necessary to the eye as food to the organs of digestion. Exposure to cold is hurtful, or to impure air and to atmospheres impreg-

nated with dust or vapour. Anything that tends to weaken the general health will also prove injurious to the eyesight, or anything that causes a determination of blood to the brain.

But while, on the one hand, the eyes should never be strained or worked to the verge of fatigue, on the other, exercise is just as beneficial to them as to any other part of the body. The habit should be cultivated of studying small objects carefully, keenness of sight depending so much upon the mental attention one is in the habit of paying to visual impressions. Excesses of every kind tend to the injury of the eyesight, and so in a very great degree does the want of good and proper spectacles, when such helps to the eyes are really needed. And they really are needed by very many who do not, through mistaken pride or some such folly, now use them. It is the greatest mistake in the world to despise the friendly aid of a pair of spectacles till we can no longer by hook or by crook do without them.

In choosing glasses or spectacles, remember that the eyes should look through the centres of the lenses, the spectacle frame ought therefore to be of the proper width and no more. Spectacles to fasten behind the ear are more generally useful than the *pinc-nez* which is balanced on the nose. The latter, however, is less liable to be lost, as it is usually worn attached by a very light chain or cord to the dress, and can be used in a moment; but for reading or writing, or any kind of work that takes up time, spectacles are infinitely to be preferred. In purchasing spectacles a guarantee should be had from the optician that they are properly "centred"—that is, that the thickest or thinnest (as the case may be) portion of each lens is really in the centre. If they then fit your sight, you can try them on in front of a mirror; if your pupils are right in the centre, the glasses are properly framed, if for distant sight. If only meant for reading, the pupils should be a little nearer the nose than the centre of the lens. The frames themselves should always, when the wearer can afford it, be made of gold. Pebbles wear better than glass; they may, too, be simply wiped with the handkerchief, but a bit of washleather must be kept for glass lenses. Spectacles, if you have managed to procure a really good and useful pair, should be taken the utmost care of; they should when not in use be put in their case, and *the case in the pocket*. Spectacles with coloured lenses should never be used, unless under the advice of a medical man.

In conclusion, I must acknowledge my great indebtedness to Mr. Brudenell Carter, F.R.C.S., the eminent specialist, for the valuable help which his interesting little book, "Eyesight, Good and Bad,"* has afforded me in the production of this paper. Those who wish to go more deeply into the subject I cannot do better than refer to the book itself.

* Macmillan & Co.