Ophthalmic nursing / by Sydney Stephenson.

OPHTHALMIC NURSING

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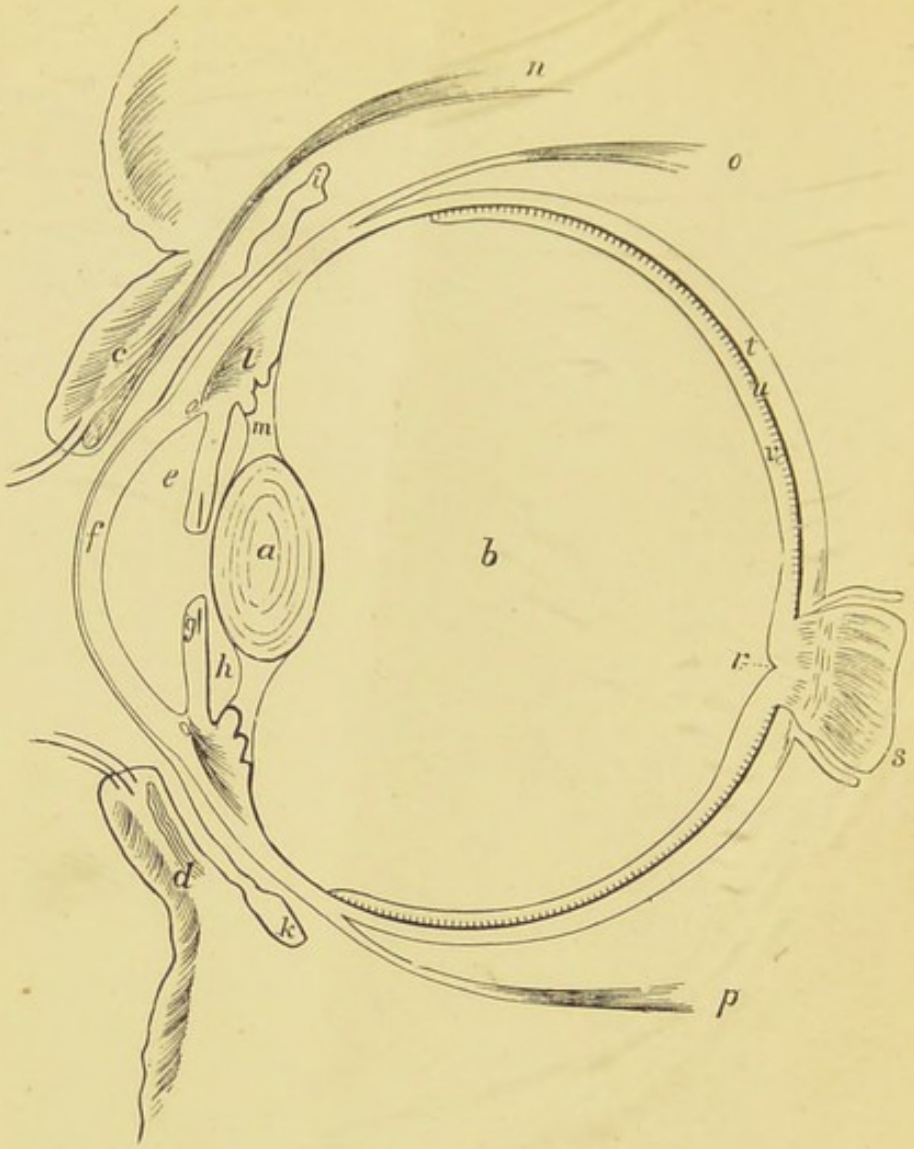

FRONTISPIECE.

VERTICAL SECTION OF THE EYEBALL AND EYELIDS.

a Crystalline lens.
b Vitreous chamber containing the vitreous humour.
c The upper and *d* the lower eyelid.
e Anterior chamber filled with aqueous humour.
f Cornea.
g Iris.
h Posterior chamber.
i The upper and *k* the lower cul-de-sac of the conjunctiva.
l The ciliary muscle.
m The suspensory ligament.
n Section of the levator palpebræ superioris muscle.
o Section of the superior rectus muscle.
p Section of the inferior rectus muscle.
r The optic disc.
s Section of the optic nerve.
t Sclerotic coat.
u Choroid coat.
v Retina.

OPHTHALMIC NURSING

BY

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WITH SIXTY-ONE ILLUSTRATIONS

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PREFACE.

This little volume is the outcome of instruction given to the nurses at the Ophthalmic School, Hanwell, W. That it may prove useful to a wider audience is rendered likely from the fact that there are upwards of forty special ophthalmic institutions in Great Britain, besides the eye departments of the general hospitals. Moreover, as yet no book has been written on the subject of which it treats.

My thanks are due to Mr. David Walsh for his painstaking revision of these sheets for the press, and also to Mr. John Griffith for the drawings that appear in the first chapter.

S. S.

62 Welbeck Street,
Cavendish Square, W.

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OPHTHALMIC NURSING

OPHTHALMIC NURSING.

CHAPTER I.

THE HUMAN EYE; ITS STRUCTURE AND ACTION.

THE human eye, as every one knows, is a rounded globe, about an inch through in all its cross measurements. Its outer envelope is made up of several layers, which will be described later on. Its interior is divided into two main cavities, the ANTERIOR and the VITREOUS CHAMBERS, while between them runs a minute channel, known as the POSTERIOR CHAMBER. (See Frontispiece.)

The ANTERIOR CHAMBER resembles in shape the space between the glass and the face of a watch. It is filled with a transparent watery fluid, the AQUEOUS HUMOUR, that can be drawn off by a puncture, as by the prick of a needle. Its watch-glass cover, so to speak, is formed by the clear CORNEA, while the face of the watch is represented by an opaque structure, the iris, and a transparent one, the CRYSTALLINE LENS. Of the two latter, the IRIS is the coloured part of the eye seen from the outside, having in its centre the round dark pupil or "apple" of the eye, which is really that part of the lens left

uncovered by the iris. Between the back of the iris and the lens is the POSTERIOR CHAMBER, a small circular channel filled with AQUEOUS HUMOUR.

The VITREOUS CHAMBER occupies by far the greater part of the eyeball. It is designed on much the same lines as a photographic camera, that is to say, a darkened box into which light is admitted through a glass lens. The vitreous chamber is a ball-shaped cavity, fitted in front with a lens of clear crystalline material, and the amount of light allowed to enter into its interior is regulated by the iris. When a photographer wishes to admit more or less light into his camera, he places a disc with a larger or smaller central hole behind his lens. In the human eye, however, the exclusion or admission of light is effected by the iris, which is a kind of elastic curtain, made up of muscular fibres, and controlled by nerves. It is impossible to contract or expand the iris at will; but let any one place his hand for a few seconds over a healthy eye, and then expose the eye to a bright light. He will find that the iris contracts sharply on exposure, and, contrariwise, it expands in the dark—actions which are involuntary, or beyond the control of the will. Returning to the camera, we note that it is blackened inside, and so too is the cavity of the vitreous, which is really a dark chamber filled with a transparent jelly-like material, the vitreous body or humour.

The aim of the photographer is to throw a small but distinct image on the back of his camera, where it falls on a glass plate covered with a thin chemical

film, which records the picture. To obtain a good picture the image must be exactly "focussed" on the sensitive plate. In the eye an image is brought to a focus not by the crystalline lens alone, but by the help of all the other transparent media through which it passes. These media are from before backwards, cornea, aqueous humour, lens, and vitreous humour. We then come to the part of the eye corresponding to the sensitive plate, namely, the inner lining of the vitreous cavity, or RETINA, composed of the delicate endings of the optic nerve, on which external images are brought to a focus.

Should any of these media become opaque, it is plain that the rays of light which convey the image will not be able to reach the sensitive plate of the retina. This is precisely what happens when the cornea grows milky, like ground glass, from inflammatory changes; when from some cause or other the anterior chamber becomes filled with matter or with blood; when the lens is clouded by the haze of cataract; or when the vitreous cavity is filled with blood. The first essential, then, of perfect vision is that all the media should be transparent; but there is a second, not less important, namely, that the rays of light must be clearly focussed on the retina. Bad sight is often due to a faulty shape of the globe. For instance, in short-sighted persons, the eyeball is too long, so that the focus of objects falls short of the retina, while in long-sighted individuals the eyeball is shorter than it should be, with the result that objects are focussed beyond the

retina. In either case, a blurred image falls upon the sensitive membrane.

The impression of a focussed image is conveyed by the optic nerve to the brain, where it is recognised by the higher intellectual faculties residing in that organ. The optic is a special sensory nerve, whose endings are acted on chiefly by light; but at the same time one should bear in mind that other stimuli, such as blows or electrical shocks, are capable of giving rise to a sensation of light. So far as we know, the rest of the sensory nerves, whether of ordinary touch, or of special sensation, as taste, smell, or hearing, are not affected by light. The optic nerve, among its other duties, is supposed to carry a special stimulus to that part of the brain which regulates the aperture of the iris. A bright light stimulates the retina, and the sensation is carried by the optic nerve to a particular brain centre, from which a motor nerve leading to the iris is set in action, and the circular portion of that muscle contracts and thereby lessens the pupil. This is known as a "reflex" or "sentinel" action, another familiar example of which, also performed through the medium of the optic nerve, is the closing of the lids when threatened by a sudden movement. Suppose the stimulus of light to be prevented from reaching the brain by disease of the optic nerve, then exposure to light no longer causes contraction of the pupil, which accordingly falls into a motionless or fixed condition.

On looking into the healthy eye from the front,

one sees practically the whole of the anterior chamber through the clear cornea. The pupil appears black, just as does the lens of a camera from the outside. Supposing now, by means of the perforated mirror of an ophthalmoscope, we throw a light into and examine the interior of the eye, a picture will be obtained like that shown in Figure 1. The entrance

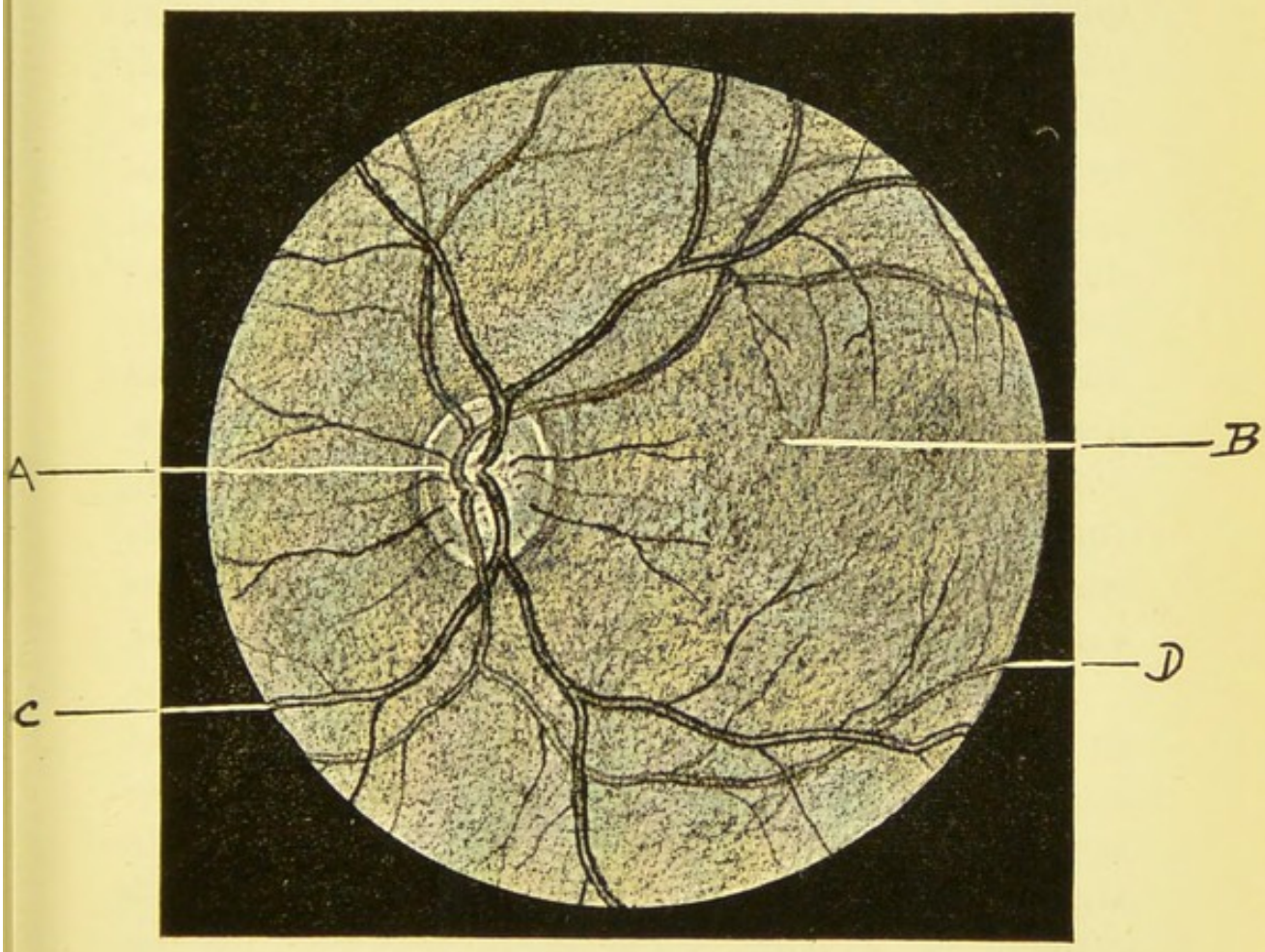


FIG. 1. FUNDUS OF THE EYE, AS SEEN WITH THE OPHTHALMOSCOPE.

A The entrance of the optic nerve, the so-called "optic disc".
B The "yellow spot".
C One of the veins of the retina.
D One of the arteries of the retina.

(Note that the arteries of the retina are smaller in size and lighter in colour than the veins.)

of the nerve (A) appears as a pinkish rounded spot, the OPTIC DISC, from the centre of which blood-vessels are seen running upwards and downwards on what, examined in this way, looks like a red background. It is interesting to note that this is the only instance in the whole body in which a nerve, an artery, and a vein are open to direct examination.

The eyeball is moved in various directions by muscles, of which two are oblique, and four straight. Of the straight or "recti" muscles, one is above, one below, and one on each side. The external rectus has a separate nerve, so that it is sometimes paralysed by itself, in which case the unaffected inner muscle pulls the eyeball inwards and an internal squint is brought about. The upper lid is lifted by a special muscle, and should this become paralysed, drooping of the lid, or "ptosis," results. The eyelids are surrounded by a thin flat muscle, the ORBICULARIS. The inner part of this muscle is concerned in winking, while the whole muscle is thrown into action when the eyelids are tightly closed.

The orbit is a large and deep cavity in the skull, in which the eyeball is tethered by its muscles and by the optic nerve. It is a bony case of immense strength, and forms a secure shelter for the delicate structures of the eyeball. Its roof is formed by a thin plate of bone, sometimes perforated by the thrust of a weapon, such as a foil or a walking stick. On the solid bosses of bone which form the projecting rim of the orbit the force of many a blow is spent, and, indeed, were it not so, every bout of fisticuffs

would almost certainly involve the destruction of one or more eyeballs. A further safeguard against the dangers of jarring is afforded by the packing of fat, glands, and loose cellular tissue, which fills up the large space left between the eyeball and the orbit.

The eyebrow is a fringe of coarse hairs running along the overhanging ridge of the orbit. Its use is to prevent sweat or moisture from trickling down into the eyes. It is a structure of more importance in the lower animals, as in the cat, where the long and sensitive hairs enable their owner to feel his way along in the dark. As age advances, the hairs in the human eyebrow often grow large, and resemble the "vibrissæ," as they are called, of the lower animals.

The lids are upper and lower, and their function is mainly that of protection. In the movements of opening and closing the eye, the upper lid is chiefly concerned. The orbicularis draws both lids together, while the upper one is raised by the LEVATOR PALPEBRÆ SUPERIORIS, and the lower one falls by its own weight. A third eyelid is present in some animals, as in birds, reptiles, and some carnivora; and this is represented in man by a pink sickle-shaped fold at the inner corner of the eye. The lids are composed of cartilage or gristle, covered on the outer side by delicate skin, and on the inner by a moist soft membrane, the conjunctiva. Inside the lids are a number of fine tubular glands, the MEIBOMIAN, the openings of which may be seen as a row of tiny dots near the free edge of each lid. These glands furnish a kind of greasy secretion, which renders the lids

water-tight when they are brought together. The secretion also prevents the tears from overflowing when the eye is opened, and it assists the lid, moreover, in the important wiping or cleansing function it exercises on the globe.

Just outside each eyelid is the fringe of hairs known as the lashes, which serve to shade the eye and to keep off dust and moisture, as well as to warn the eye of coming mischief. The lashes are very sensitive, and a slight touch is followed by an instant reflex closure of the lids.

The CONJUNCTIVA is continuous with the skin over the edge of the lid. It lines the inner surface of the lids, to which it is firmly attached, and passes in front of the eyeball up to the cornea, over which it is continued in the form of a thin and extremely delicate pellicle of epithelial cells. It is divided into two portions, that of the globe (*bulbar*) and that of the lids (*palpebral*), which are connected together by two hollow folds, the UPPER and the LOWER CULS-DE-SAC. The conjunctiva is a transparent membrane, and therefore appears white on the sclerotic, and pink over the eyelids. Its blood-vessels are invisible in health, but when inflamed they enlarge, and become gorged with blood, so that the white of the eye turns to a cherry red, or, in common phrase, is "bloodshot".

The upper palpebral conjunctiva may be inspected by turning up the lid in a manner to be afterwards described; and then one sees (*a*) the smooth and delicate conjunctiva, which in health is glistening

and traversed by a few scattered blood-vessels,(*b*) the underlying Meibomian glands—faint bluish lines running from the free edge of the lids; (*c*) the pouting mouths of the Meibomian glands; (*d*) the pin-hole opening of the upper punctum. When the lid is thus everted, there is still an unseen portion, or cul-de-sac (blind alley), running upwards and backwards between the globe and the lid. A similar though much smaller hollow dips beneath the lower portion of the globe. In both culs-de-sac, the conjunctiva is loose, so that any movement of the eyeball pulls on the cul-de-sac and not on the lid. By this arrangement, the lids and the globe are able to move independently of each other.

The tears are secreted by a special gland, the lacrymal, which is packed away beneath the upper lid at the upper and outer angle of the orbit (Fig. 2). The secretion is salt and watery, and is constantly flowing in small quantity, by which means the eye is kept moist, and the lids are enabled to glide easily upon the eyeball. The gland opens into the upper cul-de-sac by fifteen

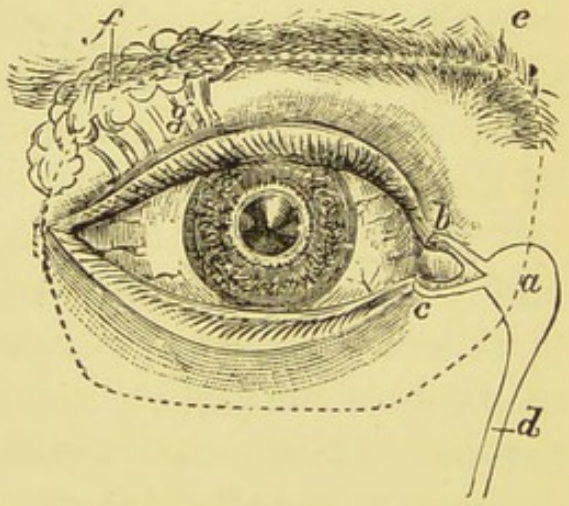


FIG. 2. DIAGRAM OF TEAR APPARATUS.

a Lacrymal sac.
b and *c* the upper and the lower canaliculi.
d Nasal duct.
e Shows the outline of the orbit.
f Lacrymal gland.
g Ducts of the lacrymal gland.

to twenty minute ducts, and under ordinary circumstances the greater part of the secreted fluid evaporates from the surface of the eyeball. On looking carefully at the edges of the lids, two small spots may be seen about a quarter of an inch from their inner ends, each having a pin-hole perforation. These PUNCTA, as they are called, open into two fine passages, the CANALICULI or lacrymal canals, which in turn lead to a membranous bag, the LACRYMAL SAC, and lastly the NASAL DUCT runs from the LACRYMAL SAC into the lower portion of the nasal cavity. The apparatus thus described serves to drain off the ordinary secretion; but when tears are secreted faster than they can be thus carried off, they overflow and run down the cheeks. Again, if there be an obstruction in any part of the conducting passages, such as a stricture in canaliculi, in sac, or in nasal duct, the tears overflow, and we get the condition known as EPIPHORA. The communication of the tear passages with the nostrils accounts for the fact that a person who is crying uses his handkerchief to his nose as well as to his eyes.

The ordinary convex lens is a transparent piece of glass, which has the power of bending rays of light passing through it, so that they are brought to a point or "focus". Its shape is that of a lentil seed (hence the name), or of the sweetmeat sold by confectioners as the "acid drop". Its action may be shown in a darkened room by placing a lens between a lighted candle and the wall. As soon as the lens is at the exact distance required to focus the candle,

an inverted image of the latter object will be seen upon the wall. If now the candle be moved away, the image on the wall will become dim and indistinct, but by putting a flatter lens in place of the first, a well-defined picture can again be obtained. On bringing the candle nearer the flat lens, the image will once more be thrown out of focus, but a clear picture is in this case obtainable by substituting a rounder or thicker lens.

In the foregoing experiment the candle alone has been moved, whereas the lens has been kept at the same distance from the wall. It shows that when an object is further off a flatter lens is needed to procure a clearly defined picture; and, on the other hand, the nearer the object, the thicker is the lens required to produce the desired effect.

Something of a similar kind happens in the human eye, which is so constructed as to focus distant objects without effort. The crystalline lens remains at a fixed distance from the retina, but instead of changing the position of the lens in order to define near objects, its shape is altered by a process known as "accommodation".

The crystalline lens is elastic, and is held in its position by a strong but delicate suspensory ligament. When this ligament is loosened, the front part of the surface of the lens bulges out, as it were, by virtue of its own elasticity, and is then by its rounder shape adapted for the focussing of near objects. The nearer the object is to the eye, the rounder does the lens become. On the other hand, when the ligament

is tightened, the crystalline lens is squeezed into a flatter shape, and is thus enabled to throw a clear image of distant objects upon the retina.

Although this action of bending or refracting rays to a focus is mainly due to the crystalline lens, yet it is aided by the other transparent portions of the eye through which the rays of light pass to reach the retina. As noted before, these additional structures are the cornea, the aqueous and the vitreous humours. That they have in themselves some power of focussing is shown by the fact that after removal of an opaque lens, as in the ordinary operation for cataract, the patient still retains a fair amount of vision. For instance, he sees a door, but cannot recognise its panels without convex glasses to replace the lost crystalline lens.

A vertical section of the eyeball, as in the Frontispiece, shows some structures not yet described. The main wall of the vitreous chamber is composed of three coats, namely, the sclerotic, the choroid, and the retina, from without inwards. The SCLEROTIC is the thickest of these three coats; it is tough, white, and opaque, and is continuous in front with the clear cornea. The CHOROID is a thin dark coat that lines the sclerotic, and resting on the inside of the choroid is the delicate retina. The RETINA is the sensory expansion of the optic nerve, and occupies the hindmost two-thirds of the vitreous chamber. It is an extremely delicate membrane, about the $\frac{1}{100}$th of an inch in thickness, and under the microscope is seen to be made up of several layers. Next to the vitreous

is a covering of fine optic nerve fibres, ending in the layer of rods and cones (Fig. 3), which is more or less embedded in the choroid. The optic nerve pierces the back of the eyeball, not exactly in the centre of the globe, but rather towards the inner or nasal side (Fig. I.). The central spot itself is

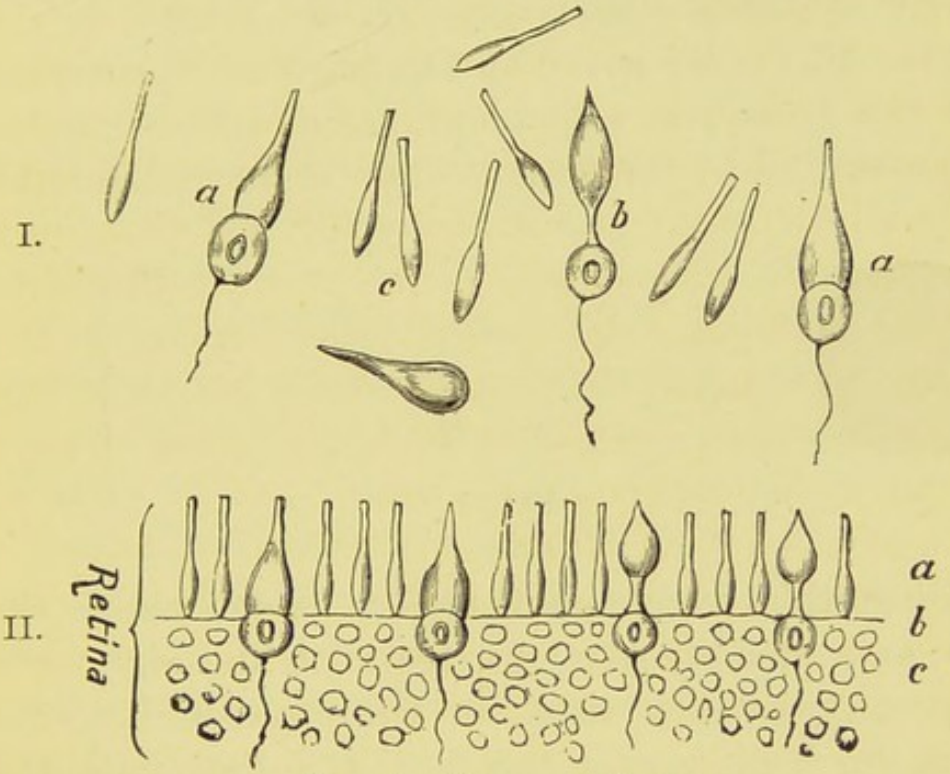


FIG. 3. RODS AND CONES.

I. *a* Retracted or sessile cone.
b Protruding or pedunculated cone.
c Rods.

II. *a* Rods and cones.
b Membrana limitans externa.
c External nuclear layer.

marked by a small depression; it is known on account of its colour as the yellow spot, or *macula lutea* (Fig. II.). At this point, vision is most acute, and under the microscope it is found that there the innermost layers of the retina are thinned and

almost altogether absent, while the macula itself is made up almost entirely of cones.

The rods and cones are the only part of the retina acted upon by light. For instance, the layer of optic nerve fibres next the vitreous has no perception whatever of light; it is in point of fact blind, and merely conducts impressions on their road to the brain. The optic nerve at the place of its entrance into the eyeball is also blind, a fact which may be demonstrated by the famous experiment of Mariotte.

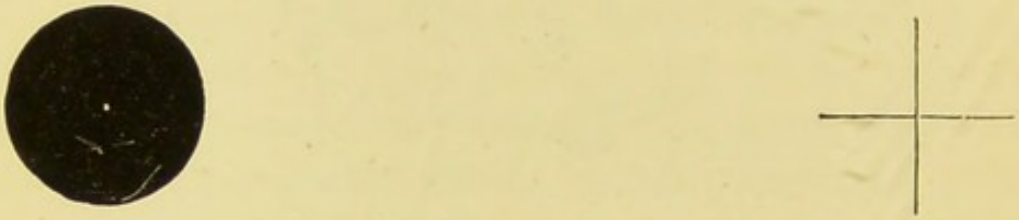


FIG. 4.

Holding this page about twelve inches from the eyes, look steadily at the cross with the right eye, keeping at the same time the left eye closed. Next bring the book nearer the face, and the circle will disappear at a certain point, to reappear again as the paper is brought still nearer the face. The experiment may be varied by closing the right eye, and looking at the circle with the left.

The suspensory ligament of the lens is seen to be continuous with the choroid coat. Between the ligament and the iris is what is known as the CILIARY BODY and the CILIARY MUSCLE. The latter is composed of unstriped muscular fibres spreading out star fashion from the back of the iris upon the choroid.

Its action is to draw forward the choroid, by which means the suspensory ligament is loosened, and the elastic lens swells out, so that its shape is altered or accommodated for focussing near objects. The ciliary muscle is thus the important structure by which accommodation is effected, and, contrary to the general rule as regards unstriped muscle, it is to a large extent under the control of the will.

The action of accommodation can be shown in the following simple way. Let the observer look through a window at a distant object, say, a church, and he will be unable to see any flaws that may exist upon the window pane. Let him next look at something on the pane, such as a name scratched with a diamond, and he will be no longer able to distinguish the church clearly. The shape of the lens is altered considerably or accommodated in each instance; and another person looking sideways into the observer's eye would be able to see the iris actually bulged forwards by the rounding of the lens when the gaze was shifted from the church to the window pane.

Wonderful instrument though it be, the human eye is by no means without errors. Owing to imperfect accommodation we often form untrue ideas about objects outside our eyes ("irradiation"), impressions which are rendered still more false because the media of the eye are not absolutely transparent. Instances of this are numerous. Thus, black clothes make the wearer appear smaller than he really is, a fact that is constantly taken advantage of by stout

people; again, white letters on a black ground, as advertisers know, look larger than black letters on a white ground. If we take the following simple figures we shall see there is an apparent difference in size both in (a) and in (b), whereas the appended measurements show them to be exactly equal.

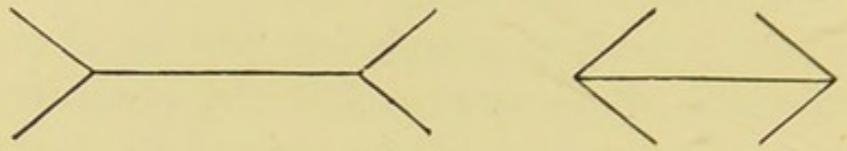


Fig. 5.

The reader will now understand why the eye has been compared with a camera. In either case, the design is to throw a clear image of an outside object upon a sensitive plate at the back of a dark chamber. The photographer regulates the amount of light he wishes to enter his apparatus by placing diaphragms of various sizes in the aperture of his camera; but this is effected in the eye by a single contracting or expanding body, the iris. The operator adjusts his focus by sliding the lens nearer to or further from his sensitive plate. The crystalline lens, however, has a much finer mechanism, by which the shape of the lens itself is altered, a single lens thus answering all the purposes of near and of distant vision. There the simile ends; for the photographic picture is fixed on the glass by suitable chemical processes, whereas the picture focussed on the rods and cones of the retina is conveyed to the brain, where its meaning and message is interpreted by the reasoning faculty.

The photographer is unable, at any rate so far, to take a satisfactory picture in colours, whereas the retina has the power of recognising different colours. If the eye be fixed steadily for a few moments, say, upon a red maltese cross printed on white paper, and then the gaze be turned to the ceiling, a green cross will be seen in the latter position. This is because the particular part of the retina which received the original picture of the cross has become exhausted for red light, and it is replaced for the time being by the remaining colours that make up white light. Some people are naturally blind to one or more colours; for instance, they may be red-blind or green-blind, or more rarely violet-blind. In most cases, this defect causes so little inconvenience that it may not be even suspected; but where it occurs amongst men who have to interpret colour signals as part of their duty, it may lead to very serious consequences. There is some evidence to show that many otherwise mysterious collisions between railway trains and between ships may be accounted for in this way.

CHAPTER II.

THE GERM THEORY OF DISEASE.

Of late years almost all our great advances in medicine have depended upon our better knowledge of germs and their relation to disease. Since the discovery of the *bacillus* of the silkworm scourge by Pasteur, the origin of many other maladies, both in man and in the lower animals, has been traced to micro-organisms.

Pasteur's earlier researches proved that fermentation was due to the presence of a special yeast fungus. He showed that this minute organism flourished in certain fluids, where it set up a series of definite chemical changes, and that its cells exhibited the three great vital phenomena of nutrition, growth, and reproduction.

A typical yeast cell—for there are many varieties—is oval or rounded in shape, and about $\frac{1}{3200}$th of an inch in length, that is to say, the same size as a red blood corpuscle. For its development and active life it requires water, warmth and oxygen, besides certain substances which serve as food. It never originates spontaneously in a fluid, but always springs from a pre-existing yeast cell. By its growth in a solution of one or more particular kinds of sugar it splits up the latter into alcohol and carbonic acid gas,

of which the latter appears as a froth. Further, drying does not destroy the vitality of the yeast, so that a dried fragment is capable of starting into active life if added to another sugar solution, where it goes on flourishing and reproducing its kind so long as any sugar is left. If boiled, however, it is killed once and for all, and a similar thing happens if it be exposed to the action of certain chemical substances, such as carbolic or salicylic acid of sufficient strength. Drugs which possess this power of destroying germs or micro-organisms are called "antiseptics".

From the foregoing sketch one may gather some of the chief facts regarding micro-organisms and their mode of action. One sees that this minute vegetable cell thrives and multiplies under favourable surroundings as to food, warmth, and moisture; that it springs from pre-existing cells of the same species, and reproduces its like; that it has a definite life history, in the course of which it decomposes the surrounding material which acts as its food; that it manufactures fresh chemical products of an entirely different kind; lastly, that the fungus, within certain limits, is capable of great vitality, but at the same time may be destroyed by boiling and by antiseptic drugs.

All micro-organisms, however, do not act in the same way as the yeast plant; in fact, they vary as much amongst themselves as common garden plants and vegetables. Thus, they differ in their shape, in the way of reproduction, in the food they require, in their *habitat* and in the chemical products to which

they give rise. Some of them cannot live without oxygen, while others demand carbonic acid; some can exist only in dead matter (*saprophytes*), and others only in living tissues (*parasites*).

Suppose we take some ordinary mutton broth and leave it exposed to the air in an uncorked flask; we know that in a few days it will acquire a bad taste and smell, or, in other words, it will have become spoilt. This change is caused by certain germs that have gained access from the air and have set up chemical processes somewhat akin to fermentation, but differing in their products, and known as putrefaction. If now we inject a sufficient dose of this stinking broth beneath the skin of a guinea pig, the animal will sicken and die. Something of the same kind happens in many of the diseased processes that take place in the human body. When an abscess, for instance, becomes foul and evil-smelling, it means that micro-organisms have gained an entrance into the abscess cavity and set up putrefaction. Some of the poisonous products of putrefaction may be absorbed into the body, and lead to a long and lingering illness (*blood-poisoning*), or even kill the patient.

Fermentation and putrefaction, then, are always due to the presence of micro-organisms. Broadly speaking, these fungi are the simplest forms of vegetable life; plants without leaves, branches, roots, flowers, or colouring matter (chlorophyll). Moreover, they live on preformed substances, as sugar or albumen, and do not build up their food from air,

water and soil, as is the case in the higher plants. The germs of these organisms, which we may compare with the seeds of plants, are found everywhere in nature, in the air, in the earth, and in the waters beneath the earth. Indeed, we know that very many of the operations of nature, such as the decay of vegetation and the fertilisation of soils, are carried on by means of these tiny micro-organisms. If we expose a tumbler of milk over-night in warm weather, it will probably be sour in the morning, because of the invasion of a peculiar fungus, the *oidium lactis*, which has changed the sugar of the milk into lactic acid.

Putrefaction cannot go on without these minute plant cells; and the prevention of that process in wounds by the exclusion of micro-organisms or their germs is the broad underlying principle of antiseptic surgery. To exclude parasites from entering the body in other ways is the aim of preventive medicine.

Let us boil some mutton broth in another flask and put a plug of wool in the neck of the vessel. The broth may now be kept for weeks or months without undergoing any visible change. In this case we first destroy by boiling all the organisms or spores that may happen to be in the broth, and we prevent the access of fresh ones from the air by the plug of wool, which acts as an efficient filter. Similarly, by adding a sufficient quantity of some antiseptic, such as corrosive sublimate, we shall destroy all fungi that may be present, and the flask may be then sealed and put away for years and years without any

putrefactive changes taking place in the broth. In surgery we purify a wound by antiseptics and by other means, and then guard against the entrance of germs by suitable dressings which act both as filters and as destroyers of germs (*germicides*). Aseptic surgery, on the other hand, aims at the excluding

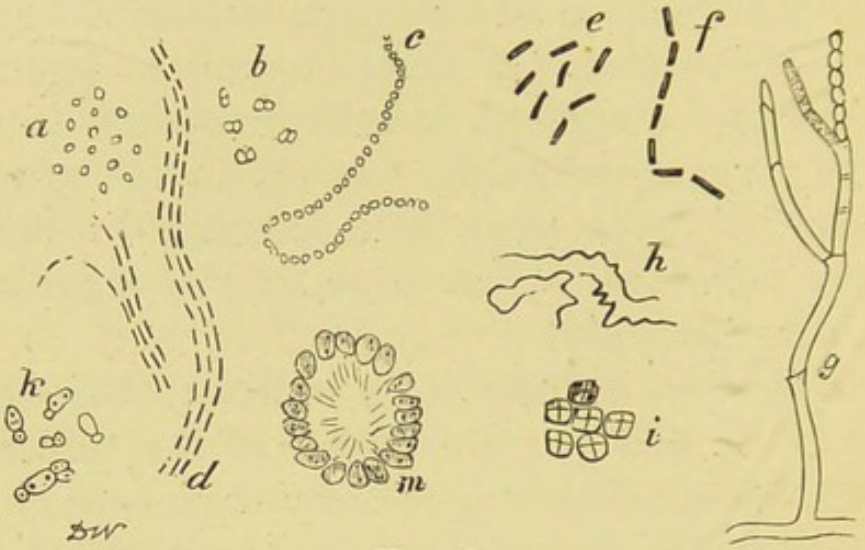


FIG. 6.

a Simple round cells, or cocci.
b Diplo-cocci.
c Chains of cocci, or strepto-cocci.
d Bacilli arranged in threads, or lepto thrix, from human mouth.
e and *f* Bacilli.
g Mould fungus.
h Cork-screw forms, or spirillum.
i Packet-forms, or sarcina.
k Yeast fungus.
m Tubercle bacilli lying inside a giant-cell.

the entrance of septic organisms by the most scrupulous cleanliness as regards all and every surrounding of a wound.

Micro-organisms are of various shapes (Fig. 6). They may be simple round cells (cocci) arranged in pairs (diplo-cocci), in fours, in chains (strepto-cocci), or in colonies (staphylo-cocci), or they may be rods,

straight, curved, oval, spiral, comma, and other shapes variously grouped in chains and in colonies. They are all extremely small, as may be judged from the fact that one of the largest, the bacillus of anthrax (cattle plague), measures only $\frac{1}{500}$th of an inch in length. Indeed, the organisms concerned in the production of parasitic disease are so small that it is no exaggeration to say that millions of them might dance on the point of an ordinary needle. The difficulty of studying the life history and habits of such tiny bodies may be readily imagined.

Bacteria, the most important species of the disease-producing fungi, may be reproduced either by simple splitting or by the internal formation of spores. These spores, as already stated, may be compared with the seeds of higher plants, and the fact should be noted that they are often of far greater vitality than the fully formed bacteria. Spores are therefore often able to resist the action of heat or of antiseptics that would readily destroy the parent organisms.

The products of bacteria are very various; but among the most important, so far as the human body is concerned, are the ptomaines, or "toxines" as they are sometimes called, These ptomaines are the products of decomposition; they are usually very poisonous, and may be compared with the alkaloidal poisons, such as strychnia, found in higher vegetable life, and which are fatal in minute doses. In many parasitic diseases the main part of the mischief is due to ptomaine poisoning. For example, typhoid fever is caused by a bacillus that infests the

lower bowel, where it causes a large amount of inflammation and ulceration. The rise of temperature, the muscular pains, the prostration, the loss of appetite and other symptoms are, however, probably due to the absorption into the system of ptomaines excreted by the typhoid bacilli. So in lung consumption, we find the local centres of inflammation or "tubercles"; but many of the characteristic symptoms, such as the continuous raised temperature, the thirst and emaciation, are to a great extent caused by poisoning from the products of the tubercle bacilli.

Koch, whose name has been made famous by his work in bacteriology, as the study of these minute fungi is called, began by perfecting his microscope. He also devised new methods of staining micro-organisms, whereby they were more readily to be distinguished in the tissues. His greatest step, however, was the discovery that bacteria could be grown in suitable material, or "media," outside the body. In this way many micro-organisms can be cultivated almost as readily as we grow radishes or mushrooms in a frame. Tubercle bacilli planted in tubes of nutrient gelatine properly sterilised (that is, freed from organisms), and kept at the requisite degree of warmth in a small oven or "incubator," will thrive and flourish. In this way they have been handed on from tube to tube through twenty or thirty generations, with a continuous descent extending over several years.

When obtained artificially in this manner a "pure

culture," or colony composed of one kind of organism only, has its own peculiar method of growth. Thus in Figure 7 three tubes are shown, each of which

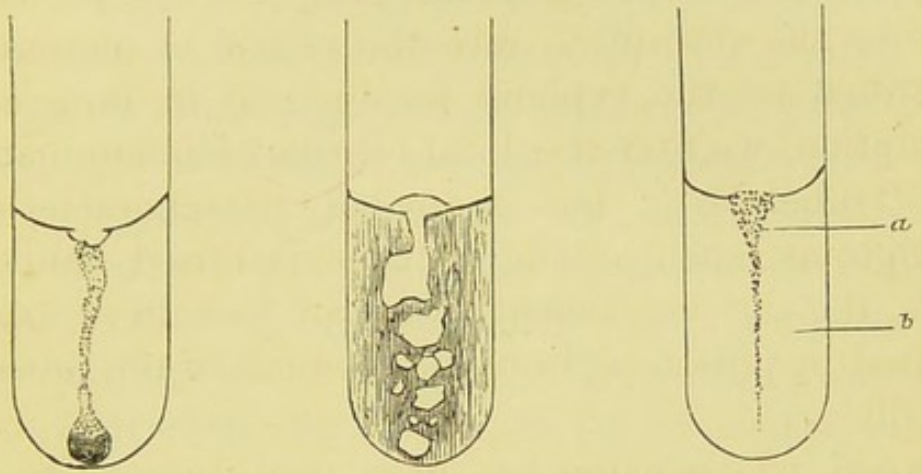


FIG. 7.

has its own shape and colour, as it grows downwards into the gelatine.

The last link in the chain of proof is to test the pure culture by injecting some of it beneath the skin of an animal which is known to be susceptible to the action of that particular organism, and noting whether the original disease be reproduced. For instance, the guinea pig is especially subject to tuberculosis, and when inoculated with the bacilli of that disease, tubercles are rapidly formed in the lungs and other parts of its body.

Other media are in use besides gelatine, amongst them being various fluid and solid materials, as for instance meat jellies or the surface of a raw potato. Cultivation, however, cannot be applied to all organisms, for many of them refuse to grow in any medium or under any conditions hitherto discovered.

Nevertheless, there can be little doubt that some day, as our methods of investigation become more perfect, we shall discover many bacteria that are now unknown, such as those of mumps, of syphilis and of influenza. Amongst those already identified may be mentioned the organisms of anthrax, relapsing fever, typhoid, tuberculosis, cholera, erysipelas, glanders, and of the suppurative process generally. Suppuration is commonly believed to be the work of several fungi, among the most important of which are the *staphylococcus pyogenes aureus* and *streptococcus pyogenes*. In the eye we can trace to definite organisms ophthalmia neonatorum and gonorrhœal ophthalmia (gonococcus), diphtheritic conjunctivitis, lupus and tuberculosis of conjunctiva (tubercle bacilli), abscess of cornea and suppurative processes. The presence of a specific micrococcus in trachoma is still doubtful.

The eye affords a good vantage ground for the growth of micro-organisms. It supplies a warm, moist surface abundantly supplied with a watery fluid which contains various salts and a trace of albumen. Indeed, when we consider these favourable conditions, together with the exposed position of the eye, we may well wonder that it is ever free from mischief due to the entrance of organisms. Mucous membranes, however, share with other healthy tissues a great power of resisting the attacks of bacteria. It has been shown that the white blood corpuscles have the remarkable faculty of taking into their interior, and, as many people suppose, of actually destroying bacteria (*phagocytosis*).

One point should be specially noted. The presence of accumulated discharges in any part of the body is an open road to the invasion of micro-organisms. Pus, which is so much dead matter, furnishes an excellent nutrient medium, or food, for bacteria. Hence it is a first rule in antiseptic surgery to provide for the quick and constant removal of discharges either by drainage or in other ways. The eye may be cleared of matter by gently wiping the exposed conjunctiva with a piece of cotton wool. Both syringing and irrigation are open to the objection that they are dangerous to the person who applies them.

Antiseptics, if required to destroy bacteria, must be of a certain degree of strength. This fact presents a difficulty in treatment, for a strong antiseptic is usually irritating. Another obstacle arises from the minute nature of these organisms, which are easily shielded in the tissues so that in many cases it is impossible to attack them directly with any antiseptic agent. If one could reach the bacilli in the lungs in a case of phthisis, there would be a reasonable hope of getting rid of the disease. No method, however, has yet been devised of bringing any antiseptic into thorough contact with the tubercle bacilli, scattered as they are through every part of the air passages down to their finest terminations, and shielded by mucous and other secretions. At one time it was thought that the desired end might be attained by the inhalation of antiseptic vapours, but when put into practice the method has proved disappointing.

The ideal antiseptic, which shall destroy bacteria, and at the same time be unirritating, non-poisonous, and harmless to instruments, has not yet been discovered.

The nurse will now perceive how necessary it is to prevent the introduction of these minute particles of vegetable matter or their no less dangerous spores into the eye. She will recognise why it is of the utmost importance to consider and guard against any and all of the hundred and one ways in which they may gain access to the cavity of the conjunctiva; why it is that the hands must be purified with antiseptics; why unclean towels and flannels and sponges are fertile agents of mischief; why eye-shades should be promptly destroyed in infectious cases; why instruments and appliances must be scrupulously cleansed. In a word, she will have the key, by an intelligent knowledge of the relations of bacteria to disease, to many of the directions given in this book, and which without that clue might appear to be tedious and unnecessarily minute.

Antiseptics will be described under the section that deals with remedies generally. It is interesting to note that the virtues of many of the old-fashioned remedies may be traced to the antiseptics which entered into their composition.

CHAPTER III.

CONTAGION AND INFECTION.—CONTAGIOUS EYE DISEASES.—AVOIDANCE OF CONTAGION: (*a*) ON PART OF PATIENTS, (*b*) ON PART OF NURSES.—TOWELS.—WASHING ARRANGEMENTS.—RULES.

CERTAIN diseases of the eye are contagious, that is to say, they may be communicated from the sick to the healthy, and are commonly said to be "catching". They are due to micro-organisms, which may reach the eye in a direct or an indirect manner. Contagion is direct when a particle of septic discharge is planted, so to speak, in a healthy eye, as happens when the diphtheritic virus is coughed into the eye of a doctor by a patient suffering from diphtheria. Contagion is indirect, on the other hand, when the infecting material is conveyed by means of some intermediate agency, such as water, sponges, or towels. Another example of indirect contagion is when a patient transfers matter from his diseased to his healthy eye by means of a finger.

It has been assumed that, under certain circumstances, a contagious eye disease may become infectious; in other words, that it may spread through the medium of the air. Particles of the dried discharge, it is supposed, float about in the atmosphere as dust, and these, coming into contact with sound

eyes, communicate the original disease. Something of a similar kind certainly happens in the case of measles, influenza, scarlet fever, and other highly infectious diseases. One cannot, of course, deny the impossibility of a similar occurrence in eye diseases, but it could come about only under the influence of bad surroundings or of gross mismanagement, such as neglect of treatment, overcrowding, dirty clothes, unwashed bedding, or the herding together of diseased and healthy persons in one room. My own experience has not furnished me with any conclusive instances of air-borne ophthalmia.

The contagious eye diseases are those inflammations of the conjunctiva collectively known as "ophthalmia," and under this heading a number of different affections will be found grouped together. All forms, however, have one feature in common, namely, the presence of discharge from the eye. It is a good working rule to regard all discharges from an inflamed eye as contagious, and the more abundant the flow of matter, the greater are its contagious properties likely to be. The discharge varies in colour: sometimes it is white and slimy, like that from the nostrils during a "cold in the head," and at other times it is yellow. The white discharge is called mucus, and the yellow, pus, while between the two are a number of intermediate varieties which may be styled mucopurulent. The more a given discharge resembles pus in its appearance, the more virulent is it likely to be, from which statement it follows that the chances of contagion are increased with the presence of copious yellow matter.

The different forms of ophthalmia vary much in their degrees of contagiousness. The chronic form of conjunctivitis known as "trachoma" is slightly contagious only, and the same is probably true of "catarrhal ophthalmia," commonly known as "blight". On the other hand, acute purulent ophthalmia, caused by the introduction of gonorrhœal matter into the eye, is highly contagious. The smallest particle of discharge from such an eye is sufficient to communicate the disease in its full activity. This fact can be easily explained now that both gonorrhœa and gonorrhœal ophthalmia have been proved to be due to a minute parasite, the gonococcus. The acute form of ophthalmia, again, which affects newborn infants (*ophthalmia neonatorum*) is markedly contagious, and may rapidly run through an entire household, unless proper precautions be taken to prevent its spread. Ophthalmia neonatorum is akin to gonorrhœal ophthalmia, and is caused by infection of the child's eyes during its passage into the world. The gonococcus may be often demonstrated in the discharge. A third highly contagious form of disease is found in diphtheritic inflammation of the conjunctiva. Fortunately, this formidable affection is rare in England, although common enough in many parts of Europe, as for instance in North Germany. It often occurs as an epidemic, and is caused by the virus of diphtheria gaining access to the eyes. In point of fact, it is simply a local form of the disease.

The following diseases, then, are contagious:

trachoma, catarrhal ophthalmia, ophthalmia neonatorum, purulent ophthalmia, and diphtheritic conjunctivitis.

Let us now suppose that we have to deal with an adult patient suffering from acute purulent ophthalmia limited to the right eye. The discharge from such a case will be profuse and purulent, and, in the absence of proper safeguards, will certainly find its way over the bridge of the nose into the left eye. How shall we prevent inoculation of the left eye with the contagious discharge? Our patient being in bed, the first obvious precaution will be to make him lie on his right side, so that the matter may flow away from the sound eye. But this expedient alone will not suffice to ensure the left eye against inoculation. Two plans are in vogue, either of which effectually shields the unaffected eye. By the first method, the lids of the sound eye are smeared with iodoform and vaseline (iodoform, one part, vaseline, eight parts), and are accurately covered with a disc of fine linen. A layer of antiseptic cotton-wool is placed over the linen, and a bandage is carefully applied. Finally, the eye is completely sealed up by placing morsels of cotton-wool saturated with collodion in any gaps that may remain between skin and bandage. This method, although thoroughly protective, has various drawbacks. In the first place, the eye becomes liable to a kind of superficial inflammation, and the dressing soon grows hot and uncomfortable; secondly, the eye is excluded from all exercise of vision; thirdly,

the dressings must be changed every day. These disadvantages may be avoided by adopting the watch-glass and sticking-plaster shield introduced some twenty years ago into ophthalmic practice by Dr. Buller.[1] The materials needed for the application of a "Buller's Shield," as it is sometimes called, are an ordinary watch-glass and some india-rubber sticking-plaster. Two pieces of the plaster are taken, the one measuring about four and a quarter inches square, the other about four and three-quarter inches square, and a circular hole is cut in each. The larger piece of plaster is fixed to the bulging side of the watch-glass; the latter is then turned over, and the smaller piece of plaster fastened in a similar way on the hollow side. The watch-glass is thus placed between the two pieces of plaster,

FIG. 8.
APPLICATION OF BULLER'S SHIELD.

[1] Buller's original shield was constructed as follows: a watch-glass was fastened into the centre of a square piece of mackintosh, trimmed to fit the nose and the forehead of the patient. By means of three strips of adhesive plaster, the waterproof shield was then fastened to the nose and to the forehead. The lower and the outer side of the apparatus was left open, so that the eye was freely exposed to the air. The plaster was renewed whenever it became moist.

which are stuck together by their adhesive surfaces. To apply the shield, the overlapping adhesive margin of half an inch is carefully fastened to nose, forehead, and cheek, but the lower part of the outer side is left open, so as to admit air (Fig. 8). The attachment to the side of the nose requires careful adjusting; and it may be necessary to add one or two extra strips of plaster in that situation. Buller's shield permits the patient to use the protected eye, while its free ventilation not only obviates inflammatory trouble, but also adds considerably to the comfort of the patient. It may be worn for many days without change, unless, as sometimes happens, the skin beneath the plaster becomes affected with a kind of eczema. In that case, a simpler form of protection must be substituted, and the irritable skin soothed with appropriate remedies.

So far we have been dealing with an adult patient, but the case is somewhat different with infants, in whom it is often a matter of difficulty to keep any sort of appliance in place. Perhaps our best plan under these circumstances is to close the lids of the sound eye by means of a couple of strips of adhesive plaster, reaching from the upper lid well down the cheek. Over this we put a pad of cotton-wool, and cover in the whole with gutta-percha tissue, the edges of which are cemented to the skin of the nose, the forehead, and the cheek by the aid of a few drops of chloroform. A decidedly inferior plan is to cover the sound eye with a pitch plaster, in the centre of which a small hole is cut for ventilation and for sight.

The various utensils used in washing are every-day agents in the spreading of contagion. In this way, towels, sponges, basins, and flannels are all sources of danger, when used in common by the healthy and by those affected with ophthalmia. A nurse should take care, therefore, that each patient has his own set of washing utensils, and that under no circumstances is he to use those belonging to other persons. In large schools, where the various forms of ophthalmia are often very prevalent, great importance is attached to this point. The children wash in running water, and the use of fixed basins is altogether prohibited. A similar principle is recognised with regard to baths, and two children are never permitted to use the same water. Indeed, some of the more modern establishments have replaced the "slipper" or plunge bath by what is termed a "spray bath". The latter consists of a slate case provided with a glass door, while the water is supplied by means of an iron service pipe with perforated nozzles. Directly a child steps into the bath, certain valves are opened by means of a spring, and the jets throw a fine spray over the whole body. In some schools a child is not allowed to use the same towel twice. More generally, however, each towel is marked with the number of the child's bed, and is changed daily or less frequently. At the same time the use of towels belonging to other children is prohibited under pain of punishment.

In dealing with contagious cases, sponges and washing flannels should be altogether discarded, and

basins, if used at all, should be thoroughly disinfected after use. The better plan to follow in these cases is to make the patient wash in a stream of water running from a tap. A piece of tow may be used for the patient's face, and this material should be burnt immediately after use. The same rule of immediate destruction applies to all dressings and other contaminated materials.

Handkerchiefs are a possible source of danger. If not done away with altogether, they should at least be stitched to the patient's clothing, so that they cannot be used by more than one person.

Contagious eye affections may be of course communicated to the nurse herself, and certain precautions should be taken against so unfortunate a result. All preventive measures centre around the fact, to which attention has been already drawn, that the essential element of contagion dwells in the discharge. "No discharge, no contagion" is an excellent maxim for those who deal with ophthalmia. It is probable that the fingers are the commonest carriers of contagion, and they therefore require close attention. When called upon to take charge of a case of ophthalmia the nurse should cut her nails closely, and should keep them short during the whole time she has to do with the case. After handling an eye, and before leaving the room, she should wash her hands with most scrupulous care. The use of the nail-brush, especially, must never be omitted. For my own part, I attach more importance to the conscientious use of a nail-brush than to any of the

so-called antiseptic soaps, so widely advertised in the present day. There is, however, no objection to the use of such soaps, provided their reputed virtues do not make the nurse careless of the more homely means of scrubbing. It is not a bad plan, when dealing with severe cases, to pack with hard soap the little space that remains beneath properly pared nails. Before drying, the hands should be immersed for ten or fifteen seconds in a solution of carbolic acid (1 in 40) or of corrosive sublimate (1 in 4000). I would urge, however, at the risk of some repetition, that careful cleansing in the first instance is to be regarded as nine-tenths of the battle.

In removing discharge from an eye, it is well to wear a pair of protective goggles, so as to prevent any sudden spurt of matter from reaching the eye of the attendant.

Another way in which I have seen contagion conveyed has been through taking an affected child into the arms for purposes of nursing. It will be well, therefore, for nurses to avoid any such practice when dealing with children suffering from ophthalmia.

The nurse's dress should be of some stuff that can be easily washed, and she should wear a large waterproof [1] apron, which can be cleansed with antiseptics after each dressing. Sleeves should be close fitting and short at the wrist, while the latter should be protected with a linen cuff. As an additional pre-

[1] Jaconet, which is much lighter than mackintosh, makes an excellent apron.

caution in cases where there is much discharge, a loose kind of sleeve may be worn, reaching from wrist to elbow, and made of green protective or jaconet. This sleeve can be easily slipped off and on, and should be disinfected before and after use in a one in twenty carbolic lotion.

In case matter reaches the nurse's eye, prompt action must be taken. The lids must be everted, and the conjunctiva thoroughly flushed with 1 in 5000 corrosive sublimate solution. After that, one drop or more of a two per cent. silver nitrate solution should be placed over the exposed membrane, and cold applications should be used for some hours. These precautions, if carried out at once, will probably prevent further mischief.

The rules, then, which should be observed by a nurse in dealing with contagious eye diseases may be summed up as follows:—

1st. Pare the nails closely. 2nd. Remove all applications with dressing forceps, and not with the fingers. 3rd. Make it a point to use the nail-brush diligently, and to wash the hands thoroughly before leaving the room. 4th. Never take an affected child into the arms if it can be possibly avoided. 5th. Stand behind the patient when using remedies, as this position is least exposed to the risk of accidental spurts of matter. 6th. Never use a syringe. 7th. Wear protective goggles, mackintosh apron, and sleeve guards when attending the more virulent diseases, such as gonorrhœal or diphtheritic ophthalmia.

CHAPTER IV.

REMEDIES.

The greater number of affections of the eye which the nurse will be called upon to treat are due to inflammation and its results. A few words may therefore be said regarding that process.

Acute inflammation is, so to speak, put in a nutshell by the four symptoms of the old writers—redness, heat, swelling, and pain. It may arise from a variety of causes, such as injury, the presence of foreign bodies, cold, new growths, irritant chemical substances, or micro-organisms. The process may end in the absorption of effusion (swelling) and recovery; it may go on to ulceration, to abscess, or to sloughing; or it may become chronic, in one form of which the effused material is slowly converted into new tissue. As pointed out by Sir Thomas Watson and other writers, nowhere can the process be more readily studied in its every stage than in the eye. An inflamed conjunctiva, for instance, is bloodshot, swollen, and painful; while a delicate thermometer, placed beneath the lid, would show the temperature to be raised.

The treatment of inflammation will be directed, in the first place, to removal of the cause, such as a foreign body or septic material (micro-organisms or

their products); while some constitutional ailment, as syphilis or rheumatism, may require appropriate medicine. Symptoms must be treated as they arise; blood-vessels may be emptied by astringents or by blood-letting, and pain relieved by the use of anodynes. Another important branch of treatment is the preventive: for instance, if one eye be suffering from a contagious complaint, it is in every way desirable to shield the other eye from infection. It is a first rule, again, that we must try to hinder all surface inflammations from spreading to deeper parts of the eye. A further preventive measure is to avoid the introduction of micro-organisms on hands, sponges, brushes, instruments, or anything else that approaches the eyes, a purification of surroundings which goes by the general name of "aseptic precaution".

We have, then, a large class of remedies, the most important of which are astringents, sedatives, and anodynes, concerned in the direct treatment of inflammation and its symptoms: a second class includes antiseptics, or substances that destroy micro-organisms: while a third class embraces irritants, depletives, and remedies of various actions.

Something may be said here about absorbent cotton-wool, which is much used in eye work. A morsel of wadding floats when thrown into water, whereas a piece of absorbent wool similarly placed sinks to the bottom of the vessel. Absorbent wool takes up water because the greasy matter of ordinary cotton-wool has been removed by treatment with

soda and spirits of salt. Advantage is taken of the properties of the prepared wool to impregnate it with various antiseptics, such as boric acid, eucalyptus, iodoform, mercuro-zinc cyanide, or sal alembroth. Pads of absorbent wool are much used in the place of sponges. Gamgee tissue consists of a layer of absorbent wool, about half an inch in thickness, enclosed between two folds of unbleached gauze. A convenient eye-dressing can be made out of this tissue, either plain or charged with one of the above-mentioned antiseptics, by cutting out a piece three inches across and rounded at the corners.

Antiseptics.

Boric or Boracic Acid is an unirritating astringent, with slight antiseptic properties. It is extensively used as a lotion, in a strength of five to twenty grains to the ounce of water. The addition of an equal quantity of borax renders the acid more soluble, and at the same time adds to its effectiveness.

Carbolic Acid in weak solutions, from a half to one part in a hundred of water, makes a good antiseptic lotion. Absolute phenol should be used, as the common acid is irritating to the eye.

Permanganate of Potash, better known in solution as Condy's Fluid, makes an excellent antiseptic wash; but it is not used so much as it might be, probably because it has the drawback of staining linen.

Iodoform, a yellow powder; a powerful antiseptic when applied to wounds. It has a strong distinctive odour, and is used as an ointment (one in twelve of

vaseline), or is dusted over parts after operation. Also prepared in discs with gelatine, $\frac{1}{1000}$th of a grain in each, but these are seldom employed. Sometimes dissolved in collodion, and painted over the lids. Another preparation is iodoform wool.

Iodol is a brown powder, free from smell, which acts like iodoform.

Sulphate of Copper (bluestone), although generally used for its other properties, is a powerful antiseptic.

Quinine, in lotion, three grains to the ounce of water, dissolved by the addition of one minim of diluted sulphuric acid.

Mercury is a powerful antiseptic in many of its preparations, of which the following are the chief:—

Corrosive sublimate, extensively used in weak lotions, one part in 3000 to 5000 parts of water; also in combination with ammonium in sal alembroth wool, coloured blue for the sake of distinction. It is a remedy of ancient repute in the treatment of distempered eyes, a fact fully explained in the light of modern scientific knowledge. Corrosive sublimate is a most valuable and active antiseptic, but has the drawbacks of being poisonous and of coagulating albumen. Mercurial poisoning, or "mercurialism," as it is called, is recognised by soreness of the gums and loosening of the teeth, by fœtor of the breath, by "salivation"—a profuse flow of saliva from the mouth—by griping, by diarrhœa, and occasionally by tremors and other nervous symptoms.

The red oxide of mercury was formerly much used, but is now almost entirely replaced by the yellow

oxide, which is employed as an ointment containing eight to sixteen grains to the ounce of vaseline. This preparation is widely known as "Pagenstecher's Ointment".

Ammoniated Mercury and Nitrate of Mercury are also used in the form of ointments.

Under the name of "Panas' solution," biniodide of mercury mixed with alcohol and water has been employed as an antiseptic after cataract extraction.

Calomel is a good antiseptic dusting powder, and is often used in superficial inflammations of the eye. Its action probably depends on its slow conversion into corrosive sublimate by the salt tears; at any rate, it is insoluble in water.

Blue ointment is sometimes used for inunction, a process which will be described later on.

Astringents.

These substances cause contraction of blood-vessels, which are thus partially emptied of blood. Most antiseptics are also more or less astringent.

Sulphate of Zinc is used as a lotion, one half to two grains to the ounce of water. Acetate of Zinc, also, is a good astringent. Chloride of Zinc, two grains to the ounce of water, has powerful astringent properties.

Sulphate of Copper, lotion of one to four grains to the ounce of water.

Subacetate of Lead as lotion (three grains to the ounce), or as a one to two per cent. ointment. This remedy has fallen into comparative disuse, as there

is a danger of its being deposited and so causing an opacity in the cornea whenever the surface of the latter is in the least broken. It is a useful application however, and one that would be difficult to replace in the treatment of certain conditions.

Alum is sometimes used as a lotion (grains one to five to the ounce), but has almost fallen into disuse.

Nitrate of Silver, one half to four grains to the ounce of distilled water, is an invaluable astringent collyrium. Stronger solutions (grains ten, fifteen, or twenty to the ounce) are applied to the conjunctiva in cases of Trachoma or of Purulent Ophthalmia. The solutions should be kept away from the light, or else placed in a blue glass bottle, as otherwise they soon become useless owing to certain chemical changes.

Sulphocarbolate and Permanganate of Zinc make excellent astringent lotions.

Chlorine water possesses astringent and antiseptic properties, and is extensively used at the present time. The remedy is, however, an old one.

Anodynes

are remedies that ease pain, and may be given by the mouth, or applied externally. Those only that are used for their local action will be mentioned here.

Carbolic acid is to a certain extent anodyne, and so too is Atropia. Formerly opium was largely used as a local sedative, chiefly in the form of tincture (laudanum), but its power to relieve pain in this way

is somewhat doubtful. Practically, there is only one local anodyne used in eye work, namely, cocaine, which is a white powder obtained from the leaves of the coca plant. It has the remarkable property of allaying pain and of destroying ordinary sensation in any part to which it is applied. Its various applications in ophthalmic work will be described in later sections of this book. (See chapter on Anæsthetics.)

Irritants.

These are substances that cause a moderate degree of inflammation.

Tincture of opium is an ancient but good irritant to the conjunctiva, this action being most likely due to its contained spirit.

Other irritants are nitrate of silver, sulphate of copper, perchloride of mercury, yellow oxide of mercury, calomel, and the various preparations of zinc.

Counter-irritants.

Counter-irritants are substances used to excite severe inflammation at some distance from an affected part.

The commonest plan in eye-surgery is to put a fly-blister, the size of a shilling or a half-crown, on the temple or behind the ear. The blistering plaster, cut to the required shape, is slightly warmed and kept in place by strips of sticking-plaster, where it is left for four or five hours, or until a blister has risen. Instead of the plaster, the nurse may use blistering fluid, which she will have to paint carefully over the spot with a brush three or four times.

in succession. Suppose a blister to be ordered of the size of a shilling, the exact size can be marked out by lightly pressing one of those coins for a few seconds on the selected spot. The blister itself is a kind of thin bladder, formed beneath the outermost layer of skin, and filled with fluid. It should be pricked with a needle in several places to let out the fluid, after which it can be dressed with boric or other soothing ointment. Sometimes it is desirable to keep up the irritation, in which case the raw surface is kept from healing by the application of Scott's dressing, or of the resin or savine ointments.

A less severe form of counter-irritation can be obtained by painting over a spot on the temple with the strong liniment of iodine. If this be used, the patient must lie down while the application is being made, and the utmost care must be taken that none of the liniment gets into or near the eyes, a caution that applies equally to blistering fluid.

A seton affords the most powerful form of continuous counter-irritation. It is applied by the surgeon, who passes a large needle, armed with lamp-wick, for a distance of an inch or more beneath the skin of the hairy scalp. The two ends of the seton are then tied loosely together, and a dressing of simple ointment or vaseline applied. The seton will require daily dressing, when its track should be syringed with one in forty carbolic lotion, and subsequently dressed with ointment. Every third day the ends of the thread must be cut, and a fresh wick pulled into the wound.

Counter-irritants are not much used in eye-surgery now-a-days. They have been replaced by more rational methods of treatment.

Caustics.

Caustics are substances that destroy tissues when applied to them locally. In eye work they are used as a rule in solid form.

Nitrate of silver is diluted (or "mitigated") with nitrate of potash, and sold as caustic points, which are extensively used in the treatment of Trachoma. Perchloride of mercury, diluted in the same way, is also applied in that affection; and alum and sulphate of copper and sulphate of zinc are sometimes rubbed on in solid form.

Lapis divinus, sold in sticks, is mitigated sulphate of copper. To prepare it for the surgeon, the nurse will have to melt it gently in a spirit flame, and then wipe off the excess of melted stick until it is of a proper pointed shape.

Actual Cautery.

The application of heat to destroy tissue. The cautery may be applied by heating an instrument in a spirit flame, or more conveniently by an apparatus known as "Paquelin's cautery". The galvano-cautery, also, is now-a-days extensively used in eye-surgery.

Myotics.

Myotics are drugs that contract the pupil: pupil contractors. Physostigmine, the old name for which was eserine, is the active principle of calabar bean,

and has a most powerful myotic action. When a few drops of a solution of the strength of one half to a grain to the ounce of water are dropped into the eye, they cause the pupil to contract rapidly to the size of a pin point. Eserine is used in glaucoma and in corneal ulcers.

Pilocarpine contracts the pupil, and is used as a substitute for eserine in some forms of glaucoma.

Mydriatics.

Mydriatics expand the pupil.

Belladonna is a powerful mydriatic. Formerly it was much used as a solution of the green extract, and some surgeons still resort to belladonna fomentations. Now-a-days, however, the active principle—atropine—is extracted from the plant. With atropine, or its salts, a rapid and certain effect can be obtained with a minute quantity of the drug. It is applied as a solution (grains one to four to the ounce), in a gelatine disc, or in solid form; a solution in castor oil, also, is often prescribed.

The local use of atropine occasionally gives rise to various unpleasant symptoms, the chief of which are: (1) Dryness and parching of the throat. (2) Swelling of the lids, with redness of surrounding parts, much resembling erysipelas of the face. (3) Delirium, especially at night: this I have observed amongst children only. (4) After long-continued use, it may give rise to a catarrhal condition of the conjunctiva, with the development of small granulations. Should any of these symptoms appear, the nurse should at

once discontinue the use of atropine, and inform the surgeon of the occurrence.

The effects of atropine upon the pupil pass off slowly; sight is disturbed for a time, and the pupil does not regain its ordinary condition for about a fortnight.

Homatropine, a somewhat costly drug, is another alkaloid of belladonna. It has the advantage of causing much less annoyance to patients than atropine, as its effects pass off within twenty-four hours, although, exceptionally, I have seen them last for some days.

Duboisine and daturine dilate the pupil, and are used when atropine does not agree with the patient.

Cocaine acts in a similar way, but a pupil dilated by cocaine still reacts to light, which is not the case when atropine is used.

Various Remedies.

Fluorescine, a coal tar derivative, stains the cornea a vivid green if ulcerated, but has no action whatever on the healthy cornea. It also stains a denuded patch on the conjunctiva. Aescorcine acts in a similar way; but in my experience possesses no advantage over fluorescine, while it is much more expensive.

Pilocarpine, besides its local use, is injected beneath the skin to cause sweating and salivation. The idea is that exudations may be thus absorbed, and it is used for deep-seated eye troubles.

An infusion of jequirity seeds has been much

lauded as a remedy for Trachoma. It is applied directly to the conjunctiva, and gives rise to acute inflammation of that structure. For my own part, I have never seen its use followed by any good results.

Poultices.

Poultices, as such, are seldom used in ophthalmic work; they have, to a great extent, been replaced by wet compresses. These "antiseptic poultices," as they have been termed, are composed of several layers of lint steeped in hot boric lotion, and covered with an overlapping piece of jaconet. Absorbent wool packing and a bandage complete the dressing.

Blood-letting.

In former times a copious withdrawal of blood from the arm was looked upon as the sovereign remedy for acute ophthalmia, and, accordingly, patients were often bled until they dropped from sheer exhaustion.

Now-a-days, bleeding is effected by scarifying the conjunctiva, by opening an artery in the temple, or by the application of leeches. The first two methods are, of course, carried out by the surgeon, but the nurse may be called upon to perform the third.

Formerly, leeches were applied to the conjunctiva of the lids, or to the inside of the nostrils; but those sites have been abandoned in favour of the temple, the forehead, the side of the nose, or behind the ear. The nurse should wash the skin of the part selected, and apply the leech by means of a test tube. If the

animal will not bite, the part may be smeared with cream, or with a little fresh blood. Each leech abstracts about a drachm and a half of blood, and will drop off when full. Bleeding may be encouraged by warm fomentations. An extract from the body of the leech has the singular property of arresting the clotting of blood. The reader will not be astonished, therefore, to learn that sometimes there may be difficulty in staunching the flow of blood from the bite, but this may be generally effected by firm pressure against the underlying bone. One reason why leeches are not applied to the lids is that it would be difficult to apply after-pressure in that situation.

A method of abstracting blood, peculiar to ophthalmic surgery, is by the use of an instrument named the "artificial leech," which consists of two parts, a sharp drill and a cupping glass. The drill is driven into the skin of the temple, and blood is drawn away by exhausting the cupping glass. Some surgeons dispense with the drill, and make instead numerous punctures in the skin by means of a small sharp scalpel. The artificial leech is used in severe cases of Iritis, and for various deep-seated affections; and there is no doubt that at times it renders valuable service in the treatment of those diseases.

Eye Baths.

A mineral spring at Buxton has gained some repute in the treatment of inflamed eyes, and in the pump-room there one may see to this day peculiar-

looking goblets of green glass or earthenware. One of these vessels is filled with the mineral water, and the patient leans downwards, and fits the cup closely to his brow and cheek, so as to cover the eye. He then throws his head backwards, still keeping the cup in place, and in this way the eye is immersed in a local bath. Although the "eye baths," as they are called, still linger at Buxton and in the windows of the chemists, their general use has been long ago abandoned. Under certain conditions, it is easy to see how they would hand on contagion from one person to another.

Inunction.

Inunction in eye diseases is confined to the use of mercurial ointments. It consists in pressing and rubbing a greasy or oily substance into the skin, through which it is absorbed into the circulation. Inunction is generally prolonged over a length of time, and, in order to avoid irritation, the ointment should be applied to a different part of the body every day. The skin is first washed and dried, and a piece of ointment, about the size of a pea, is gently rubbed in until it has disappeared. The nurse should protect her finger with a stall or a piece of bladder, or otherwise she may medicate herself as well as the patient. Formerly, the blue mercurial ointment was the only remedy used for inunction, but modern pharmacy has given us a more cleanly agent in the shape of the oleate. The symptoms of mercurialism have been previously pointed out (page 42).

CHAPTER V.

APPLICATION OF REMEDIES TO THE EYE.—DRY AND WET COMPRESSES. — LOTIONS. — DROPS. — OINTMENTS. — MASSAGE.—POWDERS.—SOLID AND LIQUID APPLICATIONS TO THE EYELIDS.

Dry Compresses.

A PROTECTIVE compress is usually made of old linen and a thick wad of absorbent wool, which is packed into the hollow over the eyeball, and held in place with a flannel bandage. A pad of Gamgee tissue may be used instead of the cotton-wool.

Dry heat, which has numerous uses in ophthalmic work, may be thus applied: a dry compress is held in contact with the outside of a can of boiling water for some minutes; it is then rapidly placed over the closed eyelids, and a bandage applied. Another plan is to warm the wool by holding it in front of the fire. The application is renewed at frequent intervals.

Wet Compresses.

Wet compresses may be used either hot or cold.

Cold applications are of service in acute ophthalmia, in injuries, or after certain operations. They may be applied in either of the following ways.

1. A piece of tape, one inch broad, is bound around the patient's head, and to it is pinned a single square of old linen or lint, kept constantly moistened with

water. A lump of ice floats in the basin containing the water, the temperature of which is thus kept at a low point. As soon as the first square ceases to feel cold, it is replaced by a second taken from the iced water. A favourite way with many oculists is to substitute for the plain water an antiseptic lotion of carbolic acid, boric acid, or corrosive sublimate.

2. "By the side of the bed is placed a large block of ice. Two pads of cotton-wool are provided, one of which is laid upon the ice, and the other upon the eye of the patient, and they are changed as often as the one in use ceases to give a sensation of cold" (W. Adams Frost).

A nurse must remember that the intermittent action of cold is harmful to an eye. She must take care, therefore, that the pads are renewed at frequent intervals.

An old-fashioned way of applying cold to the eyes was to enclose crushed ice in a bladder, which was then laid over the closed lids. The objection to this plan lies in the fact that the ice by its very weight presses injuriously upon the eye; and the same objection applies with added force in the case of Leiter's metallic tubes, which were formerly much used.

Hot compresses—perhaps the most potent means of combating pain possessed by the surgeon—are used in a variety of diseases, as Iritis, or Ulcer of the Cornea.

To apply a hot compress. Several folds of linen or lint are dipped into really hot water, squeezed as dry as possible, applied to the lids, and covered with

oiled silk. This is then packed in with a thick layer of dry wool, heated by contact with the outside of a can of boiling water, and bandaged into position. A more simple but equally efficacious plan is to wring a towel out of hot water, and to apply it to the eyelids. As soon as the first application begins to grow cold, it must be replaced by a second towel similarly treated.[1]

Hot compresses are often ordered by the surgeon for half an hour twice a day, but the exact number of the applications will depend, of course, upon the nature of the case.

Compresses should always be as hot as the patient can bear, and undue pressure upon the eye must be most carefully avoided. One additional point should be mentioned, namely, that both hot and cold compresses are not unlikely to chafe a tender skin. It is in view of this fact that one protects the skin by smearing over it a layer of vaseline, cold cream, or almond oil before applying this kind of dressing.

Application of Lotions to the Eye.

Lotions are employed chiefly for the relief and cure of conjunctival affections. The usual method

[1] To overcome the difficulty of keeping water at a high temperature for a considerable length of time, Messrs. Schollar & Simsky (Praed Street, W.) have constructed at my suggestion a simple apparatus, which is sold at the cost of a few shillings. The water in the basin is kept at a temperature of about 140° F. by passing through it steam from a small boiler. The latter holds about a pint, and is heated by a spirit lamp.

of applying these medicaments—*viz.*, by squeezing a little lotion into the eye—is obviously inadequate, because the remedy is not brought into contact with the whole of the diseased surface. In order to do this, the eyelids must be turned out, or "everted" as the process is usually called. Accordingly, I shall preface this section with an account of the small operation necessary to evert the lids.

Eversion of the Lower Lid.—It is a simple matter to turn out the lower lid. Standing behind her patient, the nurse places her forefinger or thumb on the skin below the eye, and merely draws it downwards. If at the same moment the patient looks upwards, the conjunctival lining of the lower lid springs into view.

Eversion of the Upper Lid.—Skilful eversion of the upper lid, one of the first knacks which a nurse has to acquire, is a more difficult matter, and is carried out as follows. Taking her stand behind the patient, the nurse tells him to look down, a point of considerable importance, for it is almost impossible to evert the lids of a person who will not look in the desired direction. The nurse next seizes the lashes of the upper lid between her thumb and forefinger, using the right hand for the patient's right eye, and *vice versâ*. The lid is then drawn downwards and outwards, after which the nurse places the forefinger of her disengaged hand on the upper part of the lid, so as to act as a fulcrum. Lastly, by a rapid movement the lid is twisted round the finger, and so everted. After some little practice,

intervention of the second hand can be altogether dispensed with: the lid is then turned out by the forefinger and the thumb of one hand alone. A nurse should also practise eversion of the upper lid while standing in front of her patient. Text-books recommend that a silver probe or similar instrument be laid across the upper lid, and that this structure be everted by tilting it, so to speak, around the probe. But it is better that a nurse should learn so to use her fingers as to be able to forego any such outside aid. The practised hand is able to evert the lid almost literally in "the twinkling of an eye," although nothing requires more careful attention at the outset.

In cases not confined to bed, the following method of applying lotions is adopted at the Hanwell Ophthalmic School. The patient is seated in an ordinary windsor or kitchen chair, and a towel is arranged around his neck. The nurse stands behind the patient, who rests his head upon her chest. She next everts the upper lid, using, as I have said before, the right hand for the right eye, and *vice versâ*. If without assistance, she everts the lower lid with the disengaged fingers of the hand in use upon the upper lid; or the patient himself might pull his lid downwards. A much better plan, however, is for an assistant, standing in front of the patient, to evert the lower lid fully. A pledget of wool, which has meanwhile lain in a porringer containing lotion, is then squeezed, so that its contents fall directly upon the exposed conjunctiva.

The liquid is allowed to remain in contact with the mucous membrane for some seconds before the lids are restored to their natural position. The last step is to mop superfluous lotion from the face by means of a morsel of dry wool, which, together with the piece first used, is at once destroyed.

Should the patient be in bed, the nurse may station herself either behind him or at his side, but the way of applying lotion differs in no wise from that above described.

Sponges should never be used. They are difficult to cleanse thoroughly, and are apt, moreover, to harbour the germs of disease.

Syringes are still sometimes employed, but personally I, in common with most oculists, am utterly opposed to their use in eye work. In point of fact, there are many objections to them. In the first place, the forcible stream thrown by a syringe may damage an eye. Secondly, injected fluids are apt to spurt in all directions, and particles of contagious discharge may thus infect the nurse's eyes. There is reason for believing that this casualty has often taken place. Sir Patrick Macgregor has recorded the case of a nurse who received a spurt of matter into her left eye while syringing the conjunctiva of a child affected with purulent ophthalmia. On the next day, symptoms of the disease developed in that eye. I have myself known three instances in which ophthalmia was thus contracted, while I have heard of many others. Thirdly, the careless use of a glass syringe may injure the eyeball

Fig. 9. Retractor.

itself.[1] In an eye with purulent ophthalmia, a minute abrasion of the cornea may admit septic organisms, and so lead to most disastrous consequences. Lastly, a syringe is difficult to keep clean.

In cases of purulent ophthalmia, the lids may be so swollen that they can be separated with difficulty, if at all, and the condition of the cornea cannot be ascertained by the ordinary methods. Under such circumstances, the surgeon uses an instrument called a "retractor" (Figs. 9 and 61),

[1] Mr. Wray has introduced a syringe, the nozzle of which consists of a soft elastic pipe. This simple device certainly renders the syringe safer, but at the same time it does not provide against the serious danger of inoculating oneself by accidental spurts of matter.

Fig. 10. Combined Douche and Retractor.

by the aid of which he raises the upper lid, the nurse meanwhile drawing the lower lid downwards, either with her fingers or by means of a second retractor. On an emergency, a bent hair-pin may be used instead of a retractor.

The ingenious combination of douche with retractor, represented in Figure 10, is sometimes employed. The instrument is channelled for the passage of fluid, which finds an exit by a series of small holes in the curved part of the retractor which passes beneath the lid. The nozzle of the instrument is connected by means of a flexible tube with some sort of irrigating apparatus. An ordinary ewer, supported some three feet above the patient's head, makes a good receptacle for the fluid. A clip is placed upon the tubing between ewer and retractor. When the clip is loosened, a continuous stream of fluid runs into the eye from the perforated end of the retractor, and the force of the stream is directly dependent on the height to which the ewer is raised above the patient's head.

The formal instrument just described may be replaced by a simple contrivance, introduced by Mr. Story, which acts as a combined douche and retractor. A piece of wire is bent to the shape of a retractor and is then covered with drainage tube, one end of which is doubled over, and fastened to the wire by thread. A number of small holes is next cut over the summit of the horseshoe bend which passes beneath the lid, and, lastly, the free end of the tubing is connected with an irrigator. This

instrument, which is shown in Figure 11, has the great advantage that it can be easily altered in size and shape to suit each particular case. When required for use, it is inserted beneath the upper lid, which is thus elevated, and the whole conjunctival sac can be then thoroughly sluiced by the fluid from the irrigator.

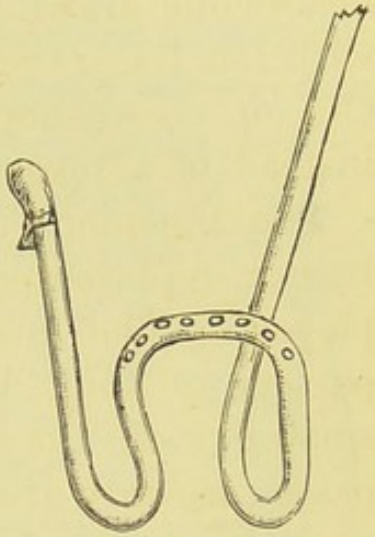


FIG. 11.
MAKESHIFT DOUCHE RETRACTOR.

APPLICATION OF DROPS TO THE EYE.

Drops (*guttæ*, in Latin) are used in smaller quantities than lotions. They are employed for various purposes, as, for example, to dilate the pupil in Iritis, to contract the pupil in Glaucoma, to relieve pain in affections of the cornea, or to act upon an inflamed conjunctiva.

If ordered for the relief of conjunctival affections, drops are applied after eversion of the lids, exactly as described in the case of lotions. Sulphate of copper and nitrate of silver drops are applied in this manner.

On the other hand, if it be desired to act, not upon the conjunctiva, but upon deeper structures, the medicament is used in a different way. Thus, the lower lid is drawn gently down, and the patient desired to look upward. One drop or more of the fluid is then allowed to fall upon the exposed conjunctiva from any of the following tubes or bottles. In doing this, the nurse must never forget that the

dropper, whatever its form, should on no account be allowed to touch the lids or the eyeball. She must also be careful to hold the dropper vertically and not slantwise, as is so often done.

1. A goose quill cut straight across its hollow shaft, and an oval piece pared away from the pointed end somewhat after the fashioh of a quill pen. The quill is dipped into the fluid, and a finger placed over its free end. By now holding the quill over the lid, and removing the finger, the requisite number of drops is allowed to escape.

Fig. 12. Glass Dropping Tube fitted with an India-rubber Teat.

2. On an emergency, a spill of clean white notepaper may be used as a dropper. A fresh piece of paper should be provided of course for each application.

3. The dropping tube made of glass, of similar shape, and acting on the same principle as the cut quill. It is often fitted at the upper end with an india-rubber teat, as shown in the illustration (Fig. 12). The fluid is drawn into and expelled from the tube by squeezing the teat.

4. The "Pneumatic Dropping Tube" is a small glass flask, the neck of which is drawn out into a fine point. It is filled by holding the flask in the palm of the hand for a few seconds, when the air becomes expanded. The nozzle of the

bottle is then inserted into the liquid, which is drawn into the bulb as soon as the air gets cool. It is now ready for use, and by inverting the flask, grasped in the hand, the solution will fall from the point drop by drop. Messrs. Reynolds & Branson (of Leeds) have made a useful modification of the above by replacing the glass neck with a cork and a piece of thermometer tubing, the capillary bore of which delivers the liquid in small drops. The flask is shown of its actual size in Figure 13.

FIG. 13. PNEUMATIC DROP BOTTLE.

FIG. 14. GALEZOWSKI'S BOTTLE.

5. Macnaughton Jones's bottle is like the foregoing, but has vulcanite mounts to exclude dust.

6. Galezowski's bottle is shown in Figure 14.

7. Chalk's eye drop bottle[1] is the one in everyday use. Its perforated glass stopper, which reaches to the bottom of the bottle,

[1] Dr. Gould, of Philadelphia, has lately introduced, under the title of an "antiseptic dropper," a precisely similar article. That gentleman is apparently not aware that such bottles have been used in this country for more than thirty years.

is capped by a sheet of thin india-rubber. The flasks are made in half ounce, one, and two ounce sizes. The illustration (Fig. 15) shows the one ounce size.

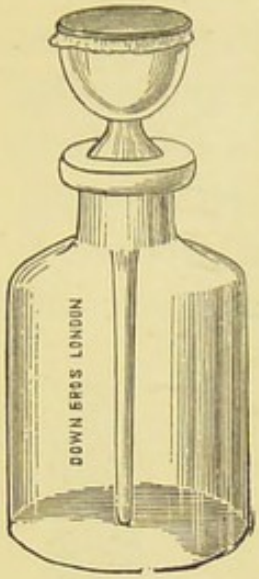


Fig. 15.
Chalk's Eye Drop Bottle.

8. Stroschein's aseptic bottle[1] (Fig. 16). This is by far the best form of bottle, from the fact that it can be sterilised by boiling the contained fluid. Figure I. represents the bottle as ready for use. The flask is constructed of thin glass, so as to bear heat without breaking. In order to sterilise the contained solution, the nipple (T) is removed, the pipette reversed, and inserted into the flask,

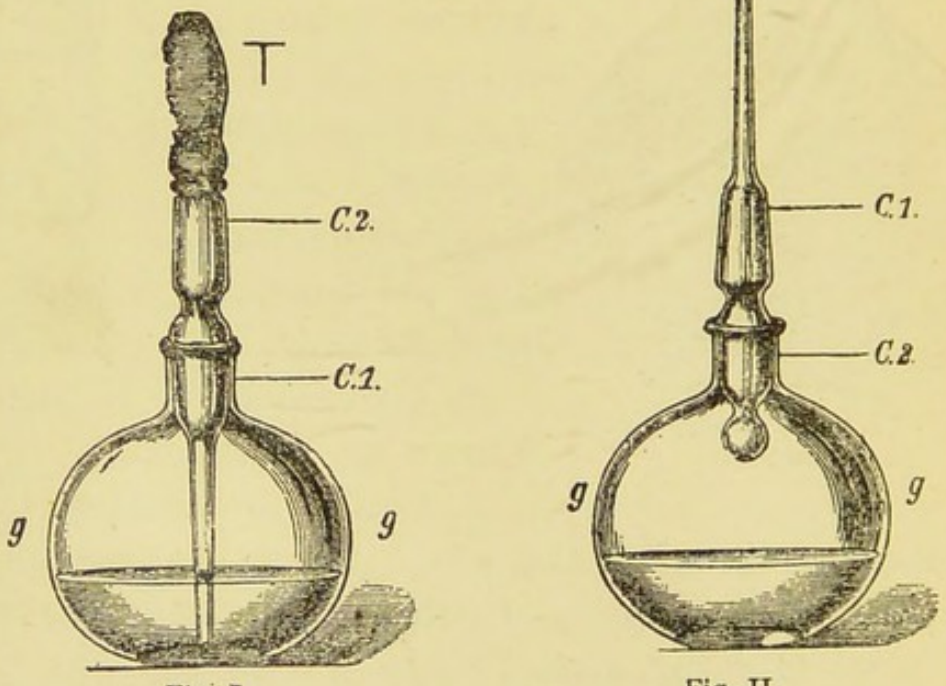


Fig. I. Fig. II

Fig. 16. Aseptic Flasks.

Ready for Use. Shows Position of Pipette before Contents are Boiled.

[1] English agents : Messrs. Schollar & Simsky, Praed Street, W.

as shown in Figure II. The whole apparatus is then boiled over a small flame—*e.g.*, that of a spirit lamp—for three minutes. During this process, the flask may be either held by a wooden clip, or it may be supported by wire gauze on a tripod. Thirty seconds after removal of the bottle from the flame, the pipette is inserted in its original position, the teat is replaced, and the bottle (as in the first figure) is ready for use. If the flask is in constant use, the boiling process must be repeated at intervals of a few days. It is evident, however, that repeated sterilisations must of necessity concentrate the solutions, a difficulty that is met by adding eight or ten drops of distilled water to the contents of the flask before boiling. The bottles are of different colours, so that the various medicaments can be recognised at a glance; and, further, the name of the contained solution is indelibly inscribed upon the face of each flask. Boiling not only renders the apparatus aseptic in every part, but the fluids, also, which in many cases are peculiarly apt to develop fungus and so become spoiled, are thoroughly purified from the presence of micro-organisms.

The following simple method of applying drops often succeeds with refractory individuals, such as "spoilt" children. Lay the patient flat upon his back, and drop the fluid over the eyelids in such a way that it collects and forms a small pool at the inner canthus. Now prevail upon your patient to open the eyes, when some of the liquid is practically

certain to enter the conjunctival sac; or the nurse may gently separate the lids, and so attain the same result.

Before leaving this subject, one caution should be given. The alkaloids used in the form of drops are capable of exerting their peculiar action even when much diluted. It is, for instance, by no means rare for a nurse, who has neglected to wash her hands after applying atropine, to get a dilated pupil herself from touching her eyes. The moral is obvious, and need not be laboured.

Application of Ointment to the Eye.[1]

Many remedies are now used in the form of ointment made with vaseline. Such an application may be prescribed for disease of the lids, as blepharitis, or for an affection of the eyeball itself. In the former case, the ointment is well rubbed into the affected lashes, all scabs having been first removed by repeated applications of hot water. In the latter case, the remedy is applied as follows. A small camel-hair pencil (that known to the trade as a "short crow" is the best) is dipped into the ointment, and the brush is inserted between the lower lid and the globe. The lids are then allowed to close, and the brush is gently drawn away at the outer corner of the eye, thus leaving some ointment in contact with the latter. The brush must not of course be used for more than one person, and it should be disinfected every time after an application has been made.

[1] See note on p. 72.

A bodkin or a silver probe may be used in lieu of a brush.

A kind of MASSAGE is often practised upon the eye. After introduction of the ointment,[1] the nurse places her forefinger on the closed lids, and makes rapid circular movements, so as to bring the unguent into intimate contact with every part of the cornea and conjunctiva. Next, up and down, and, lastly, side to side movements are executed. The pressure must be firm yet gentle; and care must be taken that the greasy finger does not enter the aperture of the lids, and so injure the eye. The rubbing must be continued until the eye becomes red and tender—usually from two to four minutes. The last step is to wipe away superfluous ointment by means of cotton-wool. Some little practice is needed before massage of the eye can be efficiently carried out.

In concluding this section I may add that iodoform ointment has been strongly recommended for the treatment of purulent ophthalmia. Should the nurse be called upon to make such an application, she will find it best to use the syringe shown in

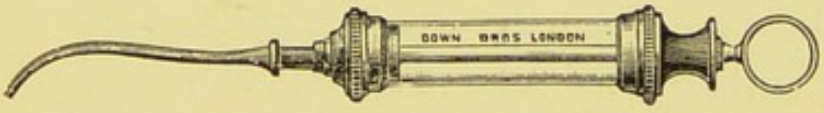


FIG. 17. SYRINGE FOR INTRODUCING OINTMENT INTO THE CONJUNCTIVAL SAC.

Figure 17. The nozzle is introduced with great care beneath the lid, and the ointment gently expelled.

[1] Dr. Tempest Anderson has made the excellent suggestion that ointments should be kept in collapsible lead tubes like those used for oil paints.

Application of Powders to the Eye.

Powders (calomel, boric acid, iodoform, iodol, aristol, alumnol) are sometimes applied directly to the conjunctiva or to the cornea. They are thus used, for example, in ulcers of the cornea, and in all kinds of phlyctenular disease.

Insufflators may be, of course, used for the purpose of making these applications, but a simpler plan is generally preferred. A small portion of the powder is taken up by means of a camel-hair pencil, and gently flicked on to the cornea or the conjunctiva, as the case may be.

With regard to calomel, a special caution should be given. Much of that salt must on no account be left in the eye, because its corrosive action may come into play, and so cause serious mischief.

Solid and Liquid Applications to the Eyelids.

For the cure of trachoma, as well as of purulent and muco-purulent ophthalmia, strong remedies are applied directly to the conjunctiva of the everted eyelids. Under medical directions, a nurse may be called upon to make these applications, and she should, therefore, fully understand how to do it.

Solids and liquids are both used. The solids include mitigated silver nitrate,[1] alum, bluestone,

[1] Mitigated caustic is prepared by fusing together nitrate of silver and nitrate of potassium in various proportions. The strength usually selected by oculists contains one part of the former to two of the latter salt, and is officially known as *Argenti et Potassii Nitras*.

lapis divinus, and a compound of corrosive sublimate and nitrate of potassium, which I introduced some years ago as a remedy for granular lids. All these agents are sold either as small conical points, intended to be held in a caustic holder, such as that shown in Figure 18, or cemented into a stout wooden handle and provided with a movable cap (Figure 19). The liquids are nitrate of silver (10, 15, or 20 grs. to distilled water, one ounce), corrosive sublimate (1 to 20 and upwards), and liquor plumbi subacetatis.

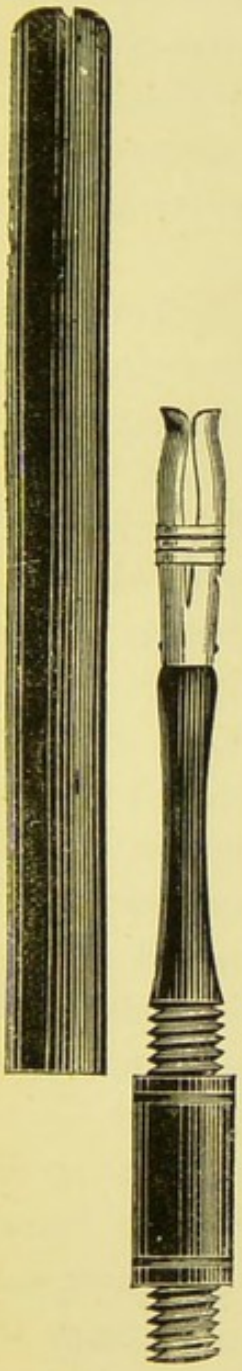


Fig. 18. Caustic Holder.

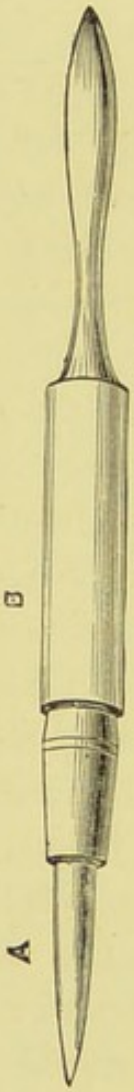


Fig. 19. Combined Caustic and Holder.
A Caustic cemented into holder.
B Removable cap.

To apply these remedies, the nurse, standing behind the patient, who is seated in an ordinary chair, everts the upper lid, while an assistant draws the lower lid downwards, and the patient is directed to close his eyes gently. Solid applications are then lightly passed over the exposed conjunctiva, in such a way that every visible

part of that membrane receives its due share of treatment. At the same time, no attempt must be made to dip the caustic point behind the conjunctiva, as otherwise the cornea might be touched. To reach the upper cul-de-sac requires both dexterity and practice, and should never be attempted except by the surgeon. I may add that in treating the conjunctiva with solid remedies it is safer for the nurse to use the side of the caustic rather than its point.

Liquids are applied by means of a camel-hair brush, the "duck" or the "goose" size being most suitable for the purpose. The preliminaries are identical with those described in the case of solid applications. The brush, previously dipped in the fluid, is passed over the diseased parts of the conjunctiva, and the remedy allowed to remain in contact with that membrane for some seconds.

Brushes, when not in use, may be kept in a flat receptacle—*e.g.*, a tooth brush dish—covered with an antiseptic lotion. If left standing upright, the brush soon becomes bent out of its ordinary shape, and useless. At the risk of some repetition let me add that brushes should be scrupulously cleansed both before and after use, and that the same brush must never be employed for more than one patient.

After application of silver nitrate, many surgeons neutralise any surplus by means of a large camel-hair brush charged with a solution of common salt. This liquid combines with the silver to form the curdy inactive chloride of silver. For my own part,

I never pursue this plan, because the salt tears are sufficient in themselves to neutralise any excess of the caustic. Sometimes, however, when using solutions of silver, I soak up excess of liquid by means of a pledget of wool wrung out of plain water. If employed to modify the action of solid applications, the wool is used wet; if, on the other hand, to absorb surplus liquid, the wool is squeezed as dry as possible.

A patient sometimes closes his lids so tightly as to interfere with the proper application of remedies. In these circumstances, he should be made to open his mouth widely, and to gape during the whole time. Curiously enough, it becomes a difficult matter to close the eyelids forcibly when the mouth is kept widely open.

It is an excellent plan, before applying these strong remedies to the conjunctiva, to soak up any discharge or moisture which may happen to be present by a small square of white blotting paper,[1] by absorbent wool, or by a fragment of that material known to dentists as "amadou". In purulent ophthalmia, this step should always be taken. Remedies can scarcely be expected to exert their full action as long as the conjunctiva is shielded by a layer of discharge.

[1] Messrs. Burroughs, Wellcome & Co. manufacture a material known as "Paper-fibre Lint," composed of pure cotton fibre entirely free from chemicals. The absorbent properties of this substance are such that it may very well replace blotting paper and even amadou.

By the application of a drop or two of a four per cent. cocaine solution, the pain of these various remedies may be greatly assuaged. A like result may also be attained by bathing the lids with cold water for ten minutes after treatment.

NOTE.—A new method of placing ointment in the eye has lately been brought under the notice of the profession by Dr. J. Ward Cousins, who advocates the use of a collapsible lead tube, the end of which is prolonged into a fine and flexible nozzle. The latter is applied to the eye, when pressure upon the tube causes the ointment to exude. It is obvious that each patient should have his own tube, as a transference of contagious particles might otherwise take place. The little apparatus is made by Messrs. Burroughs, Wellcome & Co.

CHAPTER VI.

ANÆSTHETICS; LOCAL AND GENERAL.

ANÆSTHETICS are agents by means of which insensibility is produced. They may be divided into two classes—general and local. Of the former, we may take chloroform as the type. When chloroform is inhaled, the patient loses consciousness, and the most painful surgical operations are unfelt. On the other hand, local anæsthetics lead to loss of feeling in those parts only to which they are applied. A good example of local anæsthesia is the freezing of the skin by ether spray before proceeding to open an abscess.

The general anæsthetics in common use are chloroform, ether, and nitrous oxide, or "laughing gas," as it is sometimes called. Other agents have been tried, but abandoned as possessing no particular advantages. For instance, methylene was formerly in considerable vogue for eye operations, but one seldom hears of it now. A compound of alcohol, chloroform, and ether—the so-called A.C.E. mixture—was also largely employed, but, like methylene, it is out of favour now-a-days, at least so far as ophthalmic surgery is concerned.

Three general anæsthetics, then, are used for eye operations, namely, a gas, nitrous oxide, and two

liquids, chloroform and ether. Laughing gas can be employed only for short operations, such as opening abscesses, or probing the nasal duct, as its effects pass off usually within a minute. On the other hand, the action of chloroform and ether can be prolonged indefinitely, and hence those agents are commonly used.

A nurse will often be called upon to prepare a patient for the administration of chloroform or ether, and to that end the following points must be borne in mind.

1. The night before an operation, the patient should be given a purgative. Castor oil, black draught, or indeed any of the remedies in common use may be employed for this purpose. If the purgative selected fails to act, an enema of soap and water or of glycerine may be administered.

2. An anæsthetic is best given on a fasting stomach. At least four hours must elapse, therefore, between the last meal and the administration of chloroform or of ether. This rule is important under all circumstances, but doubly so in operations upon the eye, where so much depends upon the quietude of the patient. Indeed, it is not going too far to say that some of the deaths during anæsthesia have been directly due to neglect of this precaution, the patient having been choked by lodgment of vomited matters in the windpipe.

3. Weakly patients may be allowed to take two or three wine-glassfuls of beef-tea half an hour or so before operation. But, with this exception, and then only under the orders of the surgeon, nothing

should be given to patients immediately before operation. The same rule applies, of course, to alcoholic stimulants.

4. The patient must be sufficiently and warmly clad when placed upon the operating table. For women, a dressing-gown, in addition to the usual underclothing; for men, trousers and night-shirt are sufficient; for little children, nothing is better than a long flannel night-shirt. Tight clothing must be eschewed; for instance, stays would not be worn. The reasons for this precaution are threefold: first, that the chest may be readily examined by the surgeon before operation; secondly, in order that there may be no obstruction to easy breathing; and, thirdly, that artificial respiration may be at once put into play should the necessity arise.

5. Special inquiry should be made as regards artificial teeth, which must be removed before an anæsthetic is given. Perhaps it is just as well, in the case of women at least, for the nurse by direct examination of the mouth to assure herself that artificial teeth are not present.

6. Before he is taken to the operating room, the patient should be directed to empty the bladder, as, otherwise, involuntary micturition is likely enough to take place when he is actually on the table.

7. Chloroform (and to a less extent ether) has an irritant action on parts directly exposed to its influence. Accordingly, cold cream or vaseline should be smeared around the patient's mouth, to avoid excoriation of the skin, before the anæsthetic is given.

Whenever chloroform or ether is to be given, the following articles should be provided: Stethoscope; tongue forceps; a bowl, in case the patient vomits; clean towels; brandy; hypodermic syringe, containing thirty drops of ether; an enema syringe; nitrite of amyl; a galvanic battery, in working order, and ready for instant use.

A word as to the management of the patient after the anæsthetic has been given. He should be put to bed in a quiet room, slightly darkened, and must be carefully watched for some time, because in his semi-consciousness he may tear off the bandages or otherwise injure himself. No solid food ought to be given for some hours after operation. The obstinate retching and vomiting, so often seen, are best treated by small morsels of ice, which the patient sucks. If the operation has not involved opening the anterior chamber, vomiting is often relieved by the somewhat homœopathic plan of letting the patient take repeated sips of hot water.

We may now pass forward to

Local Anæsthetics,

of which one only, cocaine, is used in ophthalmic surgery.[1] Cocaine is now used in many operations

[1] This statement perhaps requires some modification in the light of recent chemical advances. Tropacocaine is said to be more trustworthy in its anæsthetic properties than cocaine, and to possess further advantages, such as an antiseptic action, and the property of keeping unaltered in solution. If these claims stand, the position of tropacocaine in eye-surgery will be assured.

for which a general anæsthetic would have been necessary but a few years ago. This drug, as mentioned in a previous chapter, has the property, when dropped into the eye, of making the superficial parts insensitive to pain, although when thus applied it does not penetrate deeply into the tissues. General anæsthesia by chloroform or ether is still needed, therefore, for operations, such as removal of the eye, which involve the deep structures.

The usual way of applying cocaine is as follows. After the conjunctiva has been purified by antiseptics, as already described, a four per cent. watery solution of hydrochlorate of cocaine is dropped into the eyes three or four times at intervals of a few minutes. Even although the operation is to be limited to one eye, yet a drop or two of the medicament should be put into the other eye. Cocaine has the peculiar property of rendering the act of winking less frequent, probably because the natural stimulus of outside irritation is unfelt. Between the applications, a patient should keep his lids closed; otherwise, continued exposure may affect the delicate pellicle of the cornea injuriously. The cocaine must, of course, be free from obvious impurities; indeed, to attain that end many surgeons recommend that the solution be freshly made with boiling water and filtered immediately before an operation. The best plan, however, is to sterilise the liquid by boiling in one of Dr. Stroschein's flasks, which have been described in a previous chapter. In my opinion, cocaine solutions should be thus purified in every

case before an operation which involves opening the eyeball.

The insensibility produced by cocaine lasts for some fifteen minutes, although the maximum effects are reached in about eight minutes. From this it follows that in an operation lasting for more than ten minutes the nurse must be prepared to use cocaine while the surgeon is at work. Eyes reddened from whatever reason do not absorb the drug so readily as healthy eyes. Hence such eyes require a more liberal application of cocaine in the first instance than would otherwise be the case.

Some surgeons use cocaine in the form of small discs of gelatine, each of which contains a definite amount of the salt. These discs, or "*lamellæ*" as they are called, are thus applied. Fifteen minutes before operation, the patient is directed to open his eyes, and to look upwards. By means of a small camel-hair brush just damped with boric lotion, the nurse then picks up one of the delicate lamellæ, which she deposits upon the exposed white of the eye, the patient keeping his lids closed until a second application is made five minutes later. At least three wafers should be inserted in all. The fact should perhaps be mentioned that cocaine discs are not regarded with favour by everybody; for there is some evidence to show that operation wounds have been infected by their agency.

For some operations, instead of solution or discs, solid cocaine is employed. In this case, the cocaine is dusted over those parts which one wishes to

render insensitive. The salt, for example, is thus applied before cutting or crushing operations are performed upon the palpebral conjunctiva, and it may be used in a similar way during the progress of tenotomy for squint, just before the tendon is divided.

In operations involving the skin of the eyelids, it is usual to inject cocaine subcutaneously by means of a syringe, so that it may act upon deep tissues; but this duty is one that concerns the surgeon rather than the nurse. By injection of cocaine deeply into the orbit, some American surgeons claim that an eye may be taken away painlessly.

In order to deaden the pain of operations upon the eye, then, cocaine is used in substance, in solution, in discs, or hypodermically.

CHAPTER VII.

THE COMMONER OPERATIONS UPON THE EYE.

An almost bewildering variety of operations are performed upon the eye, and no small part of the nurse's work will be devoted to duties before, during, and after these procedures. It will be advisable, therefore, to describe briefly the more common operations, so that she may have some idea of what is going on.

Many of these operations deal with the lids. More or less complicated surgical methods are employed to cure a turning in (*entropion*) or a turning out (*ectropion*) of those structures. *Trichiasis*—in-turning eyelashes—or *ptosis*—a drooping of the upper lid—may call for interference. The commonest of all operations practised on the lids, however, is the removal of a tarsal cyst or *chalazion*, a growth due, in the first instance at any rate, to blocking of the meibomian ducts, and consequent retention of secretion. The surgeon everts the lids, cuts through the conjunctiva into the tumour, and shells out its contents by means of a small instrument called a "scoop" (Fig. 41).

In the operation for squint or strabismus, which is of everyday occurrence, the tendon of one of the straight muscles of the eye (generally the internal rectus) is divided. This operation is known as

tenotomy for squint. A more complicated procedure, called *muscular advancement,* is often resorted to at the present time. One of the straight muscles is cut away from its attachment to the sclerotic, and, after a piece has been removed from it, the shortened muscle is stitched to a new place on the globe. By these means, the muscle is given more power in moving the eye.

The tear passages are not uncommonly blocked in some part of their course, the most frequent situation for stricture being the nasal duct. In such cases, the fine hair-like passage of the lower canaliculus is slit up along its whole length by a delicate probe-pointed knife (Fig. 44). Silver probes (Fig. 45) of varying size are then pushed into the nasal sac, and down the nasal duct into the nose. The stricture is thus gradually stretched, and the passage again opened. In obstinate cases, some surgeons incise the stricture with a triangular-bladed knife (Fig. 46) before passing probes. Should these various measures fail to give relief, it may be necessary *to extirpate the lacrymal gland,* but this radical operation is not often resorted to.

The commonest operations upon the conjunctiva are those concerned in the cure of granular lids or trachoma. The granulations are scraped, burnt, or cut away. An operation called "*expression*" is now often practised. The folds of diseased conjunctiva are squeezed between the blades of special forceps (Fig. 60), and the offending material is thus pressed out. A more severe proceeding has been

lately carried out, especially in France. After scarifying and scraping the conjunctiva, its surface is vigorously scrubbed with a brush steeped in solution of corrosive sublimate. These operations for trachoma find their justification in the fact that the disease is possibly due to a micro-organism lodged in the conjunctiva.

Of late years, the practice of cauterising ulcers of the cornea, which have resisted milder remedies, has become well-nigh general. This operation is done, under cocaine, by means of a Paquelin's thermo-cautery, or by the galvano-cautery. In the absence of those instruments, the surgeon might use, of course, a knitting needle made red-hot in the flame of a spirit lamp. It is interesting to note that the beneficial action of the cautery is thought to be due to direct destruction of the infective micro-organisms.

The anterior chamber is sometimes opened by the surgeon's knife, so as to suffer the aqueous humour to escape. This operation, called *paracentesis*, is performed when the cornea is so seriously ulcerated that the anterior chamber is likely to burst. Another procedure, *corneal section*, is also adopted in cases of severe ulceration. In it the cornea is completely divided, together with the ulcer, by means of a narrow knife.

Nurses attached to ophthalmic hospitals will often see the operation of *iridectomy*, which is performed for the relief of a number of widely different conditions. Iridectomy consists in opening

the anterior chamber by means of an incision in the cornea, and then removing a piece of the iris, so as to leave a gap in that membrane.

Cataract, as previously stated, is roughly speaking to be regarded as a loss of transparency in the crystalline lens. Since the opacity lies directly in the line of sight it must of necessity cause great interference with vision. No medicine is known by the internal use of which the opacity can be resolved; accordingly the oculist removes the dim lens by a surgical operation. When dealing with cataract in old persons, or senile cataract, as it is called, the operator cuts through the cornea, thus opening the anterior chamber of the eye. Next, he sometimes removes a piece of iris, which he has previously withdrawn by the aid of a delicate pair of forceps; he performs in fact an iridectomy. The thin enclosing capsule of the lens is then scratched through by means of an instrument called a cystitome (Fig. 52). Lastly, by gentle pressure on the cornea, the opaque lens is made to leave its natural position, and come altogether outside the eye. The operation thus described is spoken of as "*extraction of senile cataract*".

Cataract may be met with, however, in the eyes of young persons, when a different operation is employed. A fine needle is thrust through the cornea, and the capsule of the lens opened with its point. The aqueous is thus brought into actual contact with the lens, which is gradually dissolved by that fluid. This operation has received various

names, *viz.*, *discission, the needle operation, or solution of the cataract.* But the action of the aqueous upon the lens is slow, and the needle operation may have to be repeated at intervals of a few weeks. Hence some surgeons hasten matters by introducing a hollow nozzle (Fig. 57), into the anterior chamber, and suck out the broken-up lens matter. This is called the *suction operation.* Sometimes the *linear operation* is preferred to suction. In that operation, the anterior chamber is opened by a small incision, and by pressure upon the outer lip of the little wound the aqueous will be evacuated, carrying with it fragments of partially dissolved lens matter.

It may be necessary to remove the eyeball altogether, an operation spoken of as *enucleation of the globe.* The surgeon, after cutting through the conjunctiva, divides with scissors the straight muscles of the eye. He then cuts through the optic nerve, the oblique muscles, and any tissues that may retain the eyeball in place. The conjunctiva, muscles, and orbital tissues unite to form a "stump," upon which an artificial eye is later on supported. Of late years a modification of the above operation has come into deserved prominence. It is called, after its inventor, *Mules' operation.* The surgeon scoops out the whole of the contents of the sclerotic, into the hollow of which a glass ball (the artificial vitreous humour) is stitched, and allowed to remain altogether. Over this, an artificial eye is finally placed. A very formidable operation, *exenteration of the orbit,* is performed, as a last resource, for cancers involving

both eye and orbit. The aperture of the eyelids is enlarged by incision, and everything, including, of course, the eyeball, is taken away from the orbit, thus leaving nothing except the bony walls of that cavity.

CHAPTER VIII.

OPERATIONS.—POSITION OF PATIENT.—THE OPERATING TABLE.—LIGHT.—AIR-BORNE INFECTION.—INSTRUMENTS.—SPONGES.—LIGATURES.—PREPARATION OF PATIENT.—ARRANGEMENTS GENERALLY.

In minor eye operations, such as the epilation of lashes, the passage of a lacrymal probe, the opening of styes, or the removal of foreign bodies, the surgeon usually stands behind the patient, who is placed in a sitting posture. But in the more serious operations, for example, tenotomy for squint, cataract extraction, or iridectomy, the patient lies flat on his back. This latter case demands some sort of table, with regard to the selection and arrangement of which a few words may be said.

An operating couch will, of course, be at hand in a properly furnished hospital, but in private houses it becomes part of the nurse's duty to improvise a table. For many reasons, an ordinary bedstead is quite unfitted for the purpose: it is far too broad, and the presence of head and of foot rails prevents that ready access which is one of the first essentials of an operating table. Moreover, its lowness entails most uncomfortable stooping on the part of both surgeon and nurses. Nevertheless, a patient may at times be too ill to be moved, and in that case the

best thing is to place him crosswise in the bed, so that the operator may stand at the back of his head.

In choosing a table, the chief points to be borne in mind are the following: the table must be firm; it should be of a proper height, neither too high nor too low; and narrow enough to allow people to stretch over it with ease and comfort. A dressing or a library table may be found to answer the purpose, or the long narrow laundry table which is sometimes used for ironing, and last, but not least, there is always the kitchen table. I have known a fairly good substitute made by lashing two forms together by the legs. In fact, if set about in the right way, any household will furnish materials for a makeshift operating table.

The table now requires to be fitted up. It should be covered with a couple of blankets, over which are placed in turn a rubber and a linen sheet. Blankets and sheets should be tucked in, or fastened beneath the table with safety-pins, so as to be out of the way. Next, a broad and firm pillow, covered with a piece of mackintosh,[1] is to be placed at the head of the couch. Or the pillow may be covered instead with a square of "hat lining," or "jaconet," as it is called now-a-days. It is not a bad plan, in institutions where many eye operations are performed, to cover an ordinary pillow with white mackintosh, and thus to do away with the need of separate

[1] In most cases, the nurse will be able to buy a piece of mackintosh of the required size at an india-rubber shop, where a number of "remnants" or odd lengths are usually on sale.

squares. In any case, the rubber must be carefully cleansed after use, and should be immersed in a solution of corrosive sublimate (1 in 2000) or of carbolic acid (1 in 20) before it is allowed to dry. Two towels are placed over the waterproof material, and many nurses wrap the upper towel round the patient's forehead and head. Lastly, a thick blanket is thrown over the body of the patient.

The pillow should be arranged so as to support the patient's shoulders, and thus prevent any tendency to unsteadiness during the operation. In bygone days it was customary to use an apparatus, called a "*cephalostat*," which held the head of the patient in a kind of vice. I believe, however, that this apparatus is never used now-a-days, although I know of one country eye infirmary where the cephalostat still adorns the operating table.

Most surgeons prefer to operate by diffuse daylight, which can be obtained by placing the couch with its foot towards a moderately high window. The best kind of light is generally held to be that afforded by a bank of white cloud or by a blue sky. An artist's studio is invariably arranged so that the light falls on the easel from a north window, so as to avoid bright sunlight, while a skylight is never allowed. Exactly the same principles may be applied to the management of light for eye operations. I can testify from personal experience that nothing could be worse than a top-light, as it throws troublesome shadows over the field of operation.

Artificial light is sometimes used, and special

lamps have been devised. One of the best plans of the kind is to suspend by a cord a large glass globe, or "bolt head," filled with water, behind which a powerful paraffin lamp is placed. A strong beam of light is thus produced, and by careful focussing on the patient's eye a most brilliant illumination can be obtained. This apparatus is fixed, and it is therefore necessary to shift the couch to right and left, according to the eye which is to be operated upon.

The air, as we know, swarms with various kinds of germs. The question naturally arises whether our operation wounds will not become contaminated with organisms from that source. In the earlier days of antiseptic surgery, elaborate precautions were taken to guard against the entrance of atmospheric germs. To effect that object, operations were conducted under a cloud of carbolic spray, which enveloped both operator and patient. Somewhat later, the spray was replaced by a continuous stream of antiseptic solution, which was made to drip steadily upon the wound by a method known as "irrigation". At the present time, however, neither spray nor irrigation is much used. As a matter of fact, the modern surgeon has learnt from experience that he may disregard the action of air-borne spores, and he now fears those forms of septic material only which may be introduced into a wound by uncleanly fingers, by dirty instruments, by germ-laden sponges, or by imperfect dressings.

A nurse is often required to prepare the instru-

ments for an operation—a task which involves a good deal of responsibility. Modern research has conclusively shown that operation wounds are often infected by means of septic material introduced upon the instruments of the surgeon. An instrument may be "clean" in the ordinary sense of the word, and yet quite unfit to be brought into contact with an eye. It may, for example, be literally loaded with organisms, already described under the names of micro-cocci and bacteria (chapter ii.). Some of these, it is true, are harmless, but others are capable, when introduced into the human body, of setting up

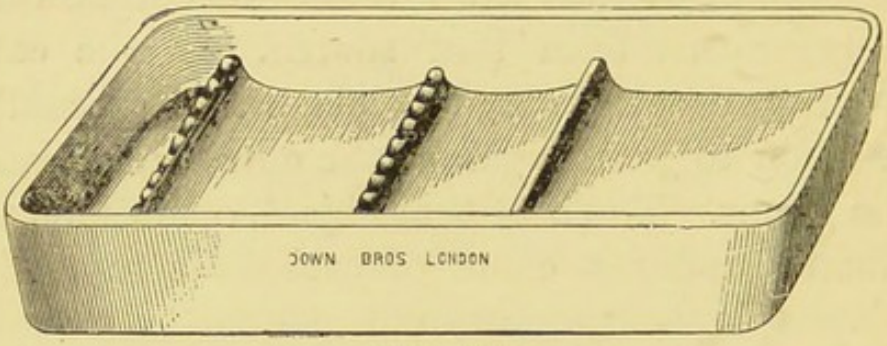


FIG. 20.
TRAY WITH RACKS FOR CARBOLISING INSTRUMENTS.

serious inflammatory mischief. It is in view of these facts that we employ antiseptics to destroy all septic organisms that may happen to be upon our instruments.

Among these agents, the best is undoubtedly a 1 to 30 solution of carbolic acid, in which the instruments may be soaked for some little time—say, ten minutes—before an operation. Surgical instrument makers sell neat trays (Fig. 20) of porcelain or of vulcanite to hold eye instruments, but an ordinary

china meat dish, such as can be obtained in any house, will answer every purpose. In hospital, an enamelled iron plate is often used. To resume: the receptacle is half filled with 1 in 30 carbolic lotion, in which the instruments are placed so that every part of them, including the handles, is immersed in the fluid. Lastly, the dish, covered with a piece of plate glass, is laid aside until required.

Cyanide of mercury has been strongly recommended in the form of a one per cent. watery solution, into which instruments are placed for ten minutes. It is claimed for this fluid that it damages neither the polish nor the temper of steel instruments, even when they are immersed in it for some hours, while its antiseptic properties are most powerful. Indeed, the cyanide appears to be an ideal antiseptic for the purification of instruments.

Boric acid or corrosive sublimate solution should not be used for purposes of disinfection. The former because its antiseptic properties are not sufficiently potent; the latter because it disfigures the surface of steel instruments with lasting stains, besides blunting them.

Some surgeons rely upon the antiseptic virtues of absolute alcohol, and are in the habit of dipping their instruments into that fluid before immersing them in carbolic lotion. The precaution, however, is hardly necessary. At the same time under certain circumstances, as, for instance, when carbolic acid cannot be obtained, we may avail ourselves of the disinfecting properties possessed by alcohol. Thus,

instruments may be dipped in whisky—which, for all practical purposes, is alcohol—and thereafter laid

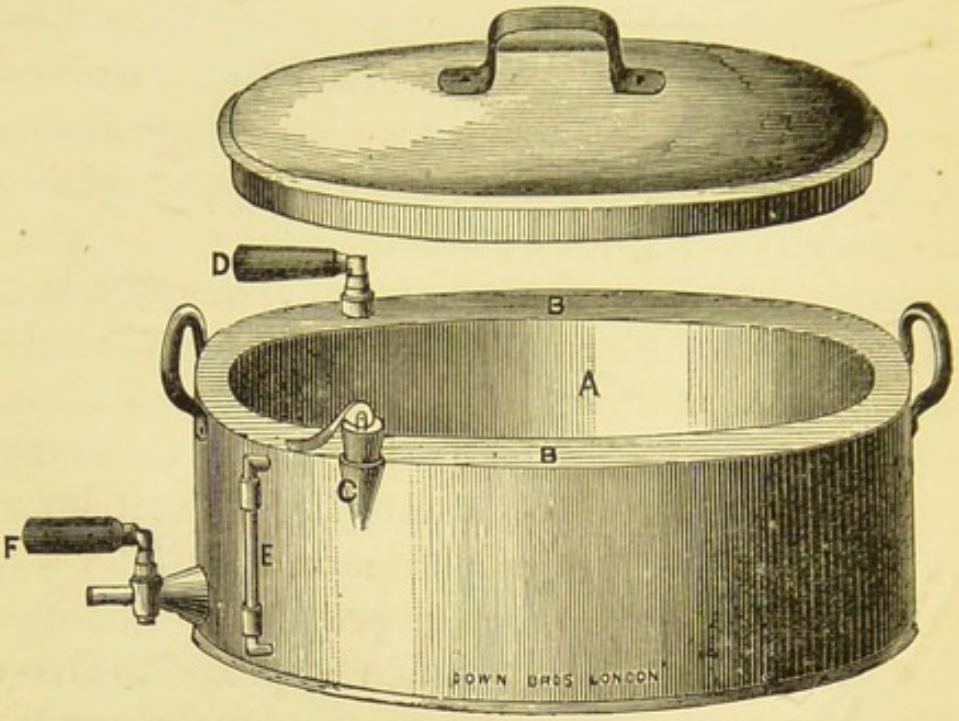


FIG. 21. CATHCART'S STEAM STERILISER.

A The oval tin vessel, holding the instruments to be sterilised, and surrounded by an outer compartment, B.

C Opening by means of which water is placed in B.

D Stop-cock which opens and shuts communication between inner (A) and outer (B) compartments.

E Water gauge which indicates the amount of liquid present in the jacket of the apparatus.

F Tap for emptying the jacket.

To use the Steriliser.—The india-rubber plug closing C is taken out, and the jacket filled until the gauge (E) registers one inch of water. Next, instruments are placed at the bottom of chamber A, and the lid of the apparatus is put on. The steriliser is then heated over a Bunsen burner or over the fire. At first the steam is allowed to escape, for the double purpose of dry-heating the instruments and driving off the carbonic acid from the water. At the end of fifteen minutes, however, C is plugged with the stopper, and by turning the handle D steam is admitted to the instruments, which are thus sterilised for a further fifteen minutes. Lastly, the lid of the apparatus is removed, the steam escapes, and the instruments are found to be dry and free from any trace of rust.

in water (which has been sterilised by boiling) until the moment of operation.

A high temperature, as the nurse has already learnt, destroys micro-organisms, and this fact is taken advantage of in ophthalmic work. For instance, steam sterilisers have been introduced by Bronner and by Cathcart. All objects to be purified are placed on trays, and enclosed in the apparatus, which is then filled with steam. Cathcart's apparatus is the one in general use for eye instruments, and an idea of its construction may be gathered from Figure 21.

In private practice, however, a steam steriliser would not be available, and a simpler plan of disinfecting by heat may be resorted to. Thus, immersion for a few seconds in boiling water, to which a small quantity of carbonate of soda has been previously added, will effectually purify any small instrument, while for larger instruments a somewhat longer time is required. But it must be remembered that the prolonged action of water at a high temperature is apt to injure steel; hence we must measure time by seconds, rather than by minutes, when thus cleansing instruments. From the boiling water the instrument is transferred to alcohol or to carbolic lotion; or simply allowed to cool, wiped with a piece of sterilised gauze, and used by the surgeon.

Dr. Gruening has devised a set of non-cutting instruments (forceps, squint hooks, etc.) made of platinum, which are purified by rendering them red-hot. Platinum cannot of course be used for knives or other cutting instruments.

After operations, instruments must be carefully cleansed and dried. The teeth of forceps and the joints of scissors should be scrubbed with a tooth brush reserved for that purpose. Soda and water may be used to wash instruments, and it has the further advantage that it will remove stains from electro-plated probes, etc. Instruments are dried by wiping them with absorbent gauze or with old linen, but lint or wool should not be used for this purpose, because fine fibres may cling to the instruments, and be introduced into an eye in a subsequent operation. Before putting instruments away, it is well, as a final precaution, to dip them into absolute alcohol, which, speedily evaporating, leaves them perfectly dry.

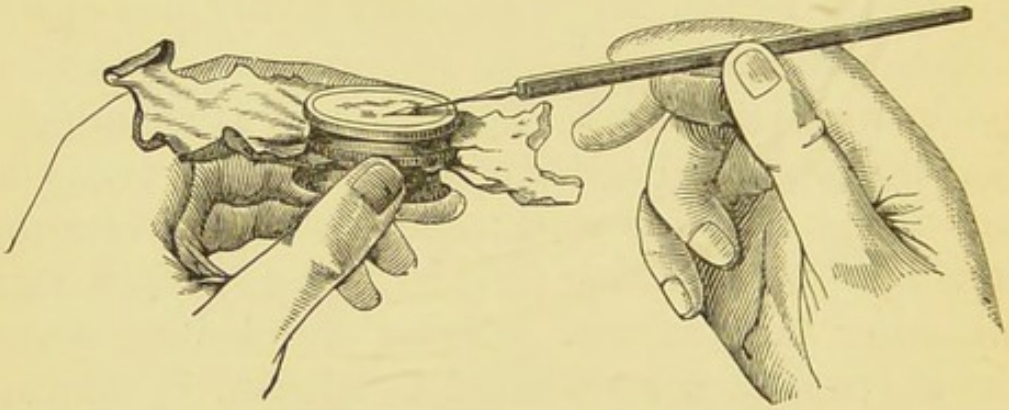


Fig. 22. Trial Drum.

The "trial drum" is a useful means of testing the sharpness of instruments. It consists of a piece of kid tightly fixed between two circles of vulcanite, very much in the way that linen is stretched for marking. Figure 22 shows the apparatus in use.

A second source of contamination lies in the uncleanliness of the hands or persons of those immediately concerned in an operation. Under these circumstances, nurses should wash their hands with scrupulous care, and, as a further safeguard, may purify them in 1 to 20 carbolic. The use of a nail brush must on no account be omitted, and the nail brush must, of course, be disinfected in its turn.

The patient himself must be regarded as a third possible source of contamination. Organisms may exist in the skin of the face, in the cavity of the conjunctiva, or in the lacrymal sac. The skin of the face may be purified with a 1 in 20 carbolic lotion, but a solution of that strength would be too irritating if applied to the eyelids. For the latter we employ a 1 in 5000 solution of corrosive sublimate, applied in the form of wet compresses, which are placed over the lids for an hour or so before operation. A liberal use of soap and hot water should always precede the antiseptic applications, and, whenever possible, a bath should be given. The eye itself is best purified by a thorough douching with 1 in 5000 corrosive solution. This precaution is specially needed when any discharge is present from the conjunctival or from the lacrymal sac, and every practical surgeon recognises the risk that is added by the presence of such a complication. To apply the lotion, it is sufficient in the majority of instances to evert the lids (page 56) and then to squeeze over the exposed surfaces plenty of the sublimate lotion, from a piece of absorbent wool.

Care must be taken to remove any matter that may have collected in the corner of the eye. In those cases where the cornea is ulcerated, it will be hardly safe to attempt eversion of the lids, and the nurse must do the best she can under the circumstances, by gently separating the lids and squeezing plenty of lotion between them. In all cases, special attention should be paid to the roots of the lashes and to the culs-de-sac of the conjunctiva, two sites in which septic organisms are particularly apt to lodge.

Should a patient have discharge from the ear or from the nose, the notice of the surgeon ought to be drawn to that fact, and the same rule applies to any sores which may be present about the face. The eye might become infected if special precautions were not taken in such cases.

We have not yet exhausted the more obvious means by which septic organisms may be introduced into the eye, for sponges—a most fertile breeding ground for bacteria—remain to be considered. Formerly, little attention was paid to the cleansing of sponges, but in the earlier days of antiseptic surgery they became the objects of the most solicitous care. Of late years, however, there has been a general tendency to abolish the use of sponges altogether in operations and to replace them by pieces of lint, cotton-wool, or gauze, which have been wrung out of some antiseptic solution. These swabs are not equal to sponges in their absorbing powers, but any loss in that direction is more than outweighed by the gain in surgical cleanliness.

Sir Joseph Lister, who, as everybody knows, is the greatest living authority upon antiseptic matters, has lately published some interesting facts about the purification of sponges. He treats his sponges after an operation by washing them thoroughly first in soap and water, and then in soda; after which they are dried, and finally stored away in a solution of 1 to 20 carbolic acid. As regards private operations, Sir Joseph simply throws his sponges after use into a tank of water, where they are allowed to putrefy. They are then washed until the water squeezed from them is no longer reddened, and are afterwards put away in carbolic lotion. According to Lister, either plan will render sponges absolutely aseptic and trustworthy.

The following method, although somewhat more complicated, is an excellent way of purifying sponges. Mix two ounces of a saturated solution of permanganate of potash with about a quart of water, and place the sponges in the mixture. Allow them to remain in the liquid for about half an hour, after which they are put into the following fluid: Diluted hydrochloric acid, one ounce; hyposulphite of soda, half an ounce; water, one quart. They are left in the latter fluid until they turn white, and look like new sponges, when they can be stored away in 1 to 20 carbolic lotion. A large earthenware pickle jar, plugged with cotton-wool, and covered with gutta-percha tissue, forms a convenient storage tank for sponges.

If no chemical antiseptic be obtainable, sponges

may be sterilised by boiling them in water, and they should be then kept in boiled water until the moment for operation arrives. It appears, however, that a sponge thus treated undergoes a peculiar change, resulting in partial loss of its power of absorption, and when dry, it becomes "perfectly hard, like a piece of wood" (Maylard).

Notwithstanding the superior absorptive powers of sponges, they can be replaced by swabs of absorbent wool in eye operations as in general surgery. Boric acid solution (saturated) or carbolic lotion (1 to 100) may be used to moisten these pledgets, which must then be squeezed dry by a nurse whose hands have been carefully purified. After that, the swabs are laid aside wrapped in a towel that has been wrung out in a similar way, or they may be stored in a glass jar that has been well washed out with an antiseptic lotion, and which is kept closed at the top with a piece of sterilised glass. The swabs may be made of various sizes, and should be large in operations which involve much bleeding.

A word as to the management of sponges when used for operations on the eye. They must be taken out of the carbolic solution and squeezed as dry as possible before they are handed to the surgeon or to the sister. After use, they should be at once placed in a separate basin containing 1 to 30 carbolic lotion, from which they are returned to their original vessel. It is almost unnecessary to remark that the hands of every one concerned must be aseptic, and that should a sponge touch any unpurified object,

such as the bed-clothes or the floor, it must be at once laid aside, and not used again until it has undergone a formal process of purification. Swabs of cotton-wool are used once only, and are then destroyed.

Silk ligatures are often needed for eye operations. They may be purified in various ways, one of the simplest of which is to boil them thoroughly in water. Another plan is to keep the silk in a 1 to 20 carbolic lotion, but the nurse should remember that immersion for any length of time in that acid spoils the silk by making it brittle. Black silk is generally selected for eye work because that colour is easier to distinguish than others. Under some circumstances, waxed silk threads are used. They are prepared by immersing silk in melted bee's wax, to which carbolic acid has been added in the proportion of one of acid to nine of wax. Superfluous wax is got rid of by drawing the silk through a dry cloth.

Specially prepared catgut or horse-hair sutures are also occasionally used; but silver wire on the other hand finds comparatively few applications in eye-surgery.

Instruments, however clean in the first instance, may become readily polluted if permitted to touch any unpurified object, such as the table or articles of clothing. Hence, one or more towels, wrung out of 1 in 20 carbolic lotion, or sterilised in boiling water, should be close at hand, so that the operator may lay down his instruments on their aseptic surface. A towel prepared in the same way is laid over

the table on which the instruments are arranged before operation, and they should be covered with another towel, so as to be out of the patient's sight.

All vessels should be cleansed antiseptically. Indeed, the rules observed in the operations of general surgery apply equally to those performed upon the eye. Thus, the nurse should take care to have plenty of spare basins, a good supply of cold and of hot water, towels, sheets, and dressings.

All tissue, tumours, lenses, eyeballs, etc., removed by the surgeon must be carefully preserved.[1]

[1] It seems scarcely necessary to add that, whenever possible, the patient ought to have a purgative the night before operation.

CHAPTER IX.

DRESSINGS AND BANDAGES.

Dressings.

It is clear that the pains we have previously taken to purify instruments, fingers, and sponges will be thrown away if septic material be allowed to reach the wound after operation. Some sort of dressing is therefore necessary to cover the eye after many operations. Its object is twofold: first, to protect the eye from injury, and, secondly, to prevent the entrance of micro-organisms.

As to any particular dressing, the nurse will naturally be guided by the surgeon in charge of the case. The applications described below are, however, in common use, and their details should be accordingly mastered.

An EYE-PAD, which is the basis of most dressings, is made in the following way. Layers of absorbent wool are cut to a circular pattern, measuring about three inches across, and one to one and a half inches in thickness. Old linen or fine cambric, which has been thoroughly boiled and dried, is then shaped in a corresponding way, and a single disc of that material placed on each side of the wool pad. Some nurses stitch the two pieces of linen together, but that is hardly necessary.

The completed eye-pad, then, consists of two rounds of linen, enclosing a thick wad of wool.

As an additional precaution the absorbent wool in the pad may be charged with one of the following antiseptics: Boric acid, sal alembroth, iodoform, eucalyptus, or mercuro-cyanide. Salicylic wool is seldom used, as the acid basis is very irritating to the eye, and for a similar reason salicylic lotion is not often employed in eye work.

A word of caution may be here inserted. Cotton-wool itself ought never to be placed next to an eye, because its fine fibres are apt to find their way between the lids, and thus lead to discomfort and irritation. Lint, although still employed by many oculists, is open to a similar objection. On the other hand, the coarse muslin known as "butter-cloth," or gauze, makes an excellent dressing for eyes. It is soft, pliable, and very comfortable to the patient. Indeed, the pad may consist wholly of gauze cut to a proper shape; or, while cotton-wool forms the bulk of the pad, several layers of gauze may be placed next to the lids instead of the linen or cambric. By chemical means butter-cloth, like wool, may be rendered absorbent, and thus prepared it may be impregnated with any of the antiseptics named above.

Unmedicated dressing.—Nothing more is required than an eye-pad of absorbent wool placed over the closed lids, and kept in position by a couple of turns of bandage passed round the head.

Antiseptic dressings.—Iodoform.[1] The closed lids are lightly smeared with iodoform-vaseline (iodoform one to vaseline ten parts), and some of the same substance is spread over the linen of the eye-pad. Iodoform wool is used in the latter. A bandage will complete the dressing.

Boric acid.—The ointment of the British Pharmacopœia, which contains one part of acid to six parts of vaseline, is smeared over the lids and the eye-pad, as in the iodoform dressing. Boric wool is employed in the eye-pad. Another method consists in moistening a piece of green protective with a saturated solution of boric acid. This, placed over the lids, is covered with a pad of boric wool, wetted with the same lotion. A third plan directs boric acid ointment to be spread on old linen, which is then applied and covered in with ordinary absorbent wool.

Alembroth.—For this dressing an eye-pad is used of alembroth wool and gauze. The latter should be damped with 1 in 100 carbolic lotion before it is placed in contact with the lid.

Perchloride of mercury.—The lids are covered with several layers of fine linen soaked in 1 to 5000 solution of the salt. A piece of protective or gutta-percha tissue, previously dipped into the lotion, is then laid upon the linen, but care must be taken

[1] Iodoform, which consists almost entirely of iodine, has very little action on bacteria outside the body, although when applied to a wound it possesses undoubted antiseptic powers. It has been suggested that iodoform acts rather upon the products of bacteria than upon the actual organisms.

that the tissue is somewhat smaller than the linen, or else the result will be a poultice rather than a dressing. An eye-pad, or several layers of cotton-wool, is next placed over the protective; and last of all a bandage is applied. Some surgeons use lint instead of linen, but, for reasons already stated, personally I prefer the latter.

Mercuro-zinc cyanide.[1]—The circular pieces of linen are charged with this antiseptic, while the cotton-wool is treated in a similar way. The dressing should be moistened with a 1 in 100 carbolic lotion before application. Perchloride lotion must on no account be substituted for the carbolic, as it enters into chemical union with the cyanide to form a compound which is not only highly irritating, but is almost powerless against bacteria.

I have already said that dressings may be made entirely of absorbent gauze. That material, medicated with iodoform, boric acid, alembroth, per-

[1] Mercuro-zinc cyanide has been introduced lately by Sir Joseph Lister, and appears to have many advantages. It is almost unirritating, and is an exceedingly powerful antiseptic. Gauze may be charged with it at a moment's notice in the following way. Absorbent gauze is soaked in a 1 to 20 carbolic lotion, and the mercuro-cyanide is dusted over it from a pepper-castor. The gauze is then rolled and squeezed together, so as to diffuse the salt through the material. Lastly, the wet gauze is wrapped in a folded sheet to get rid of superfluous moisture, and it is then ready for use. (*British Medical Journal*, January and February, 1893.) The fact may be noted that, besides staining the fingers, the above solution makes the skin rough. A nurse should, therefore, wear a pair of gloves when preparing the gauze.

chloride, or mercuro-zinc cyanide, may be arranged in a circular pad of some thickness, which is placed over the eyelids, and held in place by a bandage.

In applying any of the above dressings a nurse must always take care to fill up the hollow of the orbit by adding bits of wool or gauze here and there until a level surface is obtained. If this precaution be neglected, the patient is certain to complain sooner or later that the dressing is uncomfortable. Moreover, harm may result from unequal pressure upon the eyeball.

The discharge from bandaged eyes is generally small. If, however, it should soak the dressing and show outside, the nurse must take prompt steps to prevent the contamination of the wound. Organisms experience no difficulty in making their way along a track of this kind, from which the discharge has washed away and exhausted the original antiseptic of the dressing. Accordingly, as soon as the nurse sees a soaked dressing she should sprinkle iodoform over it externally, and then apply a pad of antiseptic wool and a fresh bandage.

Materials used for dressings should be stored away in dust-tight receptacles, and should be handled only by fingers that have been purified. Personally, I use a japanned iron deed box for this purpose, but a biscuit tin will be found to answer well enough for private work, and a small tin trunk for the wards. In any case the receptacle must first be well scrubbed with 1 in 20 carbolic lotion.

To change a dressing.—The patient, if not already in bed, must lie down, and the nurse should arrange a mackintosh sheet under his head and shoulders. A tepid lotion of boric acid, corrosive sublimate, or carbolic acid is used. A number of small squares of lint, called "guards," are placed ready at hand in whatever lotion may be selected. They are intended for three purposes: first, to wash away the soiled dressing; secondly, to wipe off discharges; and thirdly, to protect the eye while surrounding parts are being cleansed. An enema syringe, reserved solely for this purpose, may be used to loosen and wash away the dressing.

The bandage having been removed, the wool of the eye-pad is soaked with lotion and taken away piecemeal with purified dressing forceps. Lastly, the piece of linen which forms the deep dressing is washed from the lids by means of a well-directed stream of lotion. During these proceedings anything like pulling or dragging must be carefully avoided. Discharge is to be wiped off gently by means of a guard, and the roots of the lashes are cleansed in the same way. The lids are next drawn gently apart, and a stream of lotion is allowed to enter the conjunctival sac. The final steps are to protect the eye with a guard, and to purify the surrounding skin.

Soiled dressings and guards must be at once thrown into a separate basin, and the instruments, as well as the fingers of all concerned, must be carefully purified after each fresh exposure.

BANDAGES.

Bandages.—The bandages used in eye work may be considered under two heads, namely, special and roller bandages.

Special forms of bandage are extensively used in ophthalmic cases, more especially after the operation for cataract.

The "*tie bandage*" is the simplest of all and by no means the least satisfactory. It is merely a piece of calico or water-dressing bandage, two inches wide and about forty inches long, which covers the eyes,

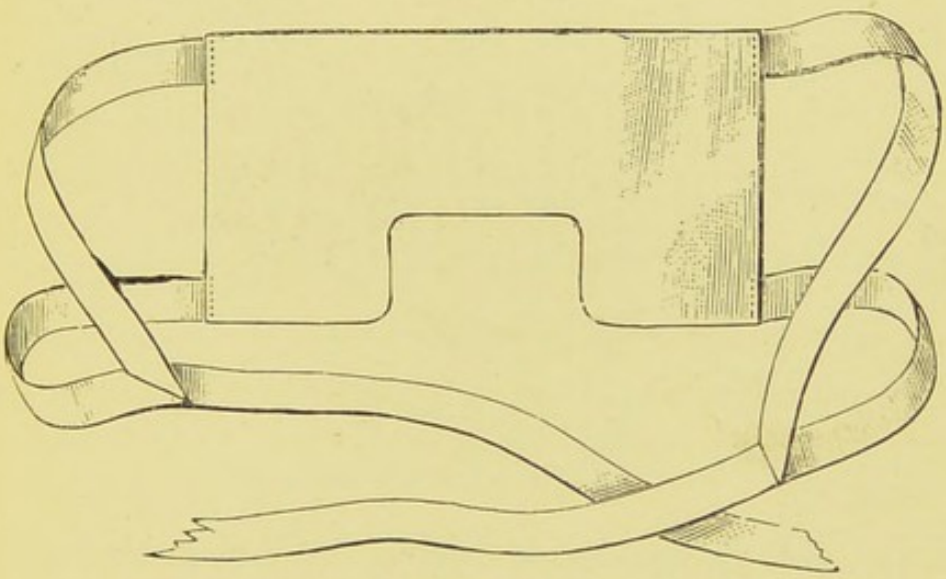


FIG. 23. MOORFIELDS BANDAGE.

and is tied either behind the patient's head or over his forehead. It may also be used to cover a single eye, in which case it is passed obliquely under the ear and round the head.

Figure 23 represents the "*Moorfields eye bandage,*" made of a double fold of linen, seven or eight inches in length and three in breadth. The bandage may be described as consisting of two squares joined

together by a narrower strip which fits spectaclewise over the bridge of the nose. The four tapes are arranged so as to form two loops, into which the ears fit when the bandage is applied. The loops terminate in free ends, which are crossed behind the head, brought forwards, and tied in a knot over the forehead. The "Moorfields bandage" is specially useful after cataract operations.

"*Liebreich's bandage*" (Fig. 24) may be thus described. Let A and B be the two ends of a linen or

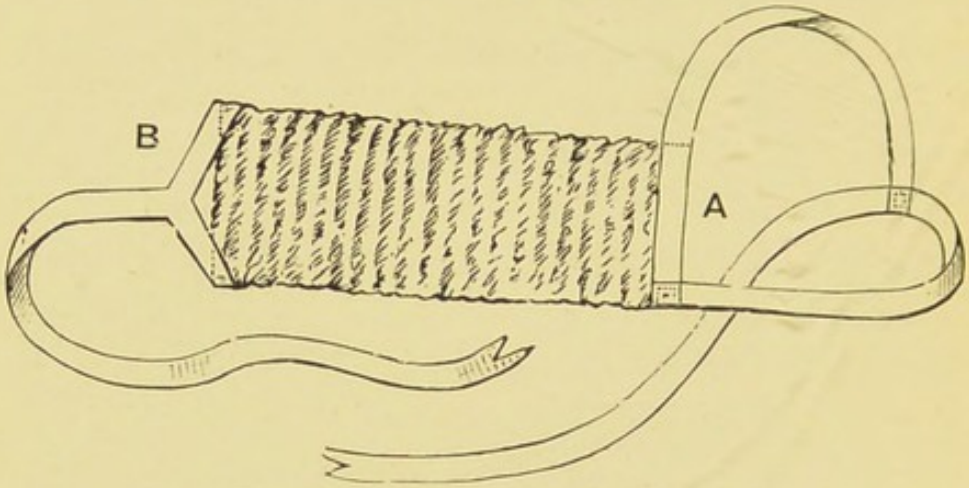


FIG. 24. LIEBREICH'S BANDAGE.

knitted cotton band, ten inches long and two and a quarter inches wide. From one end A a long tape passes round the back of the head, and is fastened to a second short tape from end B. The bandage is kept from slipping downwards by a third piece of tape, passing from ear to ear, and fastened at both ends to the long tape from end A. In applying this bandage the tapes are fastened on one temple, the right if the left eye has been operated on, and *vice versâ*.

I often use a simple bandage which can be made in a few minutes from a piece of Saxony flannel or domette. As shown in the figure, its shape resembles a dumb-bell, the handle of which passes over the nose, while the expanded ends fit over the eyes. This covering piece is fitted with two tapes, an inch in width, which are passed above the ears and round the head, to be tied together on the forehead. One may speak of this apparatus as the "*dumb-bell bandage*".

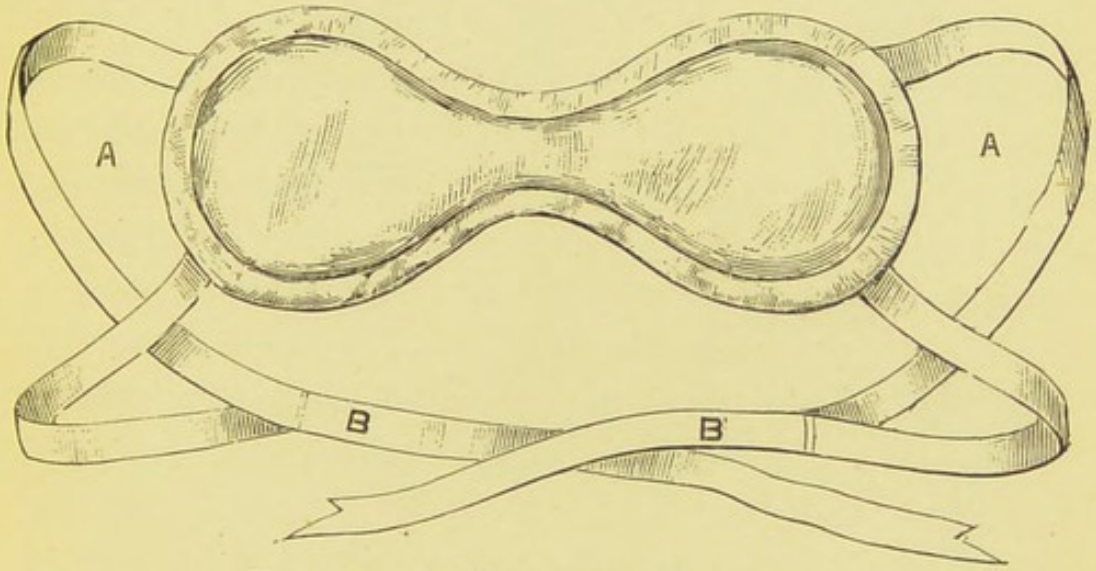


FIG. 25. THE DUMB-BELL BANDAGE.

The nurse should bear in mind that bandages are sometimes applied to the eye for purposes of pressure as well as of protection. The pressure bandage is used, for instance, to check bleeding when an eyeball has been removed, to prevent the ecchymosis of blood after a squint operation, or, curious though this may seem, when an ulcer has almost penetrated the cornea. The protective bandage, on the other

hand, is applied to keep the lids immovable after such operations as iridectomy or cataract extraction, and also in some cases of ulceration of the cornea. It would be a grave error to bandage an eye tightly after the anterior chamber has been opened, because pressure would be likely to prevent the wound from closing, and thus complicate matters seriously. It will be seen that all the special forms of bandage are for the sake of protection rather than of pressure.

The ordinary roller bandage, as every one knows, is made by tearing unbleached calico into strips of various lengths and widths. For the eye, a width of one and a half or two inches is sufficient, while the length of the roller need not exceed three yards. Calico bandages, however, are scarcely suited for the majority of eye cases; they are hot and heavy, and do not adapt themselves at all readily to the inequalities of the skull and the orbit. Consequently, bandages of other material, such as gauze or domette, are generally preferred. For my own part I may say that the best bandage with which I am acquainted is made of the open-wove stuff sold as bleached or unbleached "water dressing" or "Lister" bandage. Of the two varieties most persons prefer the bleached, notwithstanding the fact that the other is a good deal cheaper. As to the borders of the bandage it is of little importance whether they be loose or finished off with a "selvedge". The nurse should make it a rule, by the way, to brush the patient's hair both before and after the application of any kind of bandage to the head.

The following methods of applying roller bandages should be diligently practised by the nurse :—

(1) Let us suppose that it is necessary to bandage the right eye after operation. The nurse stands in front of the patient, holding the bandage in her right hand. She next places the roller on the centre of the patient's forehead, and secures its end with her left thumb. The bandage is then carried to the patient's left, round the skull to the forehead, where it overlaps and fixes the free end left upon starting. A second turn is made around the head as far as the middle of the back of the skull, when the direction of the bandage is changed so as to bring it under the right ear, and upwards over the cheek to cover the right eye. The roller is then cut short, and the loose end securely fastened to the bandage on the forehead by a safety-pin (Fig. 26). Concerning this bandage, two points may be noted: (1) that the eye is covered by a single fold only; and (2) that in bandaging the right

Fig. 26. Roller Bandage Applied to one Eye.

eye the roller is at first carried to the patient's left, and *vice versâ*. This bandage possesses a great advantage over most others, in that the patient's head need not be raised from the pillow when changing dressings; one has merely to unpin and throw down that part which closes in the eye.

FIG. 27. (AFTER DE SCHWEINITZ.) FIGURE-OF-EIGHT BANDAGE APPLIED TO ONE EYE.

(2) By a slight modification of the foregoing bandage both eyes may be covered. After the safety-pin has been inserted the roller is reversed, it is then carried downwards across the opposite eye and beneath the ear on that side to the back of the skull, from whence it is brought round to the forehead and secured by a second safety-pin.

(3) Figure 27 represents the figure-of-eight applied so as to cover one eye.

(4) The figure-of-eight covering both eyes is shown in Figure 28.

We have now seen how to apply our dressing and bandage, but in certain cases the bandage must be more securely fixed. It is of course easy to fasten the bandage by inserting numerous safety-pins, or

by stitching its various folds together. A much better plan, however, is to cover the bandage with a thin layer of boiled starch, and, indeed, with children this precaution should always be taken.

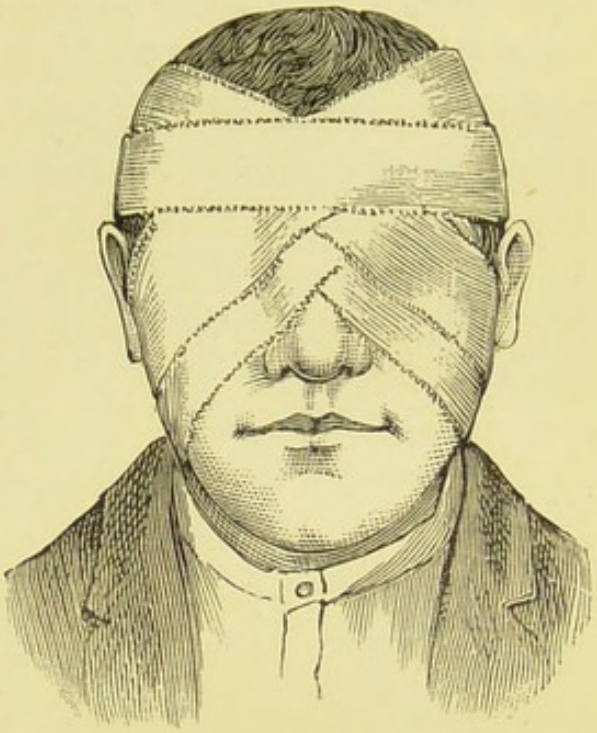


FIG. 28. (AFTER DE SCHWEINITZ.) FIGURE-OF-EIGHT BANDAGE APPLIED TO BOTH EYES.

Let me emphasise the fact that ordinary pins must not be used to fasten a bandage; safety-pins should always be employed.

Some surgeons, as will be mentioned in a later chapter, dispense with bandages after cataract operations, and simply close the eyes with strips of plaster.

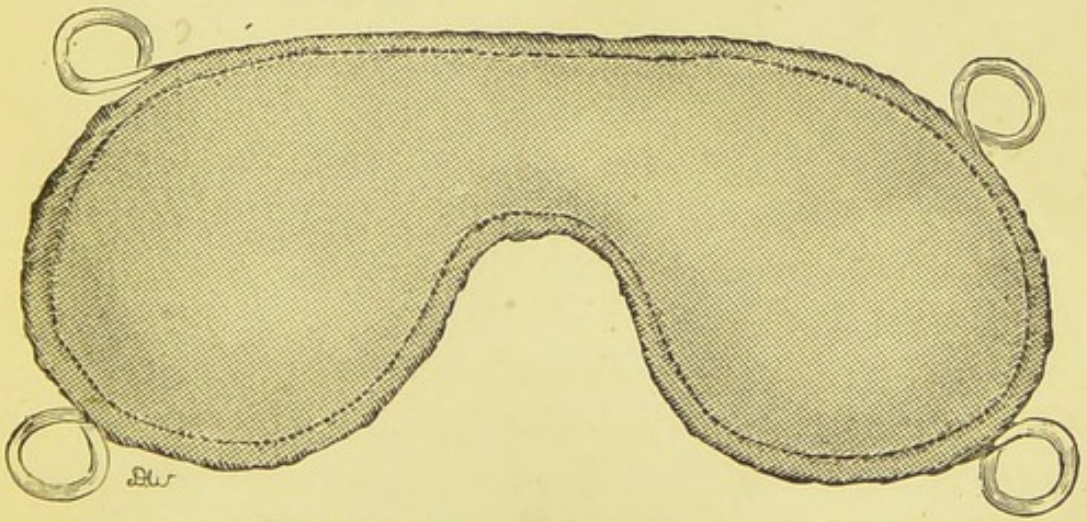


FIG. 29. PROTECTIVE WIRE FRAME.

In conclusion I may mention that a light protective frame of copper gauze[1] is useful for children, who are apt to meddle with their dressings. The apparatus is placed over the eye-pad, and takes the place of an ordinary bandage. Figure 29 represents the frame which I employ. It can be readily bent to any required shape, and its structure allows of its being scalded in boiling water for purposes of disinfection.

[1] This frame is made in three sizes by Messrs. Down Bros., St. Thomas's Street, S.E.

CHAPTER X.

NURSING OF THE DIFFERENT OPERATIONS.

For present purposes we may divide operations into two groups: those which deal (1) with the appendages of the eye (lids, muscles, and tear apparatus); and (2) with the eye itself.

Operations upon the Appendages of the Eye.

Operations involving the nasal duct and tear passages need no dressing, and are usually performed in the out-patient room, remarks which apply equally to the removal of tarsal cysts.

Excision of the lacrymal gland requires some form of antiseptic dressing, and in hospital practice the patient would be admitted to the wards.

The operations for entropion, ectropion, trichiasis, and ptosis may or may not require a special dressing, according to the method employed and to the practice of the surgeon. It is hardly possible, therefore, to give precise directions with regard to their after-treatment. Generally speaking, the nurse must be guided by the orders of the doctor.

After the surgical treatment of trachoma by "expression," no dressing is employed, but the lids are fomented with hot boric lotion for half an hour to encourage bleeding. When the more severe opera-

tion of "BRUSHING THE CONJUNCTIVA" has been resorted to, it is customary to use iced antiseptic lotions, such as boric, which are kept constantly applied to the lids until inflammatory symptoms have subsided.

Surgeons differ in their after-treatment of simple TENOTOMY or "cutting" for squint. Some cover both eyes with a pad and bandage for half an hour only, while others leave a similar dressing in place for twenty-four hours; and others, again, discard dressings altogether. Most English oculists adopt the first plan with the idea that the presence of the bandage will prevent excessive effusion of blood beneath the conjunctiva. On the other hand, they cover up with an antiseptic dressing for some days an eye on which MUSCULAR ADVANCEMENT has been performed. Some surgeons, myself among the number, prefer to bandage both eyes after this operation, even although one alone has been operated upon. Unless they have come away of their own accord before that time, the stitches are removed three or four days after operation. Dressings are changed daily, and on each occasion the eye is cleansed with tepid boric or corrosive sublimate lotion.

OPERATIONS UPON THE EYEBALL.

The nurse should clearly distinguish between two sets of operations: first, those performed outside the eyeball; and, secondly, those in which the eyeball is opened.

A. WHEN THE EYEBALL HAS NOT BEEN OPENED.

Under this head we include the scraping or cauterisation of infective corneal ulcers, enucleation of the eye, and exenteration of the orbit.

The after-treatment of an ulcer that has been burnt or scraped is simple enough. Iodoform,[1] iodol, or aristol[2] is dusted over the cornea, and a pad and bandage applied.

ENUCLEATION OF THE EYE.—As soon as the operation is completed, bleeding is checked by pressure for several minutes with pieces of sterilised gauze or wool. This is followed by the application of an antiseptic dressing, which is renewed in six hours. In my own practice, I insufflate iodoform, and stuff the orbit with pledgets of purified gauze, applying an antiseptic dressing at once. Some eight or ten hours afterwards, I remove the bandage, take out the gauze, and apply a light dressing of cyanide or of alembroth. In my experience, a roller is better than any form of special bandage after enucleation.

Bleeding occasionally sets in some little time after operation, and the nurse must be on her guard against such an accident. This "reactionary" hæmorrhage, as it may be called, is much the same thing as that which sometimes occurs within twenty-

[1] Two kinds of iodoform—the powdered and the precipitated—are sold. The former, the powdered, is the best to use, as it does not clot upon the cornea.

[2] Aristol is a brownish powder, which owes its antiseptic virtues to its contained iodine and thymol. It is often substituted now-a-days for iodoform in conjunctival or corneal affections.

four hours of an amputation, for instance, of the thigh or forearm. Should it set in after enucleation of the eye, treatment should be carried out on the following lines. First, the nurse should apply more pressure by means of an additional bandage. Should she fail to arrest the flow by that means, she must at once remove the dressings — using antiseptic precautions—and syringe out the orbit with iced perchloride lotion or with hot boric lotion. If the orbit has been plugged, the pledgets of gauze should, of course, be taken out before syringing. Bleeding will then almost certainly cease, while recurrence will be prevented by the application of a firm pad and bandage. In the event of further difficulty, it would be necessary to send for the surgeon.

If all go well, the wound left after enucleation heals by primary union, without the formation of pus, in five or six days. A small celluloid shade is then substituted for the bandage, and worn until the "stump" is fit to bear an artificial eye.

Before leaving this subject, I may be permitted to remind the nurse that the patient's temperature must always be recorded both before and after enucleation; furthermore, that after removal the eye must on no account be thrown away without the express sanction of the surgeon.

Although MULES' OPERATION is one in which the eyeball is opened, yet its after-treatment may be conveniently considered in this place. Antiseptic precautions and dressings are here absolutely neces-

sary, and the latter may consist of alembroth, iodoform, or mercuric cyanide gauze, covered with a pad of medicated wool and a light bandage. For the first two or three nights after operation, severe pain may call for a sleeping draught or the hypodermic injection of morphia. There is usually a certain amount of swelling of the conjunctiva, which may even protrude between the lids on to the cheek, but as a rule this chemosis speedily subsides. The stitches are generally taken out at the end of the first week, but some operators, Mr. Mules among the number, do not hesitate to leave them in place altogether. The same gentleman informs me that he discards dressings and bandages as soon as possible, as he believes that exposure to air has a salutary action on the parts.

B. WHEN THE EYEBALL HAS BEEN OPENED, as in PARACENTESIS, CORNEAL SECTION, DISCISSION, IRIDECTOMY, SCLEROTOMY, and the various OPERATIONS FOR CATARACT.

It will clear the ground if we consider DISCISSION or NEEDLING first. That operation is performed either to cure cataract in young persons, or to break up membrane left after extraction of senile cataract.

In the first case, the pupil is dilated with atropine before operation, and, after the needling, an antiseptic dressing is applied, and the patient put to bed. He is generally able to get up in twenty-four hours, and to leave off the dressings in a couple of days.

With regard to needling as a sequel to the opera-

tion for senile cataract, the only after-treatment required is the application of a pad and bandage for a few hours.

PARACENTESIS and CORNEAL SECTION agree in this, that the wound is re-opened daily for a longer or shorter period by means of a delicate instrument. Antiseptic dressings are used, and strict aseptic precautions are subsequently observed.

In the after-treatment of the remaining operations (IRIDECTOMY, SCLEROTOMY, and CATARACT EXTRACTION), the following rules are observed, at least by the majority of English surgeons.

1. Antiseptic precautions are strictly enforced.
2. Both eyes are bandaged for several days, even although one alone has been operated upon.
3. The patient is confined to bed, often in a darkened room.
4. Physical exertion, vomiting, coughing or sneezing to be guarded against as much as possible.
5. "Slop diet" is given for twenty-four hours after operation.

An iridectomy or sclerotomy wound generally heals completely by the end of the first week, when the antiseptic dressings are replaced either by a light protective bandage or by a shade to cover the eye that has been operated upon. Dressings are changed daily. Physostigmine (eserine) drops are put into the eye after iridectomy for glaucoma. The same drug is used by most surgeons both before and after the performance of sclerotomy; in the former case, to simplify the operation; in the latter case, to

prevent prolapse or slipping forwards of the iris into the wound.

Extraction of Senile Cataract.—The after-treatment of this operation was in former days of a most elaborate character. Thus, both eyes were bandaged; the patient was put to bed in a chamber from which every ray of light had been carefully excluded; examinations were conducted and dressings changed under the glimmer of a single candle; a special diet[1] was given; conversation was permitted in whispers only; the bowels were "locked" for some days by the use of opiates; and all possibility of accidental straining was carefully guarded against. These precautions were rigorously observed for eight or ten days.

The tendency of late years, however, has been

[1] Before the action of septic organisms was understood, it was generally believed that diet had a considerable influence in heightening or reducing inflammatory processes: a light diet was regarded as essentially anti-febrile. Accordingly, surgeons tried to prevent the onset of inflammation after cataract extraction by such a dietary as the following, which is copied from the Pharmacopœia of the Royal Westminster Ophthalmic Hospital. Breakfast: tea, ½ pint; butter (after third day), ½ ounce. Tea: as for breakfast. During the remainder of the twenty-four hours: meat (finely powdered), 4 ounces; potatoes (five times a week), 4 ounces; custard pudding, 8 ounces; milk, 2 pints, or milk, 1 pint, with 1 pint of beef-tea, corn-flour or gruel; bread, 12 ounces.

The semi-fluid diet, now enjoined for twenty-four hours after operation, is given, of course, to avoid the bad results which might possibly arise were the patient allowed to masticate solid food.

to do away with these complicated measures—an advance that dates from the recognition of the fact that suppuration after cataract extraction is due in every instance to septic infection of the wound. Modern methods aim at asepsis, and regard everything else as of minor importance. The surgeon, as we have seen, takes the greatest pains to prevent the entrance of organisms before, during, and after operation. Each time the eye is dressed, rigid antiseptic precautions must be observed by those immediately concerned; fingers, instruments, and dressings must be surgically clean; and if it be necessary to use drops, they should be either freshly prepared, or sterilised by boiling in a Stroschein's flask. In a word, until the wound is healed, and the anterior chamber re-formed, the eye should be treated as if it had been just operated upon.

Let us take, as an example, a case in which cataract has been removed from one eye only. As soon as the operation is finished, the eye is washed with corrosive sublimate (1 in 5000) or with boric lotion (saturated solution). To the eye that has been operated upon an antiseptic dressing is applied, while for the other eye a plain pad is used. Both eyes are then covered with a roller, or with a special form of bandage. The patient is put to bed, and his eyes are screened from direct light. If thirsty, he may be allowed to suck morsels of ice, but no solid food should be given during the first few hours after operation. For the first twenty-four hours, the diet may be restricted to milk, beef-tea, eggs and light

pudding; fish may be given on the second day; and, after that, ordinary food may be taken. The smarting left by the operation generally subsides in a short time; and freedom from pain may be taken throughout as a sign that everything is going on well. Coughing, sneezing, and so forth should be avoided as much as possible; and the bed-pan must be used for the first three days.

Vomiting is especially dangerous when the anterior chamber has been opened, as in cataract and iridectomy. It was more frequent in the days of chloroform and ether than it is now, when cocaine-anæsthesia is the rule. Occasionally, however, the use of the alkaloid even is attended with troublesome retching and sickness. Under these circumstances, the best treatment is to keep the patient perfectly quiet, to give him small pieces of ice to suck, and to apply a mustard plaster to the pit of the stomach. Should vomiting occur, it is not advisable to remove the bandages, but the nurse should support them with her hand. If the symptoms be not quickly relieved by these measures, it is best to acquaint the surgeon of the fact without loss of time.

It is customary to dress the eye twenty-four hours after operation. Most surgeons content themselves with removing dressings, and squeezing a little tepid[1]

[1] Cold lotion should not be used, as it may cause the patient to screw his lids forcibly together; moreover, other things being equal, a warm solution possesses greater antiseptic power than a cold one.

lotion into the eye, but they do not inspect the cornea. Dressings are applied as in the first instance, and this process is repeated daily. On each occasion the nurse should brush the patient's hair. On the third day the surgeon generally opens the lids, and looks at the cornea; when, all being well, the patient, with both eyes bandaged, is allowed to leave his bed for a few hours. On the fifth or sixth day the eye that has not been operated upon is left unbandaged. At the end of ten days, more or less, according to circumstances, a large paper shade is substituted for the bandage; and a few days later the patient is discharged from hospital, wearing a pair of protective goggles.

The foregoing remarks apply to cases in which an iridectomy has formed part and parcel of the cataract extraction. When, however, iridectomy has not been done, the eye is inspected twenty-four hours later, so that any protrusion of the iris may be cut away at once.

Unfortunately, however, cataract extractions do not always progress so smoothly as the above description might lead one to suppose, and the following signs will warn the nurse that all is not going on well. (1) Slight rise of temperature. (2) The continuance or recurrence of pain, which, as stated previously, should subside soon after operation. (3) The presence of discharge in any quantity. If watery, it often points to iritis; if yellow and thick, to suppuration. (4) Swelling of the free edge of the upper lid. The chief complications may next be described separately.

An eyelash may become detached, and getting into the conjunctival sac may cause considerable irritation. It should obviously be removed at once.

Owing to the irritation of the bandage, the orbicularis muscle may be thrown into action, and thus bring the lashes into contact with the eye. This condition, termed "Spasmodic Entropion," is most frequently met with in old persons. The first thing is to replace the bandage by a large shade covering both eyes. Should that fail to afford relief, the lower lid is drawn down, and its outer surface, together with the neighbouring skin, is dried and painted with contractile collodion.[1] The traction thus exercised is often sufficient to relieve the entropion. It is commonly imagined that greater strength is obtained by two coats or more of the varnish, but that is not the case; all that is required is to pass a large brush charged with the collodion once over the parts. In case these simple remedies fail (as they sometimes will), the surgeon resorts to operative measures, such as removing a piece of skin, or inserting stitches, so as to keep the lid in place.

Inflammation of the iris is a frequent complication, and, like suppuration, is almost always an evidence of septic invasion. It manifests itself (usually on the fourth or fifth day after operation) by pain, swelling of the lid, watering of the eye, and

[1] There are two kinds of collodion, both officinal, namely, the contractile and the flexible. The latter, which contains castor oil and Canada balsam, is not so good for this purpose as the former.

intolerance to light. Leeches and atropine are the remedies commonly employed.

Suppuration is a most serious complication, and may end in complete loss of sight. *Symptoms:* the eye becomes painful and bloodshot, the lids swollen and bathed in yellow discharge, while the wound looks grey and sloughy and has a generally unhealthy appearance. This formidable complication calls for prompt action if sight is to be preserved. The surgeon separates the lids, washes all discharge away with antiseptic lotion, and dusts the wound with iodoform. Hot fomentations are then applied, and the patient put upon a liberal allowance of meat and stimulants. An excellent treatment, much in vogue now-a-days, is to apply the actual cautery to the wound.

Confinement to bed, with bandaged eyes, sometimes proves too much for elderly persons, who become delirious, more especially if they have been addicted to alcohol. At other times, old persons grow short of breath, and are distressed by a troublesome cough—symptoms due to a form of congestion of the lungs, spoken of as "hypostatic". Under such circumstances, patients are generally allowed to get up, and to wear a shade instead of a bandage.

Any account would be incomplete which omitted to mention the views of those surgeons who dispense altogether with bandages in the after-treatment of cataract. Although that method has been extensively used in America, apparently with good results, yet it has not so far commended itself to the generality

of English ophthalmic surgeons. The American practice is to cover the lids of one or both eyes immediately after operation with a strip of thin isinglass plaster, measuring 1 by $1\frac{1}{2}$ inches, and reaching from brow to cheek. The plaster is applied smoothly to the lids in such a way that the inner and outer angles of the eye are left open, both for the escape of secretion, and for the application of remedies. By these means the lid is kept in contact with the globe, thus forming a protective covering, which may be regarded as a kind of natural splint. After operation the patient is allowed to walk to his bed, where he is kept until the following day. The room in which he lies is not darkened, and moderate exercise is permitted.

Protective shields of pasteboard or other material are sometimes used. After the plaster has been applied, they are moulded to fit the eye, which is thus effectually guarded against accidental injuries.

CHAPTER XI.

A BRIEF ACCOUNT OF THE COMMONER DISEASES OF THE EYE, WITH HINTS AS TO THEIR NURSING.

MANY passing hints have been given in different parts of this book as to the nursing of particular diseases, but it will be advisable, nevertheless, to gather those hints together in the following chapter. I must disclaim, however, any intention of describing a tithe of the diseases to which the eye is liable; my idea is simply to deal briefly with those everyday affections which the nurse will often be called upon to treat.

STYE OR HORDEOLUM.

A stye is a small abscess at the root of an eyelash. It is a common affection, especially in children.

The usual treatment, after a purge, is to apply hot fomentations or warm compresses, whereby the boil is brought to a head, when it either breaks of its own accord, or is laid open by the knife of the surgeon. A commencing stye may sometimes be cut short by pulling out the lash around which it has formed.

BLEPHARITIS, TINEA TARSI, OR OPHTHALMIA TARSI.

Blepharitis is an affection of the lashes, at the roots of which scales or scabs form, while the under-

lying skin is often ulcerated. The free edge of the lids becomes thickened, and the lashes fall out; in neglected cases, indeed, the margin of the lid may become quite bald, the patient presenting under those circumstances a blear-eyed and unsightly appearance which has received the name of "Lippitudo". The fact should be added that the upper lid is more subject to blepharitis than the lower one.

It is difficult to cure a severe case of tinea tarsi. The scales, it is true, may be removed easily enough for the time being, but, generally speaking, they form again sooner or later. In point of fact, treatment in many instances is merely palliative.

The favourite remedies for blepharitis are mercurial ointments, such as that of the nitrate, of the red or of the yellow oxide, or of ammoniated mercury. Tar ointment is sometimes used. Whatever be the ointment selected, it is well rubbed into the edge of the lids night and morning, either with the pulp of the forefinger or by means of a piece of gauze. In specially severe cases the medicament, smeared on a piece of linen, is left in contact with the lids all night. Whenever the crusts are thick it is a good plan to begin by cutting the lashes short. Before applying ointments, all scales or scabs must be removed, so as to expose the reddened skin beneath, and this may be effected in various ways. The simplest plan is by fomenting the lids with really hot water for ten minutes or longer, when the softened scabs are rubbed off with a piece of gauze or detached by forceps. A lotion containing ten

grains of borax or of carbonate of soda[1] to the ounce, used hot, often acts better than plain water, because the alkali penetrates the greasy scales, and so loosens them from their attachment. In the most severe cases of tinea tarsi it is best to pluck out the whole of the lashes, a small operation fully described in a later chapter. After the lashes have been epilated, it is a common practice to rub the edges of the lids with diluted silver stick, or to paint them with a solution of that caustic (twenty grains to the ounce). This application is repeated twice a week until the disease is cured.

Phlyctenular Conjunctivitis.

In this affection, one or more reddish-yellow pimples make their appearance on the white of the eye, as a rule close to the cornea, while each becomes the centre of a small inflammatory patch. After increasing in size, the "phlyctenulæ," as they are called, rupture, leaving small ulcers which readily skin over, and a cure is soon completed.

In a child with phlyctenular disease, the orbicularis muscle is often tightly contracted, and it then becomes a matter of some difficulty either to examine the eye, or to apply remedies. The nurse will find in a later section full directions as to the management of such cases. A complication of phlyctenular conjunctivitis may be mentioned here. I refer to an excoriation of the delicate skin at the outer canthus, the result of soddening by tears and

[1] *N.B.* Not the *bi*-carbonate of soda.

secretion. Although in many instances this heals of its own accord when the eye gets better, yet it may call for special treatment. In that event, zinc-oxide or boric ointment may be applied the last thing at night, or the affected skin may be lightly touched with mitigated nitrate of silver stick.

Phlyctenular conjunctivitis is essentially an ailment of childhood, and for the most part attacks scrofulous children. As might be expected, the disease is commonly associated with other marks of struma, such as enlarged glands, eruptions on the face or ears, thickened lips, or discharge from the external auditory meatus. It is very apt to recur again and again in the same individual.

As to treatment, the usual plan is to put a morsel of the yellow oxide of mercury ointment into the conjunctival sac, and then to rub it well into the eye, as explained in chapter v.; or the ammoniated mercury ointment is sometimes used instead of the yellow oxide. Powders, too, enjoy much reputation in the treatment of the disease. Thus, calomel, aristol, tannic, and boric acid are all prescribed. Tonics, cod-liver oil, and systematic exercise in the open air are often needed to clinch the cure.

Two cautions should be given, *viz.*, not to bandage the eyes of a child suffering from phlyctenular disease, and never to allow him to mope away in dark corners.

Trachoma or Granular Lids.

In England, trachoma is common in parochial

schools and among the poor generally, although scattered cases are not rare even among the wealthier classes of society. From some countries, as Egypt, Algeria, and Ireland, the disease is never absent. Trachoma, as stated previously, is a contagious disorder. It is the cause of a great amount of blindness. For instance, out of 1000 eyes examined by Cohn, seventeen had been blinded by trachoma.

The symptoms of trachoma, briefly stated, are as follows: discharge is present; the conjunctiva of the lids becomes red, thickened, and studded with granulations, sometimes resembling those of "proud flesh," at other times reminding one of grains of boiled sago. As a complication, the cornea may be ulcerated, or it may become red from the development of blood-vessels under its epithelium, a condition known as "pannus".

Mild remedies merely aggravate the disease: to be successful, treatment must be energetic. Thus, the lids are everted, and the diseased conjunctiva directly treated with blue-stone, lapis divinus, mitigated nitrate of silver, or diluted corrosive sublimate. Solutions of lunar caustic (gr. 10—20 to an ounce of distilled water) are also commonly used. This treatment is persevered with daily until the discharge has subsided, and the lids have regained their natural smoothness. Besides these strong measures, the eyes are washed out three or four times a day with one or other of the antiseptic lotions mentioned in the chapter on remedies. Finally, it is often necessary to resort to operative

measures, such as excising the cul-de-sac, or squeezing out the granulations ("expression").

The strong remedies enumerated above should not be applied to the lids at bedtime, inasmuch as they excite a secretion which is apt to do mischief during the night.

In trachoma, it is not advisable to use bandages or other dressing which would have the effect of keeping discharges pent up within the lids.

The Various Forms of Ophthalmia.

Ophthalmia is a general name signifying inflammation of the conjunctiva; it includes the following varieties:—

1. Muco-purulent or catarrhal ophthalmia.
2. Ophthalmia neonatorum.
3. Gonorrhœal ophthalmia.

Ophthalmia, as stated before, is contagious, that is, it may be passed on from the sick to the healthy. Of the three varieties, the gonorrhœal is the most virulent in this respect, while the muco-purulent, on the other hand, is only slightly contagious. In dealing with all forms of ophthalmia, however, a nurse should carefully follow the advice given in chapter iii.

Before describing the diseases separately, it may be well to lay down the following rules, which apply to all cases.

1. The patient should be kept apart from other persons.

2. When one eye alone is affected, the other must be covered with a protective appliance.

3. Discharge should on no account be allowed to collect in an eye, and must be washed away as soon as it forms.

4. In applying lotions, the lids must be everted, and syringes must not be used.

5. Bandages ought never to be applied, except under medical directions.

6. Lids glued together by secretion should be bathed before any attempt is made to separate them.

7. A morsel of vaseline, cold cream, unguentum zinci oleatis, unguentum acidi borici, or unguentum iodoformi, should be put into the eye at night, so as to prevent that sticking together of the lids which is alike painful to the patient and a hindrance to recovery.

1. *Muco-purulent Ophthalmia.*—The patient complains of a sensation which he says is "like sand in the eye". The lids may be somewhat swollen, and the eye looks bloodshot. The bulbar conjunctiva often shows small plum-coloured spots or patches, due to rupture of the blood-vessels; and it is occasionally puffed up so as to resemble a bladder, a condition known as "chemosis". A slightly yellowish discharge flows from the eye, but it is important to note that the secretion is not pus. All the foregoing signs become more marked at night.

In the majority of instances, catarrhal ophthalmia is not a serious affection, and gets well in the course of two or three weeks without entailing any evil consequences. The disease, it should be mentioned, is liable to relapse after apparent cure.

With regard to treatment, various plans are in vogue. For instance, some surgeons trust wholly to frequent washings with weak corrosive sublimate or other antiseptic lotion, while others add to that the constant use of cold applications. The practice of a third school, besides employing weak antiseptic lotions, is to paint the conjunctiva of the everted lids daily with solution of lunar caustic (10 grs. to the ounce).

2. *Ophthalmia Neonatorum.*—I have spoken before of this disease, and have insisted upon the fact that it is due in every instance to inoculation of the eyes with vaginal secretion during the passage of the child into the world. Ophthalmia neonatorum usually appears on the third day after birth, and if neglected may speedily lead to loss of sight. Of the inmates of blind asylums, it is probable that at least one-third owe their unfortunate condition to this disease (Fuchs). In short, we shall not err in regarding ophthalmia neonatorum as the most frequent cause of preventable blindness. Fortunately, however, a means of prevention, as simple in its application as it is satisfactory in its results, lies close at hand, and every nurse who is called upon to attend a lying-in patient should adopt this method—called after its discoverer, Credé—as a matter of course. As soon as the child is born, its eyes are cleansed with tepid water. The lids are then drawn apart, and a single drop of a two per cent. solution of silver nitrate is allowed to fall upon each cornea. By the adoption of these means, Credé reduced the frequency of

ophthalmia from more than ten per cent. to less than one per cent. among the children born in the Leipsic Maternity Hospital. It is scarcely necessary to add that the vagina of a lying-in patient ought to be douched out with an antiseptic solution before delivery.

The symptoms of this disease resemble those of catarrhal ophthalmia, although they are more severe. The lids, for example, are much swollen, and a quantity of yellow matter is discharged from the eye. The disease almost invariably attacks both eyes. If proper steps be not taken the cornea is apt to ulcerate, and the eye may be much damaged, or even wholly lost.

Ophthalmia neonatorum is generally treated by painting the everted conjunctiva with a ten-grain solution of lunar caustic, and repeating the process once or twice a day, according to the severity of the disease; or mitigated silver stick may be used in place of the solution. Between these applications, purulent discharge is washed away from the eye by means of weak antiseptic lotions, as chlorine water, boric acid, corrosive sublimate, or alum. It is often necessary to apply the lotion every half-hour, and success depends to a great extent upon the care with which that operation is conducted.

It is almost impossible to apply remedies to a baby's eye satisfactorily unless he be held by the nurse in the way mentioned in chapter xiii. The infant's head having been fixed between the nurse's knees, she turns out the lids, and removes all

discharge. The exposed conjunctiva is then dried by means of blotting paper, absorbent wool, paper fibre lint, amadou, or absorbent gauze, and, lastly, the everted lids are treated with silver as described in chapter v. The surgeon often finds it necessary to use a retractor to raise the upper lid in order that he may examine the cornea, but a nurse should not employ that instrument, except under medical directions.

3. *Gonorrhœal Ophthalmia.*—This is the most serious as well as the most contagious form of ophthalmia, and even under prompt and experienced treatment eyes are not infrequently lost from ulceration or sloughing of the cornea. Inasmuch as the disease generally attacks one eye in the first instance, it becomes of great importance to protect the second eye against inoculation. Wherefore, a Buller's shield, or other equivalent appliance, should be always used.

The symptoms are like those already described in ophthalmia neonatorum, but they are usually much more pronounced. The reddened and livid lids may be swollen to the size of a Tangerine orange, and a profuse discharge of pus takes place from the œdematous palpebral conjunctiva. Chemosis is a marked symptom, and may be so severe that the cornea seems to lie at the bottom of a pit, the walls of which are formed by a ring of swollen conjunctiva. Paroxysms of pain often prevent sleep either by day or by night.

The treatment of gonorrhœal ophthalmia proceeds

on the same lines as those described above for ophthalmia neonatorum. Many surgeons, however, use iced applications to the lids. The combined retractor and douche, mentioned in chapter v., often renders signal service in this affection by allowing us to reach the cul-de-sac with lotion.

In dealing with so contagious a disease as gonorrhœal ophthalmia, a nurse must take every precaution against infecting her own eyes. To that end, she should most rigorously observe the rules laid down on page 38. There is some evidence to show that flies may carry contagious particles from eye to eye. It is well, therefore, when dealing with purulent ophthalmia, to provide plenty of fly-papers, so as to reduce such a possibility to its lowest limits.

Before leaving the subject of contagious ophthalmia, a list may be given of articles that should be ready at hand for the surgeon's visit: Jaconet apron, mackintosh sheet, cotton-wool, absorbent gauze, amadou, a pair of retractors, corrosive sublimate lotion, solution of silver nitrate (10 grains to the ounce), and a camel-hair brush, mitigated silver stick in holder, atropine drops (4 grains to the ounce), iodoform, eserine drops (3 grs. to the ounce).

Ulceration of the Cornea.

A nurse will have learnt elsewhere that by ulceration is meant the local death and casting away of a portion of the body. Thus, an ulcer of the leg and an ulcer of the cornea are examples of essentially

similar processes, due allowance being made for difference in position, in size, and in structures involved.

Among the causes of ulceration of the cornea may be mentioned injuries, scrofula, debility, and the different forms of ophthalmia.

How can we tell when an ulcer is present? The most obvious sign is the ulcer, which manifests itself as a small pit or depression in the cornea, staining a vivid green when fluorescine is dropped into the eye. The patient complains of pain and dreads light, which he does all he can to avoid. Indeed, so characteristic is this photophobia that whenever it is observed a nurse should suspect ulcer of the cornea. Redness of the eye is generally present.

Ulcers vary much in size, position, and severity. They may, for instance, be superficial or deep, or they may have a tendency to spread widely, when they are spoken of as "serpiginous". A superficial ulcer may heal without leaving any perceptible blemish, but a deep ulcer, on the other hand, always leaves a resulting mark. To such scars, various names are given depending upon their density. Thus, a mark so faint as to need artificial light for its discovery is called a *macula;* when more pronounced, and visible under conditions of ordinary illumination, a *nebula;* and when it presents a staring white patch, a *leucoma.* Macula, nebula, and leucoma may exist together in the same eye. It is obvious that such opacities lying in the line of sight will seriously interfere with vision.

The treatment of corneal ulceration may be

summed up in a few words. In acute ulcers, the eye is protected from glare by means of a large double shade extending on to the temples, so as to cut off side light, while pain is relieved by hot compresses, and by the local use of atropine or cocaine, either together or separately. The most serious cases call for operative measures, such as burning or scraping. Chronic ulcers are stimulated to heal by the application of mercurial ointments, and in other ways. In dealing with ulcers generally, it is of the first importance to improve the general health.

CHAPTER XII.

SHADES.—ARTIFICIAL EYES.—SPECTACLES.

Shades.

In many diseased conditions it is desirable to lessen the amount of light entering the eye, and more especially when the cornea is involved. This end is usually attained by means of shades, various forms of which are in everyday use. They range from the simple contrivances of ingenious nurses, on the one hand, to the elaborate apparatus of the instrument maker, on the other; and they may be constructed of cardboard, paper, plaited straw, perforated zinc, silk, gauze, celluloid, or other material.

Shades, as a rule, are black or dark green in colour; perhaps the commonest is one made of brown paper, covered on both sides with black silk. In those instances, however, where it is meant to hide from view an unsightly orbit, a small closely-fitting celluloid shade is worn, the colour of which is pink, the better to conceal the deformity. This is one of the very few cases in which a single shade (that is, covering one eye only) may be allowed. A double shade, covering both sides, is almost invariably used, even when the trouble is confined to one eye.

It is almost unnecessary to point out that soiled

shades, like soiled bandages, might very possibly be a means of conveying contagious particles from eye to eye, if used for more than one person. But this is not all; for it has been shown beyond all doubt that after an eye has recovered from a contagious disorder, it may become once more infected by a germ-laden shade. It is in view of these facts that I recommend, above all others, shades made of paper. Such shades, which cost little in the first instance, can be burnt as soon as they become in the least degree soiled. On the other hand, shades bought from the chemist are naturally looked upon as too good to destroy, and are accordingly often kept in a family for years together, thus forming a dangerous kind of heirloom.

Three rules, then, should be borne in mind with regard to this subject: first, shades are to be made of paper in preference to any other material; secondly, they should be burned as soon as soiled; thirdly, they must under no circumstance be used for more than one person.

Various kinds of paper may be used for shades. That variety known to stationers as "olive green board" forms an excellent material for the purpose. It is sold in large sheets of two different sizes—"Royal," measuring 28½ by 21 inches, and "Imperial," measuring 22½ by 18 inches. Stout packing paper, either brown or drab, does equally well.

Shades may be either "single" or "double"; the former being meant to shield one eye, and the latter both.

The simplest method of making a double shade is to cut with sharp scissors a semicircular piece of paper, large enough to cover in the temples and to cut off all side light. The shape of the shade is exactly that of the peak of an ordinary cloth cap, only that it is larger. Another pattern, which is shaped to fit the bridge of the nose, is shown by the dotted line in Figure 30. The straight upper border is edged with three-quarter inch tape, the ends of which are left long, so that they may be tied behind the patient's head. In shop-made shades, elastic is often used, but it soon gives rise to pain in the scalp and headache, and the nurse will find tape or ribbon better in every way.

Another excellent way of making a shade, although a little more complicated than that described above, is as follows. A piece of slate-coloured packing paper is cut out into a shape resembling that of a peaked cap, only much broader and deeper, say, six inches deep by ten inches broad (Fig. 30 *a*). This makes the shield, which is completed by adding two downward slits, two inches in length, near each of its top corners. The next part of the shade is the band, which is also made of paper, about an inch and a half broad, and long enough to go round the patient's head (Fig. 30 *d*). Near one end of the band a slanting cut is made about half way through its breadth, and the notch thus made catches in the slit of the shield, and the two become firmly interlocked. The other end of the band is still free. It is passed round the patient's head and drawn through the remaining slit

on the opposite side of the shield. Another notch is cut in the band, and it may then be locked in position at both ends. The shade thus described consists, then, of two essential parts, a shield and a band, both made of coarse brown paper. A reference to the figure will make these points clear. Simple modifications of this shade will, of course, occur to the mind of every nurse.

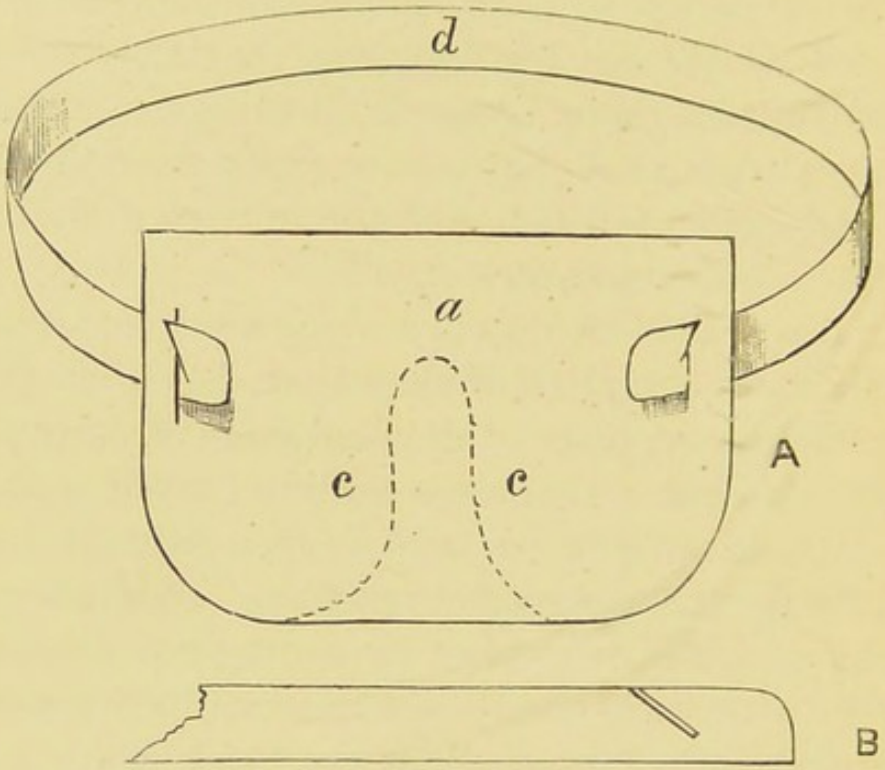


FIG. 30. PAPER SHADE.

A Completed shade, which consists of *a* the shield, and *d* the band.
The dotted line *c* is an alternative shape (see page 143).
B Band enlarged, showing oblique slit.

ARTIFICIAL EYES.

An artificial eye, that is to say, a glass shell exactly resembling in shape and colour the front part of the eye, is generally worn after removal of an eyeball

(enucleation) or of its contents (evisceration). Further, it is sometimes placed directly over a shrunken globe. Glass is occasionally replaced by celluloid, a material which has the advantage of being practically unbreakable.

For some time after either of the operations mentioned the stump of conjunctiva and other tissues left behind in the orbit remains irritable and red, and throws off more or less discharge. These symptoms must be allowed to subside before the patient will be able to use an artificial eye. At first a glass eye is worn for an hour or two only each day, but the time can be lengthened by degrees as the socket becomes tolerant, until finally it is worn all day long. Under no circumstances, however, should an artificial eye be retained at night. When the patient goes to bed, he should take out the eye, wash and dry it, and put it away in a safe place until next morning. He should never leave it over-night, as some people do, in a tumbler of water. Artificial eyes soon wear out, and under conditions of ordinary wear and tear can hardly be expected to last for more than nine months. The surface becomes rough, and is then likely to worry and inflame the conjunctiva.

Every nurse should understand the proper way both of putting in and of taking out an artificial eye. The following rules were formerly printed by the authorities of the Moorfields Hospital for the guidance of patients.

Instructions for persons wearing an artificial eye.—

"To TAKE THE EYE OUT. The lower lid must be drawn downwards with the middle finger of the left hand; and then, with the right hand, the end of a small bodkin must be put beneath the lower edge of the artificial eye, which must be raised gently forwards over the lower eyelid, when it will readily drop out. At this time care must be taken that the eye does not fall on the ground, or other hard place, as it is very brittle, and may easily be broken by a fall."

"To PUT THE EYE IN. Place the left hand flat upon the forehead, and with the two middle fingers raise the upper eyelid towards the eyebrow; then, with the right hand, push the upper edge of the artificial eye beneath the upper lid, which may now be allowed to drop upon the eye. The eye must then be supported with the middle fingers of the left hand, whilst the lower eyelid is raised over its lower edge with the right hand."

The presence of even a smooth and well-fitting artificial eye sometimes gives rise to a discharge from the conjunctiva. In such cases it is a good plan to insert a piece of wool, moistened in boric acid lotion, beneath the lids at night; and, if that does not check the discharge, a thin layer of wool, wet with some astringent lotion, may be worn behind the shell during the day-time.

In conclusion, let me add that it is an excellent routine practice to put a morsel of vaseline into the orbit once or twice a day. By this means not only are the movements of the artificial eye made easier, but wear and tear to some extent at least is reduced.

Furthermore, the little precaution adds considerably to the comfort of the patient.

SPECTACLES.

The most common use of spectacles is to assist sight, for which purpose various kinds of spherical and cylindrical glasses are used. At other times spectacles are employed to moderate light, or to protect the wearer against wind, dust, contagious particles, or the glare of sun or snow. Occasionally they are worn for the sake of appearance, as when a magnifying glass is placed before a shrunken eye in order to make it appear larger than it really is.

A careful man places his silk hat upon the table in such a way that it rests upon its brim and the edge of its crown. He knows from experience that if the hat be placed flat upon its crown it is likely to get soiled, and otherwise damaged. In the same kind of way spectacles should be put aside so that they rest on the edge of the glasses and upon the wire side fasteners, or "temples" as they are called by the opticians. If this be not done the glass face soon becomes scratched and spoilt.

As in the case of eye-shades, glasses may convey contagious particles from eye to eye. They should, therefore, be disinfected with one to twenty carbolic solution at night. At the same time it is well to smear the steel frames with vaseline in order to prevent rust.

When dealing with children, the nurse should never allow wadding to be placed under the bridge of the spectacles, nor should they be tied behind the head.

Should the skin of the nose or that behind the ears become chafed, it is a sign that the frame does not fit properly, and its shape should be set right as soon as possible. In the meantime, tender skin may be hardened with alcohol or with strong salt and water, while zinc or boric ointment may be applied to any sore places. It is often advisable to leave off the spectacles for a few days.

If the glasses be very greasy and dirty, nothing answers better than ammonia and water for cleansing purposes.

CHAPTER XIII.

EPILATION OF EYELASHES.—REMOVAL OF FOREIGN BODIES FROM THE EYE. — EXAMINATION OF TROUBLESOME CHILDREN.—TEMPERATURES.

Epilation of Eyelashes.

Lashes are pulled out for various reasons : for instance, they may turn inwards, and rub against the eyeball, a condition known as *trichiasis*. The removal of a lash may sometimes cut short a commencing stye, while a similar operation often does much good in cases of severe blepharitis. A nurse may be directed to epilate lashes, and in that event

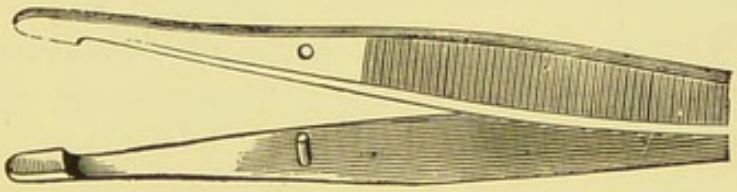


Fig. 31. Epilation Forceps.

attention should be paid to the following points : (1) Instruments : A pair of ordinary dressing or dissecting forceps, the teeth of which meet accurately together, might be used. The small instrument, known as "epilation forceps" (Fig. 31), which has broad rounded ends and no teeth, is, however, much better for the purpose. (2) Position : The patient

should be seated, while the nurse stands behind his head. (3) Operation: Should it be necessary to pluck out all the lashes, the nurse stretches the lid lightly between her fingers, and rapidly drags out bundles of lashes, and finishes by picking off those that have escaped the grasp of the forceps in the first instance. In epilating a few lashes, each one should be seized as close to its root as possible. The operator then pulls the lash steadily forwards, until, torn from its follicle, it comes away in the grip of the forceps.

Removal of Foreign Bodies from the Eye.

Most people know from painful experience what it is to have a foreign body in the eye. A lash may get between the lids, or the sufferer may feel the sudden impact of a foreign object, such as an insect, bits of metal, or pieces of straw. The eye waters; it soon becomes bloodshot; and cannot bear the light. The slightest movement of the globe causes intense pain, and accordingly the patient keeps his eye shut.

The crudest methods are often practised in order to get rid of the cause of the mischief. For instance, the nose is violently blown; or a pinch of snuff is given to the patient, in the hope that the resulting flow of tears may dislodge and wash the offending particle away. I have even known small flat stones put into the eye, and rubbed about, in order to get rid of the intruder. I need hardly point out to the intelligent reader that such methods as these are not

only useless but in most cases actually dangerous, and, further, that the obvious remedy of directly removing the foreign body is the only one worthy of attention.

The patient should be placed facing a good light, and a careful search made for the foreign body. Should the particle not be visible on the white of the eye, the lower lid must be pulled down, and its surface inspected. If not recognised in that position, the offending substance will probably be found on the inner surface of the upper lid, which structure must next be everted. If present it will be most likely seen as a small dark speck lying on the exposed conjunctiva. It must be taken away by means of a camel-hair brush moistened with water. The fragment, however, may lie on or even in the cornea, in which case cautious attempts to dislodge it may be made with the brush, but if any difficulty be experienced, removal must be left to a surgeon.

The instillation of a drop of a four per cent. solution of cocaine will render the proceedings above described painless to the patient.

Examination of Troublesome Children.

From shyness, temper, pain, or other reasons, children often refuse to open their lids, so as to permit an examination of the eye. This difficulty can be sometimes overcome by a little coaxing on the part of the nurse, who is more likely to succeed when the child's mother or friends are out of the room. The production of a watch, a kitten, a

jingling bunch of keys, or some other attractive object, may induce the patient to open his eyes. But these simple devices sometimes fail, and we must then resort to other measures. The best plan may be thus briefly described. Cotton-wool, lotions, and anything else likely to be required must be placed beforehand within easy reach. The nurse, having thrown a mackintosh sheet over her knees, seats herself in an ordinary chair, facing an assistant, who lays the child across her lap in such a way that his legs are held between her chest and her left arm, while his hands are grasped in her left hand. The patient is rendered helpless, and his head is steadied between the nurse's knees. It will be noticed that, while the assistant has her right hand at liberty to help the nurse, the latter has both hands free. The nurse will now be in a position to separate the lids, and to apply the necessary medicaments to the eye. In doing so, she should slide back the lids, as it were, over the globe, rather than pull them roughly apart, and anything like pressure must be most carefully avoided. The nearer the nurse's fingers are placed to the free edge of the lids, the easier will it be to expose the eye fully.

In specially difficult cases, the surgeon uses an instrument called a "retractor" (Figs. 9 and 61), by means of which the upper lid is raised, while the lower lid is pulled down by his fingers. This little operation, however, is one that needs care, and is usually carried out by the doctor himself.

Under certain circumstances, another plan may

be adopted. The patient's face is plunged into a basin of cold water, and held there until the tips of the ears begin to show signs of blueness. Whatever be the explanation, the fact remains that the child will voluntarily open his eyes when released from his uncomfortable position, although sometimes, it is true, two or even three immersions, repeated at short intervals, may be necessary before that end is attained. The seeming roughness of this plan is, so far as I know, the only objection to its use. I may add that, personally, it has often rendered me good service.

Temperature of Patients.

A rise of bodily heat may be the first sign of some complication. In acute diseases of the eye and after all operations, therefore, the temperature of the patient should be recorded night and morning. Furthermore, the nurse may render valuable aid to the surgeon by taking the temperature before operation. A single instance will show the importance of this precautionary measure. In a few cases, inflammation of the membranes of the brain (*meningitis*) has followed removal of an eye, and it has been suggested that the brain complication was not due to the operation, but that it was present before the latter was undertaken. Such a doubt would be almost certainly disposed of by a reference to a temperature-record taken previously to the operation.

CHAPTER XIV.

DARK ROOMS.—DISINFECTION.

Dark Rooms.

The darkened room was formerly regarded as an indispensable agent in the treatment of many eye diseases. Now-a-days, for various reasons, it has fallen into disuse, except after certain operations, and even in those it is being gradually replaced by other means. In a word, the darkened chamber, along with setons, blisters, eye baths, and blood-letting, is rapidly becoming a thing of the past.

However, should darkness be deemed necessary in any given case, it may readily be obtained by drawing the blinds of an ordinary room. Another simple plan of cutting off the light is by pasting stout brown paper over the window-panes. Thick, heavy curtains, which are sometimes used for the purpose, are objectionable, because dust clings to them, and they soon become dirty. Other things being equal, a large is better than a small room.

Before occupation the room should be thoroughly cleansed, and unnecessary carpets and valances taken away. A small bedstead should be provided, and placed in such a position as to afford access from every side. It should be scrubbed with 1 in 20 carbolic lotion before use. In a word, every

precaution ought to be taken to render the room as clean and as comfortable as possible.

A nurse must be careful that air, as well as light, be not excluded from the room. Every morning she should throw the windows widely open to air the chamber. A couple of windows, if possible on opposite sides of the room, should be kept permanently open for some inches at the top; or she may adopt the simple method of ventilation introduced by Hinckes-Bird, in which a piece of board is fitted between the sill and the lower sash of the window, and kept in that position. Fresh air is thus admitted into the room by the aperture left between the upper and the lower sash. The nurse should also take care that the chimney is not blocked up by old newspapers or other materials. Even in summer, when no fire is burning, the chimney acts as a useful ventilating shaft, while in winter, an enormous amount of vitiated air escapes by the same outlet.

As to temperature, the room should be kept at 60° F. in winter, and at 50° to 55° F. in summer.

Disinfection.

A room which has been occupied by a patient suffering from purulent ophthalmia should be disinfected before it is used by other persons. This process may be carried out in the following simple way.

The chimney-shaft is blocked up by means of old newspapers, windows are closed, ventilators are shut,

key-holes are plugged, and all inlets for fresh air are sealed as far as possible by pasting strips of paper over them. Then an iron vessel is supported by a pair of opened tongs over a large bucket containing water, and this apparatus is placed in the middle[1] of the room. The iron vessel is next filled with pieces of roll sulphur,[2] over which some methylated spirit of wine is poured, and the spirit is ignited. The sulphur soon catches fire, and liberates a gas known as sulphurous acid, which possesses powerful antiseptic properties. As to quantity, the general rule is to use at least one pound of sulphur for every 100 feet of floor space. Thus, a room twenty feet long and fifteen feet wide contains 300 feet of floor space ($20 \times 15 = 300$), and would require three pounds of sulphur for its efficient aerial fumigation. Lastly, a wet towel is laid outside along the bottom of the closed door, so as to prevent unpleasant fumes from passing into the rest of the house.

The room, filled with sulphurous acid, is kept shut up for at least eight hours, when doors and windows are thrown widely open to allow of thorough ventilation. A fire is lighted, and the chamber is left exposed to the purifying action of air

[1] If the room be of large size, two receptacles may be needed. These should be placed at opposite ends of the chamber.

[2] Messrs. Seabury & Johnson manufacture a sulphur candle which burns for two hours, and the fumes from which are said to be sufficiently potent to disinfect a room of ordinary size. A somewhat similar article is sold by the Sanitas Company, Limited.

and light for twenty-four hours. Thereafter, the floor is well scrubbed, all paint is washed, and the bedstead is cleansed with a one in twenty solution of carbolic acid. If necessary, the wall-paper is stripped off, and the ceiling white- or lime-washed.

In many public institutions, a steam disinfecting apparatus will be available for the purification of clothing and linen, but in private houses other means must be adopted. Towels, sheets, aprons, night-gowns, shirts, pillow-slips, in a word, all washable articles may be disinfected by immersing them in a one in twenty carbolic solution, or they may be steeped in boiling water for ten minutes. Blankets, pillows, mattresses, carpets, and curtains, on the other hand, should be purified by scattering them loosely about the floor before the sulphur is ignited, although a better plan is to suspend them from a rope stretched across the room. It must not be forgotten, however, that the fumes of burning sulphur are liable to bleach coloured fabrics.

APPENDIX I.

INSTRUMENTS NEEDED FOR THE PRINCIPAL OPERATIONS.

Paracentesis.

- Speculum. (Figure 32.)
- Broad Needle or Special Paracentesis Needle. (Figs. 33 and 34.)
- Fixation Forceps. (Figure 35.)
- Vulcanite Spatula. (Figure 36.)

Corneal Section.

- Speculum. (Figure 32.)
- Fixation Forceps. (Figure 35.)
- Graefe's Cataract Knife. (Fig. 37.)
- Vulcanite Spatula. (Figure 36.)

Division of a Tendon for Squint.

- Speculum. (Figure 32.)
- Fixation Forceps. (Figure 35.)
- Straight Blunt-pointed Scissors. (Figure 38.)
- Strabismus Hook. (Figure 39.)

Enucleation of the Eye.

- Speculum. (Figure 32.)
- Fixation Forceps. (Figure 35.)
- Strabismus Hook. (Figure 39.)
- Straight Blunt-pointed Scissors. (Figure 38.)
- Curved Blunt-pointed Scissors. (Figure 40.)

Removal of Chalazion.

- Small Scalpel.
- Small Sharp Spoon, or Tarsal Scoop. (Figure 41.)

Canthoplasty.

- Strong Scissors.
- Dissecting Forceps.
- Three Needles threaded with silk.
- Needle Holder. (Figs. 42 & 43.)

Operations on the Tear Passages.

- Weber's Canaliculus Knife. (Fig. 44.)
- Set of Lacrymal Probes. (Fig. 45.)
- Stilling's Three-edged Knife. (Figure 46.)
- Lacrymal Syringe. (Figure 47.)

Evisceration of the Eye.

- Small Scalpel.
- Mules' Scoop. (Figure 48.)
- Straight Scissors. (Figure 38.)
- Glass Spheres ("Artificial Vitreous").
- Fixation Forceps. (Figure 35.)
- Speculum. (Figure 32.)
- Mules' Instrument for introducing Spheres. (Figure 49.)
- Two Pairs Squint Hooks. (Fig. 39.)
- Three threaded Needles.

Extraction of Senile Cataract.

- Speculum. (Figure 32.)
- Fixation Forceps. (Figure 35.)
- Iris Scissors. (Figure 50.)
- Iris Forceps. (Figure 51.)
- Graefe's Cataract Knife. (Figure 37.)
- Cystitome. } (Figures 52 and 53.)
- Curette. }
- Cataract Scoop, or Vectis. (Fig. 54.)
- Lid Elevator.
- Vulcanite Spatula. (Figure 36.)

Suction Operation for Cataract.

- Speculum. (Figure 32.)
- Fixation Forceps. (Figure 35.)
- Keratome, or Broad Needle. (Figure 33.)
- Suction Syringe. (Figure 57.)

Solution Operation for Cataract.

- Speculum. (Figure 32.)
- Fixation Forceps. (Figure 35.)
- Cataract Needle. (Figure 34.)

Advancement for Squint.

- Speculum. (Figure 32.)
- Fixation Forceps. (Figure 35.)
- Wecker's Double Hook, or Prince's Instrument. (Figs. 58 & 59.)
- Needle Holder. (Figs. 42 & 43.)
- Threaded Needles.
- Squint Hook. (Figure 39.)
- Blunt-pointed Straight Scissors. (Figure 38.)

Iridectomy.

Speculum. (Figure 32.)
Fixation Forceps. (Figure 35.)
Keratome. (Figures 55 and 56.)
Graefe's Knife. (Figure 37.)
Iris Forceps. (Figure 51.)
Iris Scissors. (Figure 50.)
Vulcanite Spatula. (Figure 36.)

Sclerotomy.

Instruments as for Iridectomy, with the exception of Keratome,
Iris Scissors, and Iris Forceps, which are not needed.

Excision of the Upper Cul-de-Sac.

Needles.
Silk.
Straight Blunt-pointed Scissors. (Figure 38.)
Fixation Forceps. (Figure 35.)

APPENDIX II.

ILLUSTRATIONS OF INSTRUMENTS.

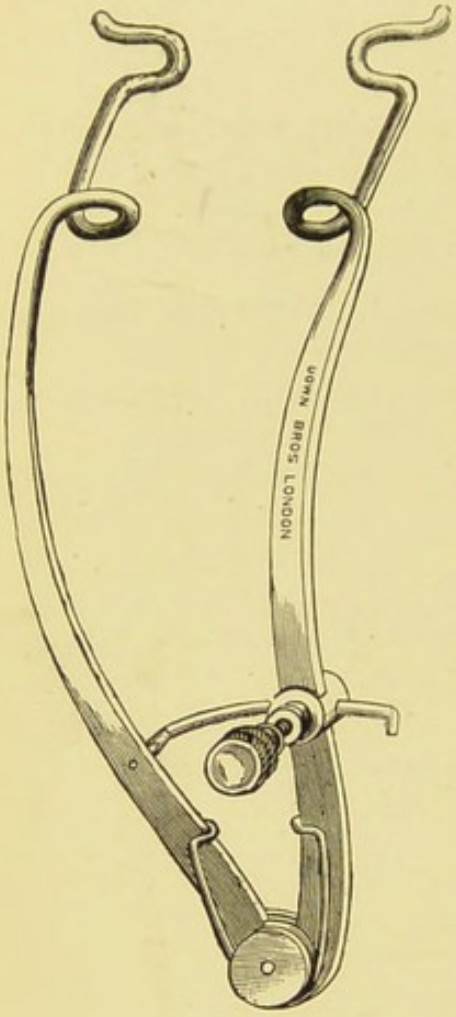


FIG. 32. SPECULUM.

FIG. 34. BOWMAN'S STOP NEEDLE.

FIG. 33. BROAD NEEDLE.

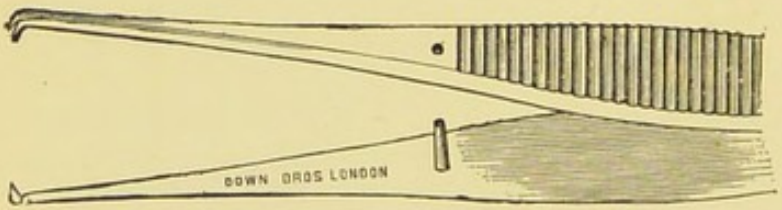


FIG. 35. FIXATION FORCEPS.

FIG. 36. SPATULA.

FIG. 37. GRAEFE'S CATARACT KNIFE.

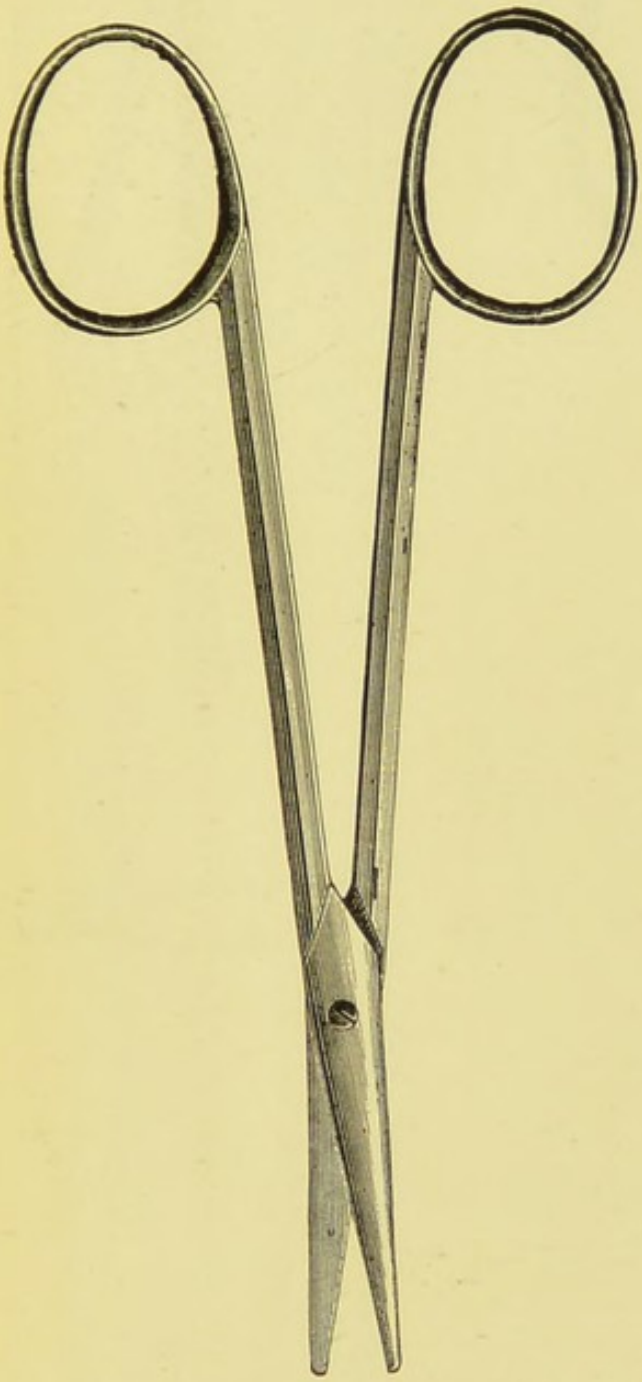


FIG. 38. BLUNT-POINTED SCISSORS.

FIG. 39. STRABISMUS HOOK.

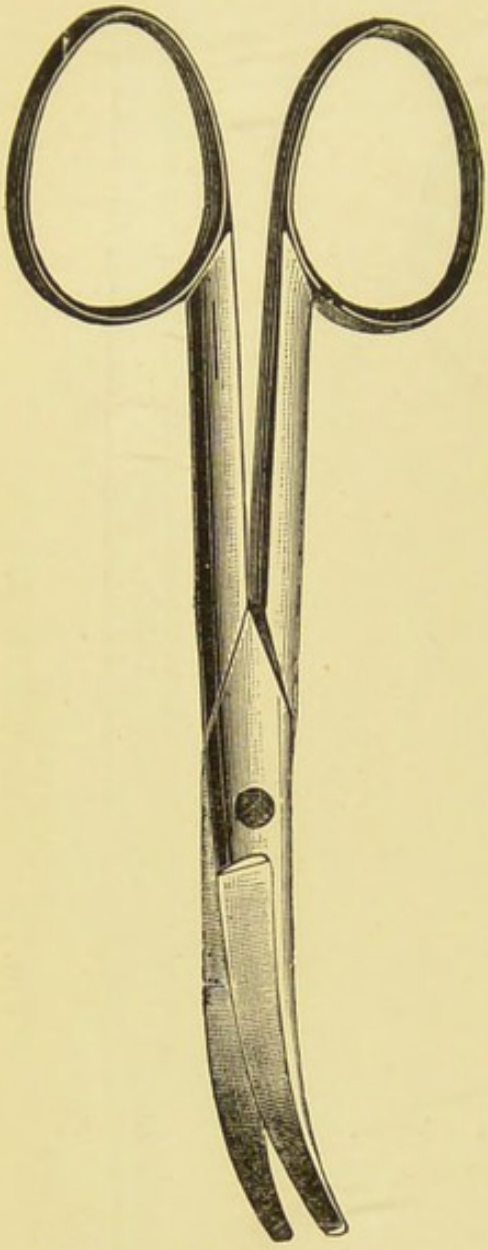


Fig. 40. Curved Scissors.

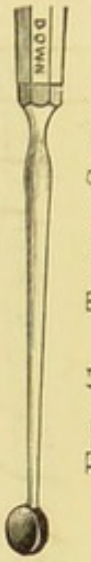


Fig. 41. Tarsal Scoop.

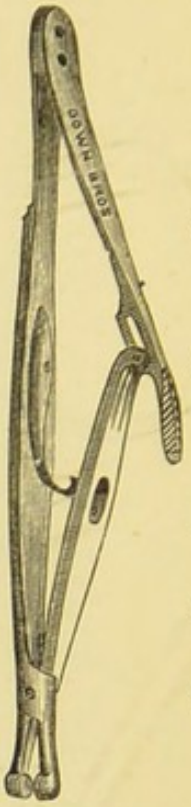


Fig. 42. American Needle Holder.

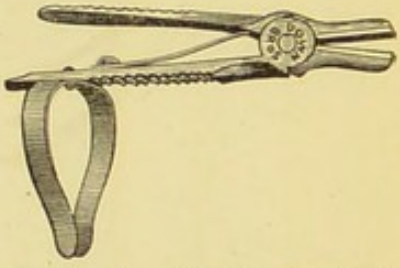


Fig. 43. Galezowski's Needle Holder.

Fig. 44. Canaliculus Knife.

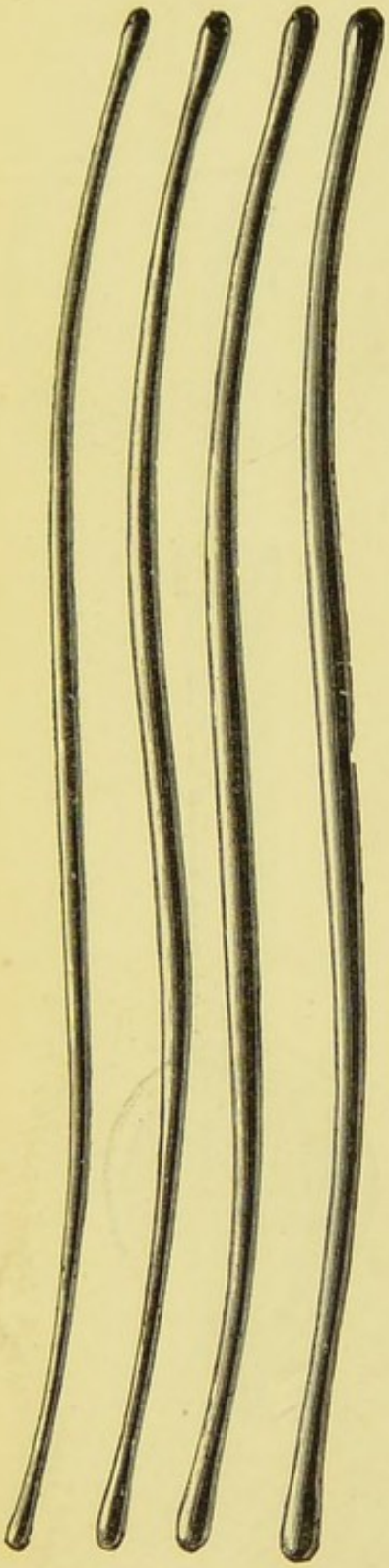


FIG. 45. BOWMAN'S LACRYMAL PROBES.

FIG. 46. STILLING'S STRICTURE KNIFE.

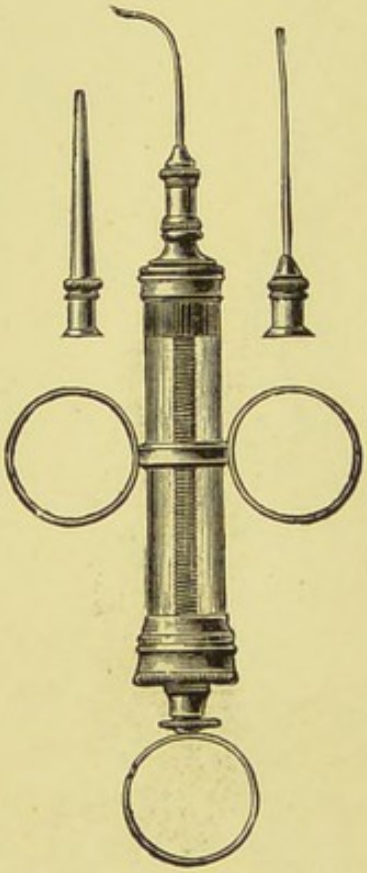


FIG. 47. LÜER'S LACRYMAL SYRINGE.

FIG. 48. MULES' SCOOP.

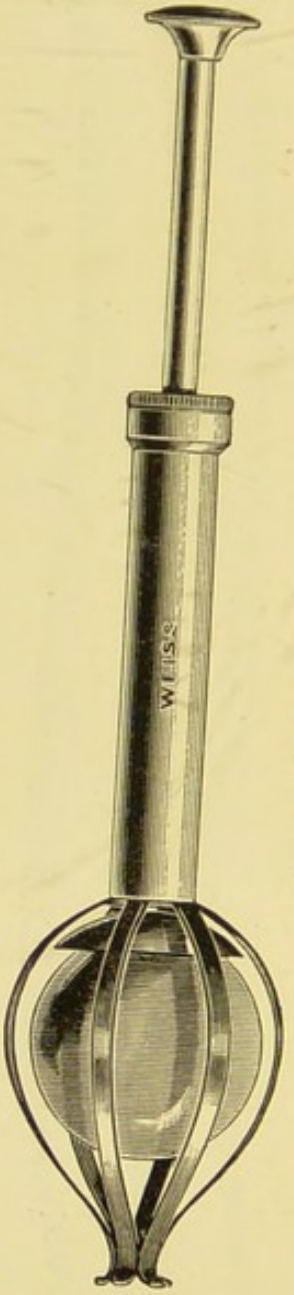


FIG. 49. MULES' INTRODUCER.

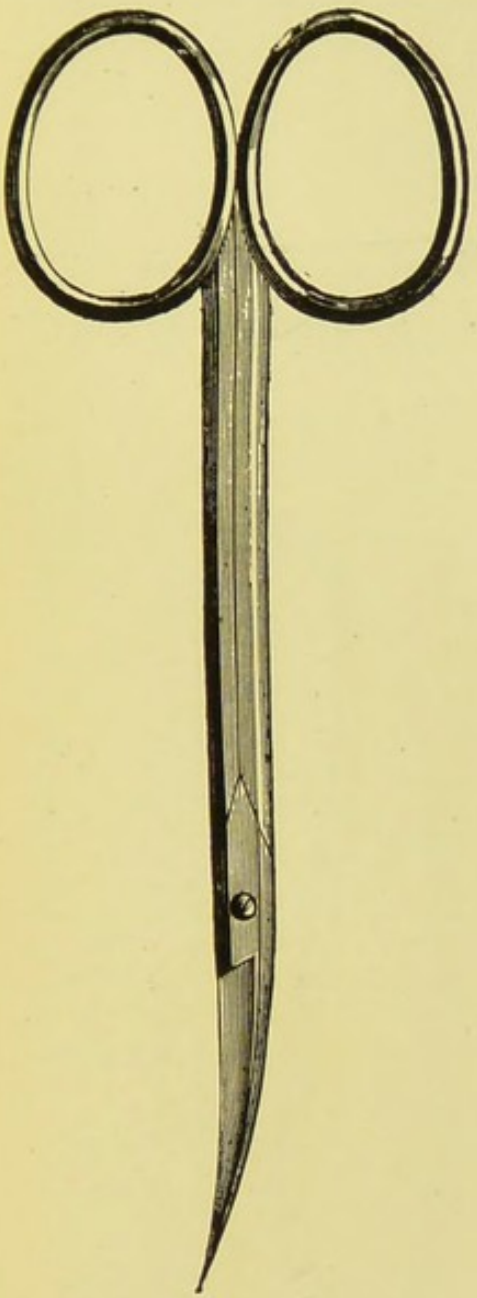
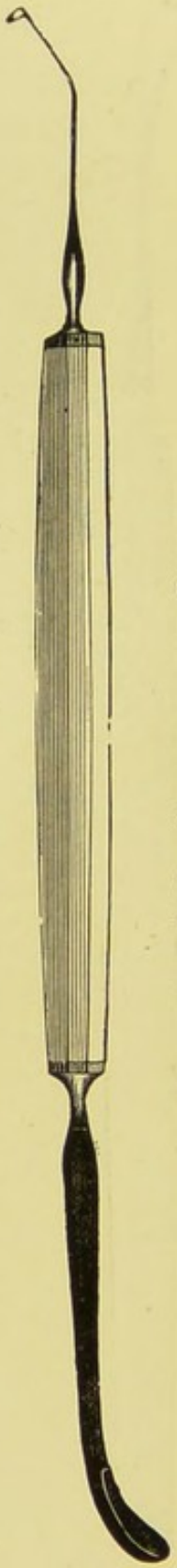


FIG. 50. IRIS SCISSORS.

FIG. 51. IRIS FORCEPS.



FIGS. 52 and 53. CYSTITOME AND CURETTE.

FIG. 55. KERATOME (STRAIGHT).

FIG. 56. KERATOME (ANGULAR).

FIG. 54. VECTIS OR LENS SCOOP.

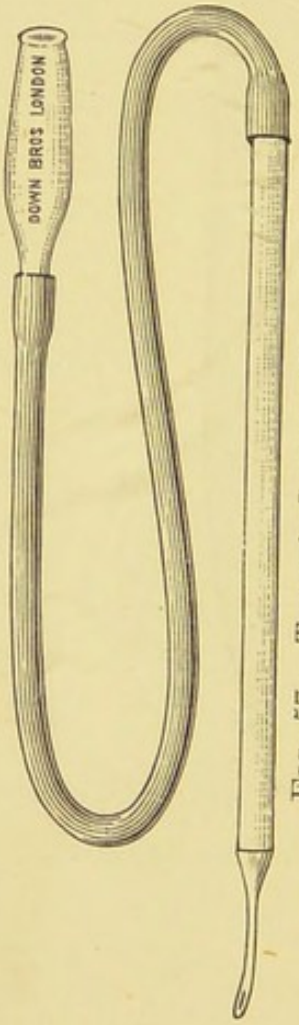


FIG. 57. TEALE'S SUCTION SYRINGE.

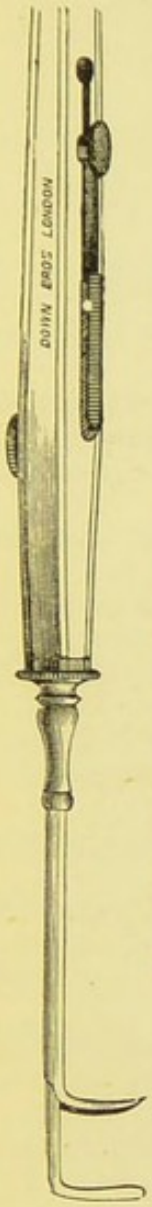


FIG. 58. WECKER'S DOUBLE HOOK FOR SQUINT.

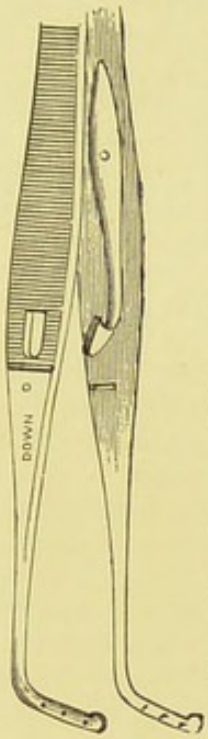


FIG. 59. PRINCE'S FORCEPS FOR SQUINT.

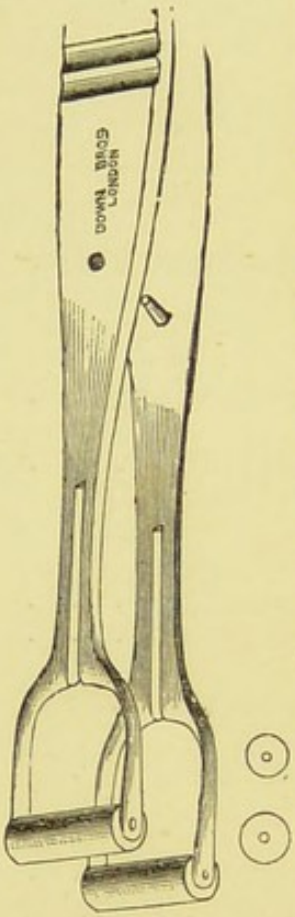


FIG. 60. ROLLER FORCEPS (modified by author).

FIG. 61. AUTHOR'S RETRACTOR.

APPENDIX III.

GLOSSARY.

Accommodation . The power possessed by the eye of adapting itself to sight at different distances by alterations in the shape of the crystalline lens.

Advancement . . An operation performed for the cure of squint.

Alkaloids . . . Certain active principles contained in plants which give to them their peculiar properties. Thus, morphia is one of the many alkaloids of the poppy.

Amaurosis . . . Blindness without external changes of the eye.

Amblyopia . . . Dulness of sight without external changes of the eye.

Anæsthesia . . . The local or general insensibility produced by anæsthetic agents.

Anæsthetics . . Agents, such as chloroform or cocaine, by means of which local or general insensibility is produced.

Anodyne . . . . That which eases pain.

Anterior Chamber The space between cornea in front and iris and lens behind; it contains the aqueous humour.

Anthrax . . . . A fatal and contagious disease of man and of animals, due to the presence of a particular bacillus.

Antiseptic . . . Broadly speaking, anything that destroys micro-organisms or their spores.

Asepsis . . . . The state of being free from micro-organisms, their products, or spores.

Aseptic . . . . That which is free from micro-organisms.

Aqueous Humour The watery fluid contained in the anterior and posterior chambers of the eye.

Astigmatism . . An optical defect of the eye, in which rays of light, instead of focussing at a point, focus at a line. It may be corrected by proper glasses.

Astringent . . . An agent which contracts blood-vessels.

Atropine . . . . The active principle of the Deadly Nightshade (*Atropa Belladonna*), used in eye-surgery to dilate the pupil, and for other purposes.

Atropinism . . . A name for the unpleasant symptoms which sometimes follow the local use of atropine.

Bacillus . . . . A micro-organism of rod-like shape but of greater length than the bacterium.

Bacterium . . . A minute rod-shaped vegetable micro-organism.

Blennorrhœa . . A discharge of "matter" from a mucous membrane: both gonorrhœa and purulent ophthalmia are examples of blennorrhœa.

Blepharitis . . . Inflammation of the edge of the eyelid, marked by redness, formation of scales, or ulceration.

Blight . . . . . A vulgar name for acute muco-purulent inflammation of the conjunctiva.

Blind Spot . . A name given to a point, insensitive to light, where the optic nerve enters the fundus.

Bulbar Conjunctiva . . . . . See "Conjunctiva".

Camera . . . . An instrument used to take photographs.

Canaliculus . . . The hair-like passage leading from the edge of the lid into the nasal sac.

Canthus . . . . The name applied to the inner and outer corners of the eye.

Cataract . . . . An opaque condition of the crystalline lens of the eye.

Cautery . . . . An instrument which is heated and applied to tissue.

Cellular Tissue . Tissue composed of cells and fibres, which connects various parts together, and serves as packing, as in the orbit.

Cephalostat . . An antiquated contrivance for steadying a patient's head during an operation upon the eye.

Chalazion (Tarsal Cyst) A tumour of the eyelids, due in the first instance to obstruction of a Meibomian gland.

Chemosis . . . Distension and swelling of the bulbar conjunctiva.

Choroid . . . . The middle dark coat of the eye, reaching from the optic nerve to the front of the globe.

Ciliary Body . . One of the deeper structures of the eye, consisting of the ciliary processes and the ciliary muscle.

Ciliary Muscle . An internal muscle of the eye, concerned with accommodation. In action, the muscle draws forward the choroid coat,

relaxes the suspensory ligament of the lens, thus allowing the latter structure to become more convex.

Ciliary Processes Some 60 to 70 projections lying on the inner surface of the choroid coat, and forming a circle beneath the ciliary muscle.

Cilium . . . . . An eyelash.

Cocaine . . . . An alkaloid obtained from the coca leaf, and used in eye-surgery chiefly on account of its anæsthetic properties.

Cocci . . . . . Micro-organisms having a spherical or an oval shape.

Collodion . . . . A solution of gun-cotton in spirit and ether.

Collyrium . . . An eye-wash.

Commissure . . . See "Canthus".

Compress . . . . A suitably shaped pad, wet or dry, applied over the eyeball.

Conjunctiva . . The delicate membrane which lines the eyelids (*palpebral conjunctiva*) and covers the front of the eyeball (*bulbar conjunctiva*).

Conjunctivitis . . Ophthalmia or inflammation of the conjunctiva.

Contagion . . . The dissemination of disease by contact.

Cornea . . . . The transparent front of the eye, measuring about $\frac{1}{25}$th of an inch in thickness, and forming $\frac{1}{6}$th of the external envelope of the globe.

Corneal Section . An operation performed for ulcers of the cornea.

Corneitis (Keratitis) . . . . Inflammation of the cornea.

Counter-irritants Agents which produce inflammation, and which are applied at some distance from the seat of a malady, *e.g.*, a mustard leaf.

Crystalline Lens . The transparent solid body which separates the aqueous from the vitreous humour, and is the chief agent by which rays are brought to a focus on the retina. Its shape resembles that of a "burning-glass".

Cul-de-sac . . . The blind alley at the junction of the palpebral and bulbar conjunctiva.

Depletives . . . Agents which abstract blood.

Diphtheria . . . An infectious disease, due to a specific organism; its essential symptoms being great prostration, and the formation of a false membrane in the throat or other part affected.

Diplo-coccus . . An organism which takes the shape of two minute cells joined together.

Diplopia . . . . Double sight.

Discission . . . An operation in which a needle is introduced into the eye in order to break up an opaque lens, and for other purposes.

Drachm . . . . A measure equal to 60 drops (liquid) or to 60 grains (solid).

Drop (minim) . . The smallest liquid measure; it equals $\frac{1}{60}$th of a drachm.

Ectropion . . . A turning outwards of the eyelids, so that the conjunctiva is exposed.

Eczema . . . . Inflammation of the skin, dry or moist, often attended with the formation of scales.

Eczematous . . . Relating to eczema.

Emmetropia . . That optical condition of the eyeball in which parallel rays of light are brought to a focus on the retina without exercise of accommodation.

Endemic . . . . A disease peculiar to a people or a district. Thus, goître is endemic in Derbyshire.

Entropion . . . A turning inwards of the eyelids, so that the skin comes into contact with the eye.

Enucleation of the Eye . . . . . The operation of removing the eyeball.

Epidemic . . . . Any disease, attacking, it may be, large numbers of people. Scarlet fever is often epidemic, for instance, in London and other large towns.

Epilation of Eyelashes . . . . The operation of plucking out the eyelashes.

Epiphora . . . Overflow of tears.

Eserine (Physostigmine) . . . . The alkaloid of calabar bean, used in eye-surgery to contract the pupil, and for other purposes.

Evisceration . . An operation in which all the contents of the eye, except the sclerotic, are removed.

Exenteration of Orbit Removal of all the contents of the orbit. Performed for malignant growths.

Expression . . . An operation by which the diseased material of a granular eyelid is squeezed out.

Extirpation of Globe . . . . Now used to indicate enucleation of the eye.

Eyebrow (Supercilium) The fringe of coarse hairs overhanging the orbit.

Fundus Oculi . . That part of the optic nerve, the retina and the choroid, which can be seen when using the ophthalmoscope.

Fungus . . . . Broadly speaking, fungi are plants that reproduce their kind by means of spores.

	The term, however, is used in this book to mean micro-organisms.
Germicide . . .	Germicides are agents which kill germs, that is, micro-organisms.
Glaucoma . . .	A formidable disease characterised by increased hardness ("tension") of the globe. It may be acute or chronic, and in the latter case is usually painless.
Glioma	A tumour affecting the retina of infants.
Globe	As used in this book, the term "globe" means the eyeball.
Gonococcus . . .	The micro-organism which causes gonorrhœal ophthalmia and gonorrhœa.
Gonorrhœa . . .	A contagious disease in which pus is discharged from the generative organs (male or female).
Gonorrhœal . .	Having to do with gonorrhœa.
Granular Lids (Trachoma) . .	A contagious disease of the conjunctiva, in which the lids become red, rough, and granular.
"Guards" . . .	Small pieces of lint, wet with lotion, used for various purposes when dressing an eye.
Gutta	The Latin for drop.
Hæmorrhage . .	Bleeding from any cause.
Hemeralopia . .	Night blindness.
Hirudo	The Latin name for a leech—a worm used to extract blood.
Hordeolum . . .	A stye arising in connection with the glands of the edge of the eyelid.
Hyaloid Membrane	A thin transparent membrane which encloses the vitreous humour.
Hydrargyrum . .	The Latin name for mercury or quicksilver.
Hypermetropia .	An optical defect of the eye, which is too short from before backwards. "Long sight," as this condition is often called, may be relieved by suitable glasses.
Hyphæma . . .	A collection of blood in the anterior chamber of the eye.
Hypopyon . . .	A collection of pus in the anterior chamber of the eye.
Hypostatic Congestion	A form of inflammation of the lungs, liable to affect elderly bed-ridden people.
Infection	The power possessed by certain diseases of spreading through the air.
Inflammation . .	A series of changes in the blood-vessels and tissues of a part, due to irritation. Characterised by heat, pain, redness, and swelling.
Inunction . . .	The rubbing into the skin of greasy applications.

Iridectomy . . . An operation by which a piece of the iris is cut away.

Iris . . . . . A muscular structure which gives its distinctive colour to the eye, and which is seen through the cornea.

Iritis . . . . . Inflammation of the iris, due generally to rheumatism or to syphilis.

Irradiation . . . A phenomenon due to defective accommodation.

Irrigation . . . The flushing of a part by a constant stream of fluid.

Irritants . . . . Substances capable of giving rise to inflammation.

Jaconet . . . . Thin pink mackintosh used in surgical dressings.

Jequirity . . . . The seeds of *Abrus precatorius*, used to produce a kind of artificial ophthalmia for the cure of pannus and granular lids.

Keratitis . . . Inflammation of the cornea.

Lacrymal Duct . The canal leading from the lacrymal sac into the lower portion of the nose.

Lacrymal Gland . The gland which secretes tears.

Lacrymal Sac . . The dilated bag which lies between canaliculi and nasal duct.

Lacrymation . . The act of secreting tears.

Leech . . . . . See "Hirudo".

Lesion . . . . . A disease or injury of any part of the body.

Leucoma . . . . A scar upon the cornea, the result of an ulcer.

Leucorrhœa . . A white discharge from the vagina.

Levator Palpebræ Superioris A muscle the function of which is to raise the upper lid. It is supplied with nervous energy by the third cranial nerve.

Linear Operation A name given to the operation commonly used for the extraction of senile cataract.

Lippitudo . . . An unsightly appearance of the eyelids, due to neglected blepharitis.

Macula . . . . A scar left in the cornea after ulceration of that membrane.

Macula Lutea . . An oval area in the retina where sight is most acute. It measures about $\frac{1}{12}$th of an inch in diameter.

Meibomian Cyst . See "Chalazion".

Meibomian Glands A series of small glands which lie embedded in the tarsus of the eyelids.

Meningitis . . . Inflammation of the membranes of the brain.

Mercurialism . . A term to express the unpleasant effects (salivation, soreness of the mouth, etc.) sometimes produced by the administration of mercury.

Micro-coccus . . See "Cocci".

Micro-organism . A minute living cell, to be recognised with a powerful microscope only. This term is now reserved for the vegetable fungi which cause fermentation, putrefaction, and many diseased processes.

Minim . . . . . See "Drop".

Muco-purulent Ophthalmia Inflammation of the conjunctiva, characterised by discharge mid-way between mucus and pus.

Mucous Membrane A moist, soft membrane lining all the internal passages—*e.g.*, gullet, windpipe, bowel, etc.—and throwing off a fluid secretion known as mucus.

Mucus . . . . . The glairy substance thrown off by a mucous membrane.

Mules' Operation . An operation in which the whole contents of the eyeball, except the sclerotic coat, are removed.

Muscular Advancement . . See "Advancement".

Mydriasis . . . Dilation of the pupil.

Mydriatic . . . That which dilates the pupil, *e.g.*, atropine.

Myopia . . . . An optical defect of the eye, in which that organ is too long from before backwards, with the consequence that rays of light do not focus exactly upon the retina. Myopia, or "short sight," as it is called, can be relieved by suitable glasses.

Myosis . . . . Contraction of the pupil.

Myotic . . . . That which contracts the pupil, *e.g.*, physostigmine.

Narcotic . . . A drug which induces sleep, such as opium.

Nasal Duct . . . See "Lacrymal Duct".

Nebula . . . . An opacity of the cornea, due to ulceration of that structure.

Neonatorum . . A Latin word, meaning of newly-born children.

Nictitation . . . The act of blinking the eyes.

Nyctalopia . . . Day blindness.

Nystagmus . . . An involuntary rolling of the eyeballs, generally a sign of bad sight.

Two

Oblique Muscles . The external muscles of the eyeball, superior and inferior.

Œdema . . . . A swelling due to effusion of lymph.

Oidium Lactis . . The organism which turns milk sour.

Onyx . . . . . A fanciful term given to a collection of pus between the layers of the cornea. It is doubtful whether onyx ever exists apart from hypopyon.

Opacity . . . . Dimness.

Officinal . . . . A term applied to those medicines which are included in the *British Pharmacopœia*.

Ophthalmia . . . A general term applied to all inflammations of the conjunctiva.

Ophthalmia Neonatorum A form of purulent ophthalmia which affects newly-born children, and is due to a micro-organism, the gonococcus.

Ophthalmic . . . Belonging to the eye, or having to do with ophthalmia.

Ophthalmoscope . A mirror for examining the fundus of the eye.

Optic Disc . . . That part of the optic nerve visible with the ophthalmoscope.

Optic Nerve . . The nerve of sight which passes from the eye to the brain.

Orbit . . . . . The bony cavity in the skull which contains the eyeball.

Organism . . . A term applied in this book to the minute vegetable fungi, spoken of as bacteria, cocci, etc.

Orbicularis Muscle A muscle, the function of which is to close the eyelids. It derives its nerve-force from the facial nerve.

Ounce . . . . . A measure which contains 480 grains (solid) or 480 drops (liquid).

Palpebral Conjunctiva . . . See "Conjunctiva".

Palsy . . . . . See "Paralysis".

Pannus . . . . A complication of trachoma, really trachoma of the cornea.

Paracentesis . . The operation of opening the anterior chamber of the eye.

Paralysis . . . Loss of the power of motion.

Parasites . . . Organisms which derive their nourishment from the body or tissue of a host. In the narrower sense of the word, certain micro-organisms which live at the expense of the human body.

Phagocytosis . . A power possessed by the white blood corpuscles of attacking and destroying the germs of disease.

Phlyctenular Conjunctivitis A form of disease in which phlyctenules appear upon the white of the eye.

Phlyctenule . . Red pimples met with in phlyctenular conjunctivitis.

Photophobia . . Dread of light.

Physostigmine . See "Eserine".

Posterior Chamber A small space lying behind the iris and containing aqueous humour. It is bounded

behind by the suspensory ligament of the lens, and at the outer side by the ciliary processes.

Presbyopia . . . A defect of accommodation, natural to the eye, coming on at about the forty-fifth year, and due to weakness of the ciliary muscle.

Ptomaines (Toxines) The products of micro-organisms, similar in many respects to the alkaloids of plants.

Ptosis . . . . . A falling of the upper lid, congenital, or due to paralysis of the third cranial nerve.

Punctum . . . . The pin-point opening of the canaliculus.

Pupil . . . . . The "apple" of the eye.

Purgative . . . A medicine which causes evacuation of the bowels.

Purulent Ophthalmia A severe form of inflammation of the conjunctiva, accompanied by the discharge of pus from that membrane. Probably always due to contagion.

Pus . . . . . The familiar yellow product of inflammation known as "matter".

Reactionary Hæmorrhage The bleeding which sometimes occurs within twenty-four hours after a wound, either accidental or operative.

Recti Muscles . . The four straight external muscles of the eye.

Retina . . . . . The delicate inner coat of the eye, placed between the choroid and the vitreous humour.

Rods and Cones . One of the layers of the retina closely concerned with sight.

Salivation . . . An excessive secretion of saliva, often caused by the administration of mercury.

Saprophytes . . Organisms that exist only in dead matter, for example, pus.

Scarification . . A method of drawing blood by numerous small incisions.

Sclerotic (Sclera). The firm white outer coat of the eyeball, which forms $\frac{5}{6}$ths of the globe, the rest ($\frac{1}{6}$th) being formed by the cornea.

Sclerotomy . . . An operation for the relief of glaucoma.

Scrofula (Struma) A peculiar constitution characterised by tendency to chronic inflammation of skin, glands, joints, bones, conjunctiva, and other tissues. Formerly known as the "King's Evil".

Scrofulous Ophthalmia . . . See "Phlyctenular Conjunctivitis".

Sedative . . . . Any agent which soothes pain or inflammation.

Sensory . . . . Having to do with the senses.

Septic	Applied to micro-organisms, this term means those which produce diseased conditions in the human body.
Seton	A thread kept beneath the skin in order to excite inflammation.
Serpiginous	A term applied to a serious form of ulcer of the cornea, attacking old broken-down people, and due to micro-organisms.
Shades	Contrivances to shelter the eyes from light.
Spirillum	A corkscrew-like micro-organism. Relapsing fever is caused by a spirillum.
Spores	The minute cells, by means of which micro-organisms reproduce their kind.
Staphylococci	Cocci arranged in irregular masses.
Staphyloma	A protrusion of some part of the coats of the eye.
Sterilise	To render free from germs and their spores. Thus, water which has been boiled is said to be sterilised.
Stimulus	A stimulant.
Strabismus	Squint.
Strabotomy	A barbarous term sometimes used to indicate the division of a tendon for the cure of squint.
Strepto-cocci	Cocci arranged in rows like the pearls of a necklace.
Stye	See "Hordeolum".
Suction Operation	An operation in which a softened cataract is sucked out of the eye.
Supercilium	The eyebrow.
Suppuration	The formation of pus, or "matter," as it is generally called.
Suspensory Ligament	A transparent structure placed in front of the capsule of the crystalline lens, and joining the hyaloid membrane of the vitreous humour.
Symblepharon	A condition in which the palpebral and the bulbar conjunctiva become adherent to each other; it sometimes follows burns and other injuries of the eye.
Syphilis	A constitutional affection which may be hereditary or acquired. It may be conveyed in many ways.
Tarsal Cyst	See "Chalazion".
Tear Passages	The channels by which tears pass from the eye into the nose.
Tenotomy	Division of a tendon.
Tinea Tarsi	See "Blepharitis".
Toxines	See "Ptomaines".

Trachoma . . . See "Granular Lids".
Trichiasis . . . A condition in which the eyelashes are badly directed, thus coming into contact with the globe.
Tubercle . . . . An inflammatory nodule caused by the irritation of the tubercle bacillus.
Ulcer . . . . . A superficial sore.
Uvea . . . . . The pigmented parts of the iris, choroid, and retina.
Venesection . . Bleeding by opening a vein.
Vibrio . . . . . A micro-organism resembling the spirilla.
Vibrissæ . . . . Long sensitive hairs common in the lower animals, and sometimes developed in the eyebrows of old people.
Virus . . . . . Speaking generally, an animal poison. For instance, the virus of hydrophobia.
Vision . . . . . Sight.
Vitreous Humour The transparent jelly-like material which is contained in the vitreous chamber of the eye, and which supports the retina.
Vitreous Chamber The cavity which contains the vitreous humour.
Voluntary . . . Subject to the will.
Yellow Spot . . See "Macula Lutea".
Zonule of Zinn . See "Suspensory Ligament".

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