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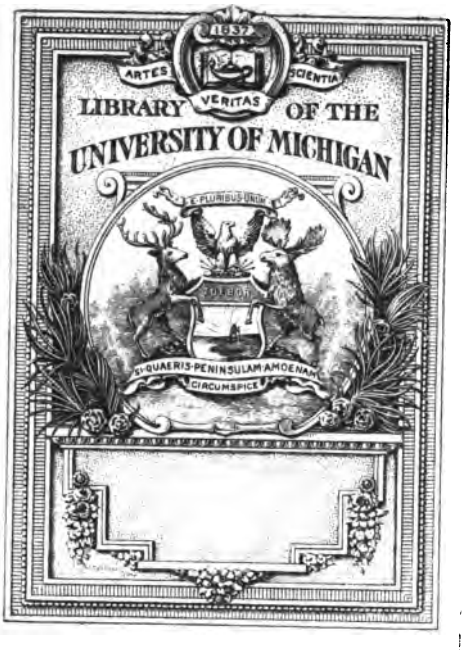

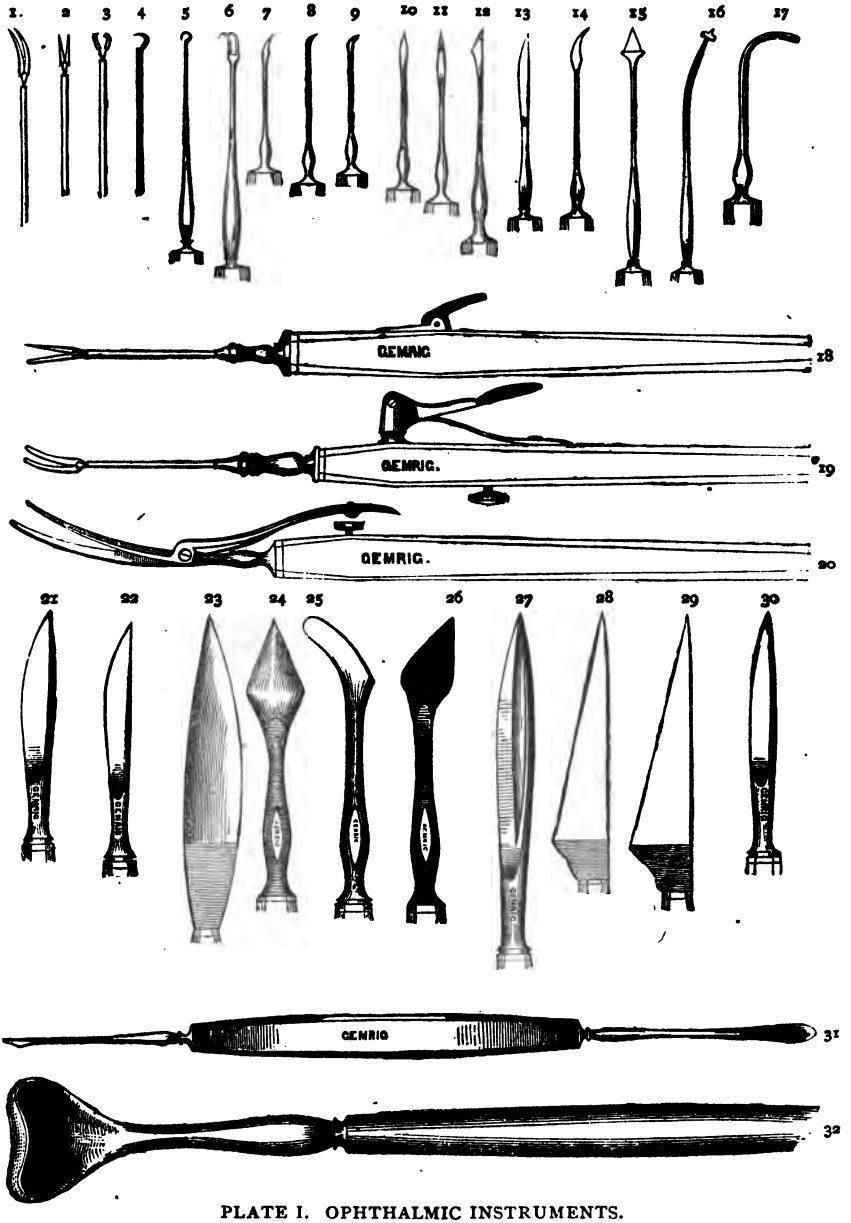

PLATE I. OPHTHALMIC INSTRUMENTS.

All these Instruments, of the best make, are furnished by J. H. Gemrig, 109 South 8th St., Philadelphia.

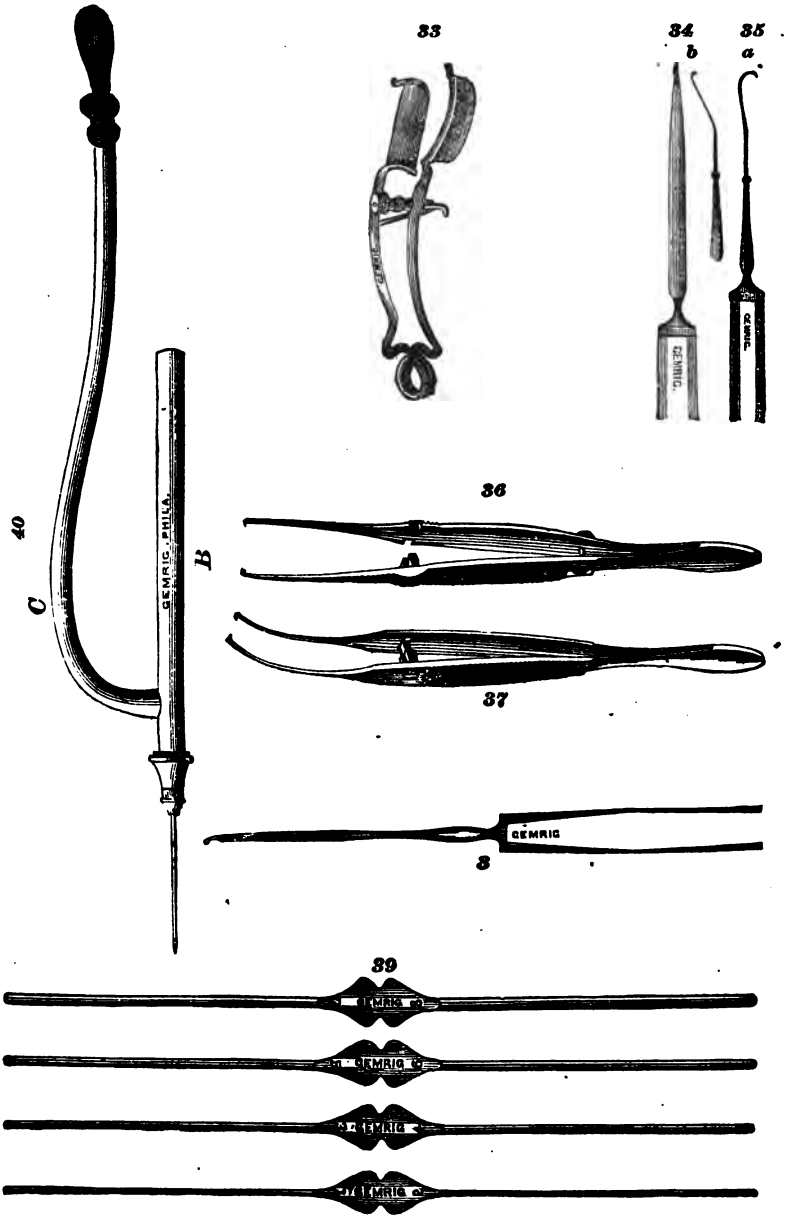

PLATE II. OPHTHALMIC INSTRUMENTS.

All these Instruments, of the best make, are furnished by J. H. Gemrig, 109 South 8th St., Philadelphia

HOMŒOPATHIC OPHTHALMIC PRACTICE:

A

SYSTEMATIC TREATISE

ON

DISEASES OF THE EYE;

FOR THE USE OF

GENERAL PRACTITIONERS AND STUDENTS.

By C. P. HART, M.D.,

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WITH NUMEROUS ILLUSTRATIONS.

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DEDICATION.

TO

T. STERRY HUNT, LL.D., F.R.S., ETC., ETC.,

WHOSE ATTAINMENTS IN SCIENCE HAVE DESERVEDLY
GIVEN HIM A

WORLD-WIDE REPUTATION,

This Volume

IS RESPECTFULLY AND AFFECTIONATELY INSCRIBED, BY HIS

FRIEND AND FORMER FELLOW-STUDENT,

THE AUTHOR.

PREFACE.

The present volume owes its origin to a desire on the part of some of the readers of the "*American Homœopathic Observer*," that the series of articles on Ophthalmology contributed by the writer to that journal, should, for the sake of convenience, be republished in book form. In complying with this request, the author has extended the series so as to embrace all the leading diseases of the eye, and in so doing has endeavored to exhibit, in a concise and practical form, a clear and exact account of the present state of ophthalmic science. Thus prepared, the work is now offered to the profession, not as an aid to the specialist, for whom it would be in many respects inadequate, but as a guide to the general practitioner, and also as a means of presenting to the student, in a condensed form, such new facts and discoveries in Ophthalmology as have marked the progress of the science within a comparatively recent period.

Unfortunately, the science of which we treat is still regarded by many as too abstruse, and the practice of it too difficult, for the general profession, and hence it has been relegated, for the most part, to a comparatively small number of practitioners. We say *unfortunately*, because the vast majority of ophthalmic diseases are still treated, and of necessity always will be treated, by the ordinary medical attendant. The important question, then, is, not whether diseases of the eye should be turned over to the specialist for more scientific investigation and treatment—the propriety of which, in many

cases, no one who has any regard for the welfare of the patient will deny—but whether the general practitioner, who, nine times out of ten, is expected to treat these cases, shall be properly qualified to discharge a duty which, whether qualified or not, he is required to perform. Besides, even if it were possible for the majority of such cases to be referred to experts, the general practitioner would still need to be as fully informed on this as on other branches of medical learning, in order to enable him to give proper and timely advice to his patients, and to secure to himself the advantages, too numerous to mention, resulting only from a well-rounded medical education.

Let us not be misunderstood. We are not calling in question the propriety of referring all complicated and difficult cases to specialists, but, as nine-tenths of all diseases of the eye are either inflammatory or functional, and as only a small proportion of eye difficulties, except such as require manual dexterity in operating, will be sent to ripe specialists—of which there indeed but very few—we are simply emphasizing the need of greater competency on the part of those who are daily called upon to diagnose and treat this important class of cases. And we opine that the chief reason the general profession is, as a body, so lamentably ignorant of Ophthalmology, is not in consequence of the abstruseness of the science, for this is no greater than that of any other department of medicine and surgery; more especially since the discovery of the ophthalmoscope—the use of which has greatly simplified the subject, and rendered many parts of it much more definite and easy of comprehension. But we are of the opinion that the reason of this acknowledged incompetency lies chiefly in the paucity of suitable Manuals. Not that the profession is wholly without valuable aids of this character, but that those already published are, for the most part, too concise to serve as guide-books to the student and general practitioner, or else savor too much of prolixity, in consequence of the introduction of unnecessary

details, or of matter which belongs rather to the province of strictly theoretical treatises.

Whether this volume will meet the requirements above suggested, is not for the author to affirm. He can, however, truly say, that he has labored conscientiously and assiduously to bring it up to the standard of what he conceives to be requisite in a text-book of this character; and he will feel amply compensated for his labors if the work shall be found free from any serious defects, and, at the same time, not wanting a reasonable degree of the only merit within the scope of his design, namely, that of furnishing a clear and concise description of ophthalmic diseases and their appropriate treatment, together with a correct and intelligible account of the facts, principles and discoveries furnished by the ablest of the American, English and German authorities.

We have not deemed it necessary, nor even desirable, to cite the authority for every important statement made in the text. To have done so would have greatly encumbered our pages, and increased the size and expense of the work. We have, however, in most cases, given due credit for any fact or discovery the authorship of which it is important the reader should know; and would refer those who desire to consult any of the original sources of information to the admirable treatise of Stellwag, whose bibliography of every department of the literature of Ophthalmology, is sufficiently ample to satisfy the most exacting.

C. P. HART.

WYOMING, Ohio, October, 1877.

PUBLISHER'S NOTICE.

The Publisher regrets that, owing chiefly to the fact that a number of the proof-sheets failed to reach the Author in time for revision, several typographical errors remain uncorrected. Fortunately, most of them are of so simple a character as to be readily understood by the reader, and will not, therefore, require to be pointed out. To avoid any ambiguity, however, please insert the pronoun *their* between "require" and "separate," on page 9; omit the period after the word "characteristic," on page 161; and substitute *edge* for "eye" in note on page 29, *epichondral* for "episcleral" on page 43, *it* for "them" in tenth and twelfth lines on page 95, *serous* for "serious" on page 103, *T* for "Tn" in the parenthesis on page 120, and *Aurum* for "Arum" on page 160.

DISEASES OF THE EYE.

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PRELIMINARY OBSERVATIONS.

Ophthalmic diseases, especially those of an inflammatory character, have hitherto, for the most part, been regarded by us, as well as by many allopathists, as a single affection, whereas the structures which enter into the composition of the eye are, like those of the encephalon, so diverse as to require separate consideration. For what resemblance, except in a general way, is there between conjunctivitis, iritis, scleritis and retinitis, to say nothing of the various forms which even the first mentioned disease assumes in different cases? We do not propose, however, to describe, much less to enter into any considerable detail concerning many diseases to which this organ is subject, but simply to describe the more common forms of inflammatory and other diseases of the eye, in a manner sufficiently ample and accurate to enable one, by means of the symptomatic indications, to treat diseases of this organ with the same scientific precision that characterises our treatment of other diseases. For it must be confessed that, until within a very recent period, ophthalmic medicine in our school has not kept pace with the general advance of homœopathic practice. On the contrary, it has hitherto remained, for the most part, in its very infancy;* so that our ophthalmic literature furnishes but a modicum of pure grain, in comparison with the large amount of chaff with which it abounds. This arises, however, from no defect in our system of practice, since the success which has attended the treatment of eye diseases under the law of *similia* has

* The only work we now have is Angell's "*Treatise on Diseases of the Eye*," the fourth edition of which, just published, is, I regret to say, very deficient both in description and treatment; especially the latter.

been much greater than that under allopathic treatment, as evidenced by the fact that the authorities have substituted the former for the latter in some of the great public charities;* and also by the fact that certain diseases not amenable to allopathic treatment, such as incipient cataract, have in some instances, unquestionably yielded to homœopathic medication. Perhaps this very success has been the means of retarding, rather than advancing, this special branch of medicine among us, by satisfying the demands of the public with less than what would have satisfied it, had the result of allopathic treatment been greater.

The chief difficulties under which we labor in these cases are two-fold; first, the limited number of symptoms pertaining to the disease. depending for the most part upon the purely local character of the affection; and, secondly, the defects of our Materia Medica, so far as the eye symptoms are concerned, arising from the incomplete, careless and imperfect character of our provings. The latter can only be remedied, and is therefore the principal road to improvement in this branch of medical science. If under such adverse circumstances the superiority of the homœopathic ophthalmic practice is manifest, what brilliant results may we not justly expect, when our Materia Medica shall be freed from its incomplete and unreliable symptoms, and indications based upon scientific observations, be substituted in their place? Meanwhile, and as a humble initiatory effort in this direction, we shall attempt to make such use of the materials before use, as will fairly represent the existing state of our knowledge on this important subject.

ANATOMY OF THE EYE.

It is not necessary, nor would this be the proper place, to give even a general description of the anatomy of the eye, as every physician is supposed to be sufficiently acquainted with

* See *Am. Hom. Obs.*, vol. iv, p. 386.

both its structure and physiology. It will be well, however, before entering upon the study of the various affections which we shall have to consider under this head, to refresh the memory by means of the following diagrams, which, in connection with the explanatory references, will be found to be of far greater practical value than the most labored description.

HORIZONTAL SECTION OF THE RIGHT EYE.

1. *Sclerotic coat*, or sclera, consisting of a white, fibrous, dense, and somewhat elastic membrane, covering the posterior five-sixths of the globe, and giving shape and firmness to the organ.

2. *Choroid*, or second tunic. This is a thin vascular coat, which, like the sclera, covers the posterior portion of the eye, and is pierced near the centre to admit the optic nerve and vessels of the retina. In front it unites with, and forms a part of the ciliary body and iris. The outer portion of this coat consists of the larger vessels, connected by a delicate cellular tissue, and an abundance of brownish pigment; the inner portion consists of the capillary vessels of the membrane.

3. The *cornea*, or "window" of the eye,* consisting of a transparent fibrous membrane, similar in structure to the sclera, covering the anterior sixth of the globe. It is composed of five layers; an outer epithelial layer; the elastic layer of Reichert; the true cornea; the layer of Descemet; and an internal epithelial layer; the two latter constituting the anterior or corneal

* This is *popular* language only, since the *pupil* is the only true window, or opening of the eye.

portion of what is generally known as the membrane of the aqueous humor. The cornea, though largely supplied with nerves, contains no blood vessels; consequently it never exhibits any appearance of vascularity, except when diseased.

4, 5. The membranes of Descemet and Reichert. (See *Cornea.*)

6. The *iris*. This is a beautifully colored vertical membrane, or curtain, attached by its margin to the ciliary processes, having an opening near its centre called the pupil. Its structure is similar to that of the choroid coat, of which it may be regarded as an extension, just as the cornea may be considered an extension of the sclera; it differs, however, from the choroid in being more muscular, having a circular set of muscular fibres for diminishing, and a radiate set for enlarging, the pupillary opening. It is abundantly supplied with nerves as well as blood vessels; and is covered posteriorly with a pigment layer, called the *uvea.*

7. The canal of Fontana or Schlemm, giving passage to a plexus of veins; and generally known as the circular venous sinus of the iris.

8. The *conjunctiva*; a transparent and highly vascular mucous membrane covering the anterior portion of the globe, and reflected from the globe to the internal surface of the lids, at the ciliary margin of which it is perforated by the ciliary ducts. The former portion is called the *occular* conjunctiva; and the latter the *palpebral*; the posterior portion, where it is reflected from the globe to the lids, is frequently called the *retro-tarsal fold*; the ciliary edge of the membrane being known as the *tarsal* conjunctiva. The entire membrane forms a sac, the opening of which corresponds to the edge of the lids. It is abundantly supplied with nerves as well as blood-vessels, the former being derived chiefly from the first, or ophthalmic branch of the trifacial. The palpebral portion is

thickly studded with papillæ, which, when enlarged by disease, give to the membrane a villous or granular appearance.

9. Vena vorticosa; 10. Optic nerve. (See *retina.*)

11. Intervaginal space; 12. Lamina cribrosa.

13. The *retina*, or occular expansion of the optic nerve, forming the internal, or third principal membrane of the eye. It is divided by recent anatomists into no less than ten layers, the principal of which are: the layer of *nerve fibres*, the layer of *rods and cones*, and the *pigment* layer. The first of these is but a simple expansion of the optic nerve fibres, being thickest at the optic disc, where the expansion begins, and gradually thinning down as it approaches the ciliary processes in front. It lies next the internal limiting layer or surface of the retina, and forms the *conducting layer*, as that of the rods and cones constitutes the *perceptive layer*.

14. The *macula lutea*, or central transparent spot of the retina, having in its centre a depression called the *fovea centralis*.

15. The *ora serrata*, or posterior edge of the ciliary processes. The engraver has represented this with a regular curve line, whereas it should be *serrated*, to correspond with the name.

16. The *zonule of Zinn*, or suspensory ligament of the lens.

17. The *crystalline lens*, a double convex body, suspended from the ciliary processes immediately behind the iris. It is enclosed in a transparent capsule, the anterior and posterior portions of which are denominated the anterior and posterior capsules. The lens is transparent, laminated, and increases in density or hardness towards the centre, or *nucleus*, where it has about the consistency of soft wax. At birth it is perfectly colorless, but as age advances it acquires more or less of an amber tint, impairing to some extent its transparency.

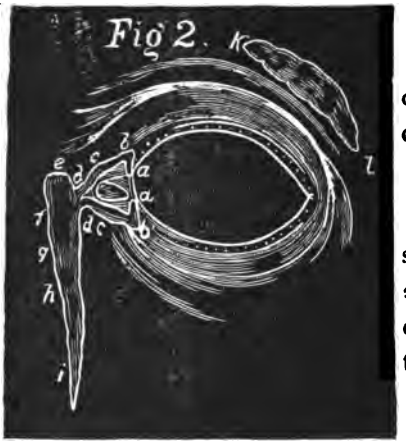
18. *Ciliary processes.* The ciliary processes are some seventy-five or eighty in number, and constitute what is known as the *ciliary body.* This is composed chiefly of the ciliary muscle, covered by the choroid and pigment layer. (See *choroid.*) The ciliary muscle is composed of two sets of fibres

an anterior set which are circular, and a posterior which are radiating or meridional.

19. The *anterior chamber*, or concavity, bounded by the cornea and iris.

20. The *posterior chamber*, bounded anteriorly by the uvea, and posteriorly and laterally by the lens, a portion of the zonula, and the ciliary processes. The anterior and posterior chambers communicate by the pupil; and are filled with a transparent watery fluid, called the aqueous humor, which readily escapes whenever the cornea is punctured, but is rapidly restored by secretion.

21. The *vitreous humor*. This is a transparent, jelly-like substance, containing neither vessels nor nerves, which occupies the entire cavity of the retina. So far as simple appearance is concerned, it bears a striking resemblance to glass, whence it derives its name. It consists of a loose cellular texture, containing water in its interstices, the latter constituting some ninety-eight per cent. of its bulk. The membrane inclosing the vitreous body, and which is but an external condensation of the cellular mesh-work, is called the *hyaloid membrane*, so named by its discoverer, Fallopius.



THE LACHRYMAL APPARATUS.

LACHRYMAL ORGANS.*

a, a, Puncta lachrymalia, or openings of the lachrymal canals, in the lids.

a, b, c, d, Lachrymal canals.

b, b. Blind dilatations, or small *culs-de-sac*, at the orbital extremities of the lachrymal canals, where they turn inward to the lachrymal sac.

e, f, g. Lachrymal sac.

* After *Sommering.*

e. The blind end of the lachrymal sac.

g. Termination of the lachrymal sac, at which point there is a slight contraction which serves to distinguish between the sac and duct.

h, i. The *ductus ad nasum*, or nasal duct.

i. Opening of the nasal duct into the nose.

k, l. Lachrymal gland. This is a small conglomerate gland situated just within the orbit, near the external angular process of the frontal bone. It communicates with the surface of the conjunctiva by means of seven or eight small excretory ducts, which open just above the external angle of the eye.

DIV. I.—OPHTHALMIC INFLAMMATION.

ART. I.—CONJUNCTIVITIS.

Of the various forms of ophthalmic inflammation, we shall first describe *Conjunctivitis*, as that is not only the most frequent, but also the most important affection of the eye which the busy practitioner is called upon to treat. It is referred to under different names—*Ophthalmia, Ophthalmitis, Conjunctivitis*, etc., the first of which is the most common, the last the most correct. As the name implies, it is simply an inflammation of the conjunctival mucous membrane. This membrane is not only the most exposed to atmospheric influences, but also to direct external injuries, to irritations arising from the pressure of dust, cinders, and other extraneous substances in the eye, to inverted or misdirected cilia, and to tumors, changes in the lids, etc.; all of which excite more or less inflammation of the conjunctiva. It may also arise indirectly from scrofulous, syphilitic, or other unhealthy states of the constitution, or as a consequence of other inflammations, either simple or specific, in other organs or in other parts of the same organ. The simple form, *conjunctivitis simplex*, does not differ in any essential particular from the *catarrhal*, so that it is unnecessary to describe it separately. The treatment, also, is similar, the special indications depending chiefly upon the intensity of the inflammation; these, in severe cases of simple conjunctivitis, being identical with those of the milder varieties of catarrhal ophthalmia.

I.—CATARRHAL CONJUNCTIVITIS.

CATARRHAL OPHTHALMIA; MUCOUS OPHTHALMIA.

FIG 3.

CATARRHAL CONJUNCTIVITIS.

This is a simple inflammation of the conjunctiva, resulting from exposure to cold and damp. When the inflammatory process extends to the sclera, catarrhal conjunctivitis becomes either *catarrho-rheumatic* or *catarrho-arthritic conjunctivitis;* and when it involves the lids, the affection is called *blepharo-conjunctivitis*, or simply *blepharitis.*

SYMPTOMS.—Dryness, itching, smarting and stiffness, with more or less redness, lachrymation, sensitiveness to light, and a feeling as though sand or some other foreign object had gotten into the eye. Sometimes this is really the case, even in catarrhal conjunctivitis, but it is much more apt to occur in the simple form of the affection, since it is in that manner that *simple* conjunctivitis is generally excited. The symptom in question is generally due to the roughness of the conjunctival surface, caused by the enlarged and tortuous vessels which characterize the inflammation. Vision is often impaired, especially towards evening, on account of the abundance of mucus secreted at that time and deposited upon the cornea. The palpebral conconjunctiva is of a bright vermilion hue, frequently flecked with slightly ecchymosed patches of a deeper color, and is sometimes so much increased in extent by relaxation, especially the great fold of the membrane, as occasionally to be twice its usual volume. In some cases, slightly diaphanous granulations, of a lighter color than the general surface, may be perceived upon the general surface, particularly of the upper lid.* Sometimes

*This is agreeable to most authorities, and is undoubtedly true of the chronic variety, in which alone granulations form a prominent feature; but in the more simple subacute forms, I have generally found them to be most conspicuous upon the lower lid, or rather in the conjunctival folds between the lid and the globe, and such also appears to have been the experience of EBLE.

also little vesicles, or pustules, consisting of slight elevations of the mucous membrane, and containing a serous fluid,* are situated about the margin of the cornea. The eyelids generally participate more or less in the inflammation, whenever the conjunctivitis is of an active character.

DIAGNOSIS.—The vessels of the ocular conjunctiva have a more or less regular distribution (*See Fig. 3.*); their trunks are turned towards the circumference of the globe, from which they run forwards in a slightly tortuous, but nearly parallel course, subdividing and inosculating as they approach the cornea, and terminating in very fine points at the distance of about two lines from the outer edge of the cornea, leaving a space around it in the form of a band which is free from redness. The distended vessels are quite superficial, and may easily be displaced by moving the lids. This form of inflammation seldom causes much swelling of the mucous membrane, and is not to be compared with the chemosis associated with the more acute inflammations of the conjunctiva. In addition to these diagnostic signs, other mucous surfaces suffer when the conjunctivitis is severe, producing more or less coryza, headache, and catarrhal fever. The symptoms, both local and general, remit in the morning, and undergo exacerbation at night.

PROGNOSIS.—Catarrhal conjunctivitis if properly treated undergoes resolution, and is therefore, generally speaking, free from danger; but if violent, and especially if wholly neglected, or improperly treated, it may extend to the cornea and sclera, producing opacity and ulceration of the former, granulation and ulceration of the conjunctiva, and other serious consequences.

ETIOLOGY.—Cold and damp are the chief exciting causes of catarrhal ophthalmia as they are of catarrhal affections in general. Great and rapid atmospheric changes, especially from heat to cold, often produce an attack; so also do cold

*And therefore *not true pustules*, though frequently so called.

winds, especially when combined with rain or snow. Changes of clothing, especially such as favor a chill of the surface, are capable of producing it, particularly if the head itself is exposed. Getting wet, either partially or generally, exposure to drafts of air, and whatever causes a chill of the body, may all give rise to it; it is also sometimes caused, apparently, by certain atmospheric influences, the nature of which has never been satisfactorily explained.

TREATMENT.—The proper treatment for catarrhal conjunctivitis is that which is best adapted to catarrhal inflammations in general, and particularly to coryza, with which it is frequently associated. Hence the principal remedies are:

Aconite,* especially at the beginning of the attack. This remedy alone will frequently allay the inflammation, provided no untoward complications exist.

Apis mel.—This remedy is often associated with Aconite, especially in the first stage, and, not unfrequently, with great apparent benefit.

*Belladonna.**—This medicine is best adapted to the more violent forms of catarrhal conjunctivitis, particularly when there exists considerable sensitiveness to light.

Euphorbium.—This is often a very efficient remedy in violent forms of the disorder; also in chronic catarrhal conditions, with dryness and itching of the lids and canthi.

Euphrasia is an excellent medicine, similar in its action to Belladonna, and especially adapted to cases complicated with coryza, or with copious mucous discharges from the nasal passages. It also generally has an excellent effect when applied locally in suitable cases.

Hepar Sulph.—This remedy is best adapted to the subacute forms of catarrhal inflammations; also in the acute after Aconite and Belladonna, particularly the latter.

Mercurius.—This is one of our most efficient remedies in

*See *Am. Hom. Obs.*, vol. iv., p. 440, (*sub-acute*; A, 1-10.)

obstinate cases, especially when associated with a general catarrhal condition of the system.

Rhus Tox. has also been found useful in bad cases of catarrhal ophthalmia, attended with more or less œdematous swelling of the conjunctiva.

The chief remedies for the more chronic forms of catarrhal conjunctivitis are:

Arsenicum, especially when there is ulceration of the cornea and the margin of the lids; also when there is œdema, lachrymation, and nightly agglutination.

Calcarea.—This remedy is particularly useful in cases similar to the above, and of long standing, especially if aggravated by reading or sewing.

Hydrastis Canaden.—This medicine may be used to advantage, both locally and generally, in chronic catarrhal conjunctivitis, especially when attended with ulceration; it is also, like Hepar Sulph., frequently useful in the acute and sub-acute forms.

Iodium.—This remedy is suitable to obstinate cases occurring in lymphatic constitutions, and in which there is more or less redness and swelling of the eyelids, with nightly agglutination.

Phosphorus.—In cases similar to the above, associated with coryza, or with a more general catarrhal condition of the system.

Staphysagria.—This medicine is well adapted to cases which have become complicated with inflammation of the lids, especially when the meibomian glands are implicated.

Sulphur.—This remedy is suitable to almost every form of chronic catarrhal inflammation, especially when attended with ulcerations of the margins of the lids, with swelling of the conjunctiva or with opacity or ulceration of the cornea.

Thuja.— This remedy is found useful in the most violent forms of chronic catarrhal conjunctivitis, attended with thickening and granulation of the lids. See *Chronic Purulent Conjunctivitis*, § 2 (2).

Although the above list of remedies is amply sufficient for the successful treatment of every variety of catarrhal conjunctivitis, additional remedies, together with their symptomatic indications, will be given after the other forms of ophthalmia have been described. See *Tables A. and B.;* also *Therapeutic Indications* at the end of the *Section on Ophthalmic Inflammation.*

LOCAL TREATMENT.—Topical treatment, under homœopathic medication, is seldom required in either the acute or sub-acute forms of catarrhal conjunctivitis. If, however, owing to constitutional weakness, or other causes, the inflammation, in spite of the indicated constitutional remedies, runs very high, and especially if there be much chemosis, or swelling, *cold compresses* will generally give great relief, and aid materially in bringing about speedy resolution. Irritating collyria, however, are never admissible during this stage. It is not until the inflammation has been somewhat subdued, or else is disposed to linger, or become purulent, that collyria are beneficial; and then they should be of the most simple character, such as a solution of one grain of nitrate of silver, one or two of the sulphate of copper or zinc, two or three of alum, the same quantity of the acetate of zinc, or five or six grains of borax, to the ounce of distilled water. These should be interchanged from time to time, using such only as are found to be most beneficial and agreeable to the patient, and either discontinued altogether or conjoined with the use of the cold compress, whenever active inflammatory symptoms supervene. If the collyrium, however weak it may be (and it should never be very strong in the early stages of the disease), causes much pain, it should either be abandoned, or greatly reduced in strength, as experience shows that such washes generally do more harm than good under such circumstances. By carefully adapting them, however, to the requirements of each particular case, they may be made to contribute to both the comfort and benefit of the patient. If the inflammation prove obstinate, and especially if the discharge assume a purulent character, the case should be treated as directed in the following section.

2.—PURULENT CONJUNCTIVITIS.

CONJUNCTIVITIS BLENNORRHOICA; PURULENT OPHTHALMIA.

We propose to describe under this head the varieties of conjunctival ophthalmia originating in the mucous membrane of the eye, and often confined to it, characterized by an increased secretion of a purulent or puriform character. They are:

a. Conjunctivitis neonatorum, or purulent ophthalmia of newly born infants.

b. Conjunctivitis purulenta, or purulent ophthalmia in the adult.

c. Conjunctivitis gonorrhoica; or acute gonorrhœal ophthalmia.

These varieties of conjunctivitis are strikingly similar in their symptoms, course and terminations, are all very destructive to the integrity of the organ, and are chiefly distinguishable from each other by the age of the patient, or by the nature of the exciting cause.

A—Conjunctivitis Neonatorum.

PURULENT OPHTHALMIA OF INFANTS.

SYMPTOMS.—This form of conjunctivitis generally sets in about three days after birth, but it sometimes begins at an earlier and sometimes at a later period. At first it is limited to the palpebral conjunctiva, which is red and velvety; the edges of the lids, also, are somewhat red, particularly at the corners, where they adhere slightly to each other, the adhesion arising from their being kept closed in consequence of pain experienced on exposure to light, and to the secretion by the inflamed membrane of a small quantity of white mucus, which may be seen

on everting the lower lid. This *blepharo-blennorrhœa*, or *blepharitis*, as it is termed, constitutes what is called the *first stage*.

The *second stage* is marked by the extension of the disease to the ocular conjunctiva, the redness and inflammation being greatly increased, and the inflamed membrane pouring out a copious puriform secretion, which causes adhesion of the palpreb al edges, and the accumulation between the swollen and inflamed lids of more or less of the purulent matter. In this stage, there is always considerable tumefaction both of the lids and conjunctiva, the loose folds of the latter being distended into fiery rolls, having a finely granulated or villous appearance, and producing in many cases temporary ectropium of one or both of the lids. Photophobia is always great, and generally extreme, the child contracting its brow, and resisting as much as possible every attempt at exposure to the light. Whenever the lids are separated, especially in the morning, a profuse purulent discharge generally gushes out, and pours over the face of the child; and in all cases the puriform secretion is sufficiently abundant to agglutinate the lids, and, when separated, to conceal from view the inflamed surfaces. The discharge is of different degrees of consistency, and of various shades of color, being generally of a purulent or muco-purulent character, but sometimes ichorous or sanious and even bloody.

The *third stage* stage is characterized by a gradual subsidence of the inflammation; the redness and tumefaction abate; the secretion is not only diminished in quantity, but altered in quality, becoming bland and muculent; the photophobia subsides, so that the child will even open its eyes when the light is subdued; and the temporary ectropium, resulting from the eversion and strangulation of the lids, disappears, so that the eye can now be carefully examined.

RESULTS.—Opacity, ulceration and more or less sloughing of the cornea, as well as adhesion of the iris to its inflamed or ulcerated surface, may all occur in the second stage of the com-

plaint. When the whole cornea sloughs and the humors escape, the eye shrinks greatly in size, appearing like a flattened tubercle at the bottom of the orbit, when the humors are retained, the front of the globe only is flattened. When, in consequence of extensive sloughing of the cornea, the iris prolapses and becomes adherent, staphyloma, either partial or general, commonly supervenes; sometimes, however, the tumor thus formed gradually diminishes until only a small brown point remains in the cornea, impairing the vision more or less, according to its situation and extent. The cicatrices left after healing of the corneal ulcerations are opaque, and consequently interfere more or less with vision. Permanent opacity of the cornea, (*leucoma albugo*,) resulting from a greater or less amount of interstitial deposition, may be either partial or general; in such cases, of course, vision is more or less permanently impaired; but when the opacity is superficial, or results from a slight degree only of interstitial deposition, the effusion will ultimately be absorbed, and the transparency of the cornea fully restored.

PROGNOSIS.—When the disease is severe, neglected, or badly treated, the danger to the eye becomes very great, and vision is apt to be permanently injured. On the contrary, if the case be taken in hand early, before the cornea becomes seriously affected, the inflammation can almost always be subdued in time to avert the dangers to which this form of conjunctivitis is subject. Indeed, if the cornea remains clear, even if the inflammation has extended to the ocular conjunctiva, but little risk is incurred, provided the most prompt and efficient means are employed. But if extensive ulceration or sloughing of the cornea has occurred, or if inflammation has extended to the deeper structures of the eye, producing adhesion of the iris, (*synechia anterior*,) or impairing the transparency of the humors, the loss of vision will be unavoidable.

ETIOLOGY.—Purulent conjunctivitis of new-born infants has been proven in many instances to be contagious; and the gen-

eral appearance of the disease on the second or third day after birth, taken in connection with the fact that, in a large proportion of cases, the mothers have been observed to have a morbid vaginal discharge, such as leucorrhœa or gonorrhœa, renders the received notion of its contagious origin from contact of these morbid secretions, highly probable, to say the least. On the other hand, conjunctivitis neonatorum frequently attacks the children of healthy mothers, or, at least, of such as appear to be quite healthy, so that the question as to the contagious origin of the complaint still remains to some extent unsettled.* Whether contagious or non-contagious, however, one thing is certain, namely, that those influences that excite other forms of conjunctivitis are capable of producing this; thus it is found to be most frequent and destructive among weakly children, and such as are inadequately and improperly nourished, clothed and housed; also, that it is more prevalent and destructive where large numbers are collected together, as in foundling hospitals, especially those which admit children of the lowest class, the mothers of which are frequently affected with leucorrhœal or other vaginal discharges, and whose infants are often puny, premature and badly nourished.

TREATMENT.—In order to avoid unnecessary repetition, we shall mention in this place only a few of the leading medicines adapted to this variety of ophthalmic inflammation, referring to TABLES A and B, and also to the THERAPEUTIC INDICATIONS at the end of the SECTION ON OPHTHALMIC INFLAMMATION, for such additional remedies as may be required in exceptional cases.

Aconite.—This medicine appears to be incapable of causing a true inflammatory exudation of plastic lymph or pus, and is therefore of no value in this form of inflammation, except

*It is true, the most recent authorities regard every form of purulent conjunctivitis, even the catarrhal, as somewhat contagious, and this is no doubt true; but our own experience, no les than that of many others, to say nothing of the general history of the disease, is not such as to warrant us in giving an unqualified opinion on the subject in question.

during the first stage of the complaint, and even then it will be most useful if given in alternation with Argent. nit., or Belladonna.

Argentum nit.—This remedy enjoys the reputation of being a specific for this form of conjunctivitis; it is well to alternate it with other medicines whenever special symptoms demand a change of remedies.

Belladonna.—This remedy is well adapted to the first stage of conjunctivitis neonatorum, especially in the less acute grades of the disease; its use, however, should not be persisted in after the secretion has become thick and copious, but the practitioner will do well, as a general rule, to resort at once to

Bryonia.—This medicine is adapted to the second stage, when the conjunctiva has become more or less infiltrated, the secretion being thick and slimy and the lids agglutinated; but, unless improvement rapidly follows, resort should be had to

Hepar Sulph., or to the *Muriate of Hydrastia*, either singly, or in alternation with Bryonia or

Mercurius.—This is perhaps the most reliable remedy after the second stage has become fully established and plastic exudation has taken place, especially if pustules or ulcers have already formed on the cornea.

Rhus tox.—This medicine is also well adapted to the second stage of the disorder, especially when there is very great swelling of the lids and conjunctiva, with redness and hard swelling of the tarsal edges.

Thuja.—This remedy, which is better adapted to severe forms of catarrhal conjunctivitis, has been recommended chiefly on theoretical grounds; yet it has been proven to be of considerable value in many cases, especially when there is very high inflammation, with great redness and swelling of the lids and ulcerations of the tarsi and cornea.

AUXILIARY TREATMENT.—Great care should be taken to cleanse the eyes, as often as may be needed, with warm milk

and water, by means of fine old linen rags, never using the same piece twice, and never opening the lids without first soaking them until the dried and glutinous matter is entirely removed. A light linen compress, saturated with a solution of *Belladonna* or *Thuja*, of the strength of fifteen or twenty drops of the mother tincture to the glass of water, and frequently changed, may be used to advantage in the first and second stages respectively; and a solution of *Argentum Nitratum*, one grain to the ounce of distilled water, and kept in the dark, may be dropped into the eye, or applied to diseased surfaces, every six hours during the suppurative stage, by means of a camel's hair pencil, being careful to cleanse the pencil with warm water every time it is used. This application not only destroys the contagious character of the secretion, but acts favorably upon the inflammation, by limiting the exudative process and promoting the absorption of the exudation; and, if carefully and timely applied, it will insure resolution of the inflammation, by preventing disorganization of the ocular structures and consequent loss of vision.

DIET AND REGIMEN.—From what has been said respecting the nature and causes of this disease, it is evident that the nutrition of the infant is a matter of the highest importance;* and for this purpose, healthy maternal breast-milk should, if possible, be obtained. If, however, the babe *must* be fed with artificial food, well-cooked oat-meal, prepared with half water and half milk, and strained, will, as a general rule, be found to be the best substitute. Due attention to cleanliness, the use of a proper amount of warm, clean clothing, and a plentiful supply of pure air, are matters also which the practitioner should be careful to enjoin.

* To those practitioners who are accustomed in this complaint to rely wholly on medication, these directions may appear both antiquated and unnecessary; but an experience of many years in its treatment, and the disastrous results which in many cases we have observed to follow the neglect of suitable hygienic measures, especially in public institutions, not only authorize, but demand, we think, their observance in all cases.

B.—Conjunctivitis Purulenta.

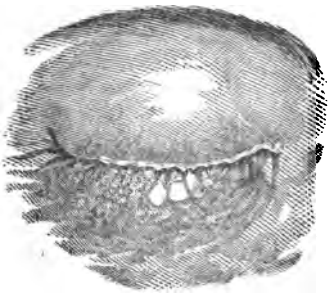
PURULENT OPHTHALMIA OF THE ADULT; MILITARY OR CONTAGIOUS OPHTHALMIA.

This form of conjunctivitis is of different degrees of severity, according as it occurs in civil life and under favorable circumstances, or in the army, in over-crowded barracks, hospitals, etc. In the former case, it is generally a comparatively mild affection, differing in no respect from the milder form of conjunctivitis neonatorum just described, except as modified by age and other accidental circumstances. Indeed, there is reason to believe that in some instances it is nothing more than a severer and more dangerous form of the catarrhal. In the latter case, however, owing doubtless for the most part to exposure, a scorbutic state of the system and want of cleanliness, it has proven exceedingly destructive, no less than eleven hundred cases of blindness having occurred in the Prussian army out of thirty thousand attacked. Sometimes, also, the ravages of the disease are alarming even in civil life, as when it breaks out in asylums and large schools, or when, through neglect of sanitary precautions, or the non-observance of suitable hygienic measures, it becomes epidemic. The latter constitutes what is generally known as

(1.)—ACUTE PURULENT CONJUNCTIVITIS.

SYMPTOMS.—As in ophthalmia neonatorum, the redness and inflammation are at first confined to the palpebral conjunctiva; there is also more or less lachrymation, stiffness of the lids, and accumulation of whitish mucus on the inflamed membrane. This is the first stage, or *blepharo blennorrhœa*. The inflammation soon extends to the conjunctiva oculi, producing great redness and swelling of the affected membrane, and copious discharge. At first there is simple stiffness of the globe and lids, but this is soon followed by a feeling as though sand or cinders were in the eye. The lachrymation of the first stage is succeeded by a puriform discharge, so copious as to frequently

FIG. 4.



PURULENT CONJUNCTIVITIS.

overflow the lids and face. Chemosis, from swelling of the ocular conjunctiva, becomes so great as frequently to overlap and nearly cover the cornea, forming with the swollen membrane of the lids, two large pinkish rolls or protuberances, which so effectually close the eye as to render a satisfactory view of the cornea quite impossible. When the inflammation extends to the sclera, the pain is greatly augmented, becoming at times almost intolerable; the constitution also sympathises with the affection, producing a feverish state of the system, attended by headache, throbbing in the temples, loss of appetite, etc. The vascular exitement and suffering remit or abate from time to time, generally in the morning, and sometimes they become distinctly periodical. This is the second stage, commonly called *ophthalmo-blennorrhœa.* The third stage is marked by a general subsidence of the foregoing symptoms; the pain, swelling and discharge diminish, leaving however for a considerable period more or less eversion of one or both of the lids.

RESULTS.—Among the effects sometimes resulting from acute attacks of purulent ophthalmia, we have opacity, rupture, sloughing, suppuration and ulceration of the cornea, interstitial deposition into and between its laminæ, prolapsion and adhesion of the iris, vascularity, thickening and separation of the mucous membrane covering the cornea, staphyloma, ectropium, entropium, and enlargement or collapse of the globe. Even when no such effects follow the inflammation, a certain degree of impaired vision *(amblyopia)* sometimes remains, owing to changes in the lens, choroid coat, vitreous humor, and vessels of the orbit and brain.

DIAGNOSIS.—The violence of the disease, the purulent char-

acter of the secretion, and the changes above-mentioned, especially the chemosis, which, as a dropsy of the conjunctiva, is not to be compared with the swelling of the conjunctiva in catarrhal ophthalmia, will serve to distinguish it from the latter, with which alone it is liable to be confounded. Severe cases of catarrhal ophthalmia, attended by puriform secretion, sometimes bear a close resemblance to this disorder, and, as already stated, may perhaps be properly regarded as mild cases of the disease; but the fact that the inflammatory process commonly affects the whole conjunctival surface at once, instead of being confined for a time to the palpebral conjunctiva alone, as in purulent ophthalmia, will, in connection with the history and progress of the case, generally serve to establish a satisfactory diagnosis between them.*

PROGNOSIS.—Notwithstanding the formidable character of the inflammation, if the cornea be unaffected, suitable treatment will generally arrest the disorder; but if the cornea, and especially the globe, be involved in the inflammation, the event is more or less doubtful. Interstitial deposition, suppuration, and even ulceration, unless considerable, and occurring in a bad state of the system, do not necessarily involve the loss of vision, much depending, of course, on the extent and situation of the changes; if the centre of the cornea, or any considerable portion of it, remains clear, the sight is not likely to be greatly impaired. The general prognosis depends, of course, on the more or less rapid progress of the inflammation; the more rapidly it passes through its several stages, the more danger we shall have to fear. Whenever the true nature of the exciting cause can be determined, we shall have still surer ground upon which to base the probable results. Thus, if the blenorrhœa depends upon

* The following is the diagnosis of Prof. Arlt, Vienna: "The upper lid is to be everted, and if the conjuctiva is sufficiently transparent for us to see the lines of the meibomian glands running toward the eye, of the tarsus, we have a catarrh; if the infiltration is so great as to hide these glands, we have no longer a catarrh, but either a purulent or some graver form of ophthalmia."—ANGELL ON DISEASES OF THE EYE, p. 28.

infection, forty-eight, or even thirty-six hours may be sufficient to produce irreparable injury to the cornea, and consequently to vision.

ETIOLOGY.—Severe catarrhal and mild purulent ophthalmia are so closely related, that it cannot be positively denied that the latter may sometimes originate in the same causes that give rise to the former; but it is generally admitted to be of an infectious origin and nature; indeed, in most cases it can be traced directly to some contagious or blenorrhœic secretion, emanating either from the eyes or from the genital organs. The contagion is promoted, of course, by everything which tends to favor it, such as the crowding together of large numbers in the same apartment, thus accounting for its comparatively frequent occurrence in asylums and large schools, and in army hospitals. The same circumstances, likewise, superadded to exposure, want of cleanliness, and a scorbutic or psoric condition of the system, greatly facilitate the spread of the contagion, and hence the fearful ravages which the disease sometimes makes in the army.

In proof of its contagiousness, it is only necessary to cite the fact that it has frequently been communicated by direct inoculation, not only accidentally in persons, but intentionally in animals, the disease having been repeatedly produced in dogs and cats by the application of the purulent secretion to their eyes. Additional confirmation is found in the fact that, being endemic in Egypt, it was first brought to Europe by the English and French armies—whence the name of *Egyptian Ophthalmia*, by which it is sometimes known—and from this source its progress was traced from the infected to the uninfected, until the Europeon surgeons were, with but few exceptions, convinced of its contagious character. On the other hand, as Lawrence observes, "this notion of a specific contagion, imported from Egypt, originated in Europe, never having occurred in the supposed birth-place of the virus. Assalini, and the other medical

observers who actually witnessed the affection in Egypt, refer it to the ordinary causes of ophthalmic disease." In confirmation of the latter opinion, it may be stated, that where collections of individuals affected by it have been separated, the disease, instead of being propagated to others, generally abates. The only rational conclusion, therefore, that we can come to on this subject, is, that as a general rule, when the disease breaks out in over-crowded, filthy, and disease-producing situations, the malady becomes highly contagious and virulent; while on the other hand, in situations and under circumstances favorable to health, it soon undergoes amelioration, generally losing, to a great extent, at least, its contagious character, and becoming milder and more manageable.* This will satisfactorily account for the milder form which the disease often assumes, not only in civil life, but also in the army, whenever suitable hygienic regulations are observed.

TREATMENT.—This should be similar to that recommended for ophthalmia neonatorum, only, as the inflammation is generally of a higher grade, the treatment should, if possible, be still more energetic. As the same indications exist, the same remedies will be found applicable, and it will therefore be unecessary to repeat them here. See TREATMENT of *Conjunctivitis Neonatorum*, and consult also the remedies mentioned in *Table A*, at the end of the section on *Ophthalmic Inflammation*.

LOCAL TREATMENT. — Most authors recommend ice and ice water compresses for external use, and when well-borne and regularly and judiciously applied, they are found to be a very efficient means of subduing the inflammation, but it should be remembered that such applications are extremely hazardous in unreliable and inexperienced hands. We have often obtained much better results from water of a moderate coldness only, applied constantly by means of light linen rags, frequently renewed, taking care to cleanse the eyes from time to time with

* See *Am. Hom. Obs.*, vol. ii, p. 309, *et seq.*

fresh portions of the same. Sometimes even this degree of cold cannot be borne without great pain, in which case it should be used tepid, or else omitted altogether, except for purposes of ablution.

After the redness and swelling of the inflamed membrane have somewhat subsided, and the pain and soreness have mostly disappeared, astringent washes, composed of such substances as we have already mentioned, will prove most beneficial, especially when used in conjunction or alternation with a solution of *Argentum Nitratum*, of the strength of from three to eight grains to the ounce, according to the severity of the case, applied by means of a camel's hair pencil, in the manner recommended for the purulent conjunctivitis of infants; remembering always to rinse the lids immediately after making the application, and not to repeat it oftener than twice a day If the caustic applications are made prematurely, before the inflammation is sufficiently reduced, they will aggravate the complaint, and should at one be suspended, until, by the use of Aconite internally and cold compresses externally, the inflammation is so far lessened that they can be resumed with benefit.

DIET AND REGIMEN.—If the general health of the patient is good, the diet should be very light, consisting only of farinaceous food, wholesome fruits, and light, unstimulating drinks; but if weak and emaciated, and especially if there is a scrofulous or scorbutic state of the system, the diet should be liberal and nutritious. Should the case linger from any cause, as it is frequently apt to do in a depraved state of the constitution, and especially if the loss of vision be threatened by progressive ulceration of the cornea, such articles as milk, eggs and beef should be prescribed, and if necessary even a moderate amount of port wine should be allowed; since, in these cases, notwithstanding the inflammation, the danger to the integrity of the organ arises rather from under than from over stimulation. But before resorting to even the mildest stimulative measures, the practitioner should be certain that he has correctly interpreted the constitutional state; otherwise irreparable mischief will be the consequence.

C.—Conjunctivitis Gonorrhoica.

ACUTE GONORRHŒAL OPHTHALMIA.

This variety of conjunctivitis differs in no essential respect from the acute form of purulent ophthalmia already described, except in the specific nature of the exciting cause, and in the more violent and rapidly destructive character of the inflammation. Instead, therefore, of giving a detailed description of symptoms, which, for the most part, would be but a repetition of those mentioned in the preceding article, we shall content ourselves with merely pointing out the characteristic features of the disease, by way of

DIAGNOSIS.—Gonorrhœal conjunctivitis in its most severe form is, with perhaps a single exception, the most rapidly destructive form of purulent ophthalmia known; frequently destroying the eye, or producing irreparable mischief to the organ, within a few hours. The disease, which at first is generally confined to the conjunctiva, producing symptoms similar to those of simple catarrhal or purulent ophthalmia, soon extends to the globe, causing the most severe and agonizing pains in the head and eye, accompanied with great chemosis, excessive photophobia, and a more or less violent febrile movement of the circulation. At this stage the tumefaction, both of the lids and the orbital conjunctiva, is extreme, completely closing the eye, and rendering a satisfactory view of the cornea utterly impossible. As the œdema declines, one or both of the eyelids generally become everted, producing temporary ectropium.

As between the highest degree of catarrhal inflammation and the milder form of simple purulent ophthalmia there is a striking resemblance in the local symptoms, so between the severest grade of purulent inflammation and acute gonorrhœal ophthalmia there is a similar resemblance. The swelling of the eyelids, which is always considerable, is generally more marked in the former, while the chemosis, or œdema of the con-

junctiva oculi, is greater in the latter; the discharge, also, is generally of a brighter yellow, more creamy in consistence, and more abundant. But the chief difference between them is that the latter sets in suddenly with the greatest violence, and proceeds with such rapidity as to terminate in a few hours or days, either by resolution, or what is more common, by destruction of the organ. Again, gonorrhœal ophthalmia, with but few exceptions, attacks only one eye, while the purulent or contagious disease generally affects both. Finally, sloughing of the cornea, which is a frequent consequence of gonorrhœal inflammation, seldom or never occurs in simple purulent ophthalmia.

RESULTS.—The immediate results, unless relieved by treatment, are: ulceration, suppuration, and more or less sloughing of the cornea, together with interstitial deposition into and between its laminæ. The more remote consequences are: corneal opacity, synechia anterior, obliteration of the pupil, staphyloma, and collapse of the globe. Sometimes the sloughing process, though general, is limited to the anterior laminæ of the cornea, the posterior layer or membrane of the aqueous humour being left, so that the anterior chamber is not exposed; in which case the front of the eye remains flattened, or is bulged forward by the protruding iris, forming what is called *staphyloma racemosum.*

PROGNOSIS.—In a large proportion of cases, vision is either lost or seriously injured. Since the inflammation is not equally violent in all cases, the prognosis chiefly depends upon its comparative mildness or severity, and upon the state of the cornea. If the latter should be clear, the sight may be saved; but if it has lost its transparency, and especially if the inflammation is of the most acute character, vision will probably be lost or seriously impaired. On the other hand, if the inflammation be subdued before extensive sloughing or ulceration occurs, the sight may be restored.

ETIOLOGY.—This form of ophthalmic inflammation always

arises from some kind of connection, either innoculative, constitutional or metastatic, with the gonorrhœal virus. It has been satisfactorily proven that the application of gonorrhœal matter, either from the patient's own urethra or from that of another person, is capable of exciting the disease in its most intense form. In a large proportion of cases, however, no such direct application of matter can be traced; and hence the inference is unavoidable, that the disease frequently arises either from metastasis, as orchitis or mammitis arises from mumps, or else that it depends upon some peculiar condition of the constitution, in the same manner that rheumatic or arthritic ophthalmia depend upon similar states of the system to those in which they respectively occur. Probably the latter hypothesis is the true one, since the urethral inflammation is never suppressed by the transference of the disease to the eye, and hence a true metastasis, or translation of the disease, cannot be said to occur in these cases. Moreover, the sudden stoppage of gonorrhœa by treatment is not followed by ophthalmic inflammation, and hence its origin cannot be referred to the cessation of the disease in the urethra.

TREATMENT. — The treatment, both local and general, should be similar to that recommended for acute purulent ophthalmia. The first application should consist of a saturated solution of *Argentum Nitratum*, which should be promptly applied to the diseased surfaces, in the manner described under the head of ophthalmia neonatorum. After the swelling and other effects of the application subside, the remedy should be repeated, observing to lessen the strength of the solution in proportion as the purulent discharge diminishes and the inflammation abates. As a general rule, one application per day will be found to suffice, provided it be sufficiently thorough. It is best made by everting the lids, and passing the camel's hair pencil, loaded with the solution, quickly over the distended conjunctiva, taking care to avoid touching the cornea, and to

wash the lids afterwards with tepid water before returning them, especially the first time the application is made. (*See Fig.* 5.)

It should be borne in mind that the saturated solution of Arg. nit. here recommended is required only in the severest form of the disease. Many cases of gonorrhœal ophthalmia are so mild as to resemble the simple purulent form of conjunctivitis, and then require the same treatment. (*See* § *B.*)

Light linen rags wet with a weak solution of Alumen or Muriate of Hydrastia, and frequently renewed, should be kept constantly applied to the affected eye.

The internal treatment consists mainly of the following remedies :

Acidum Nitricum.—This remedy is not only pathogenetically appropriate, but its use in this form of ophthalmia has been attended with the best results.

Cannabis sativa.—This medicine, used low, is useful in every stage of the complaint, especially if there is opacity of the cornea, or a spasmodic pressure of the lids.

Cantharis.—This remedy is indicated in the first stage, when attended with violent stinging and burning pains in the eye and urethra.

Clematis—This medicine is most useful in the latter stages of the disorder, in cases similar to those for which Cantharis is recommended.

Hepar sulph.—This is one of our best remedies in gonorrhœal ophthalmia, especially in the second and third stages.

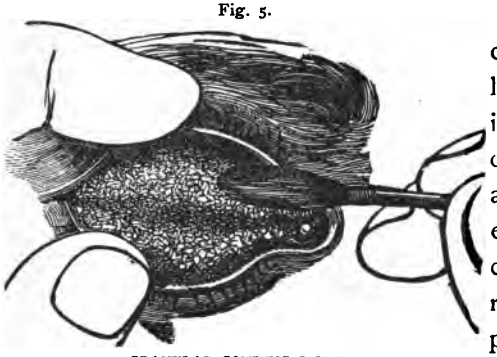
Mercurius.—The same remark applies to this remedy, Mercurius being one of the best, if not the very best remedy for this complaint; it is more particularly adapted to the highest state of inflammatory action.

Additional remedies for this disorder are given in TABLES A and B ; consult also the THERAPEUTIC INDICATIONS at the end of the *Section on Ophthalmic Inflammation.*

2.—GRANULAR CONJUNCTIVITIS.

CHRONIC PURULENT OPHTHALMIA; TRACHOMA.

Fig. 5.



GRANULAR CONJUNCTIVITIS.

This much the most commen form of Purulent Ophthalmia, especially in civil life. It is distinguishable from the acute form just described, chiefly by its being confined, except in very rare instances, to the palpebral conjunctivia; by its generally running a comparatively mild and very chronic course; and by a gradual change of the mucous lining of the lids, especially of the lower, which, after the lapse of several weeks or months, are, so to speak, over-run with patches of minute fleshy growths, or vegetations, called "granulations," which give to the affected membrane a rough, mulberry like appearance, *(trachoma.)* The size and color of the granulations are generally proportioned to the intensity of the inflammation; when the conjunctivitis is most intense, they are commonly of a deep red or garnet color, and of a rough, warty, or condylomatous appearance; but when the inflammation is less violent the palpebral conjunctiva is paler, and appears as if sprinkled with dust or fine sand. At first the granulations are soft and tender, and bleed easily; afterwards they become more and more indurated, and give to the conjunctiva a somewhat seamed or cracked appearance.*

SYMPTOMS.—The disease often sets in so gradually as scarcely to attract attention. Commencing with the symptoms

* It is important to distinguish between *granulations*, properly so called, and *enlarged papillæ*. The latter ordinarily accompany the former, but are more superficial; granulations, proper are an inflammatory product, appearing, even before changing into cacatricial tissue, as distinct formations, like grains of sand, lying immediately under the conjunctiva.

of catarrhal ophthalmia, the patient experiences more or less uneasiness in the eye, attended with a feeling of heat or burning, especially of the tarsal edges, which exhibit more or less redness; sometimes the inflammation is confined to the tarsal portion of the lids for a considerable period; afterwards, when the inflammation has spread towards the globe, the patient complains of a feeling of dryness and roughness in the eye, as if caused by particles of foreign matter beneath the lids. There is now an increased secretion of tears and of mucus, but little or no pain. The disease may continue in this mild form for two or three weeks, and then terminate under proper treatment? or, in consequence of unfavorable circumstances, it may increase in intensity until it reaches a higher grade, the conjunctiva becoming redder and more swollen, and secreting a thick, glutinous, or puriform matter. The affected membrane now takes on the characteristic granulated appearance; the lids participate in the general swelling; and the pain becomes more considerable. This, the most inveterate form of the complaint, may last for several weeks or months before it terminates, either by resolution, or, which is more common, by reaching a still higher degree of intensity—a grade which, like the former, it may assume from the beginning. This stage or degree of the inflammation generally supervenes suddenly on the condition just described; and from its great violence may work irreparable mischief to the organ within a few hours. The pain is now severe, and of a burning, aching or stabbing character; the granulations become warty and luxuriant; the lids swell enormously; the purulent discharge becomes profuse; and a condition of the palpabral conjunctiva succeeds similar to what occurs in the third stage of acute purulent ophthalmia, except as modified by the granulated state of the lids.

RESULTS.—The ordinary and characteristic results of chronic purulent ophthalmia, are such as arise from the thickening and granulation of the lids. Even after the removal of

the symptomatic affections, so long as the granulations exist there will remain more or less weakness of vision, arising from irritation, together with swelling of the eyelids, a lessening of the palpebral fissure, and, in some cases, more or less eversion of the tarsi.

In addition to these changes, there is commonly more or less vascularity and opacity of the cornea, generally of its upper half, arising from the friction of the granulated surface of the conjunctiva, which is chiefly limited to the upper lid. The vascularity of the mucous covering of the cornea may become so great as to constitute what is technically termed *pannus*. As the results of severe inflammation, we may also have ulcer, leucoma, prolapsion and adhesion of the iris, and staphyloma.

PROGNOSIS.—This is generally favorable; though there will always remain great liability to relapse, the weakened vessels of the conjunctiva becoming congested by very slight causes. The constitution, habits and occupation of the patient, as well as the state of tne weather, and other accidental circumstances, will have much to do with the progress and termination of the case. The disease which appears greatly improved to-day, may be greatly aggravated to-morrow. In this way months and even years sometimes elapse, the superficial and interstitial changes of the palpebral conjunctiva gradually becoming greater and greater, until it is even doubtful in some cases whether the affected membrane can ever be fully restored to a healthy state.

ETIOLOGY.—The causes of chronic purulent ophthalmia are the same as those which give rise to the acute form,and need not therefore be repeated. Less commonly, the disease succeeds to the acute form; the latter, owing to bad management, or some vice of the constitution, not undergoing complete resolution.

TREATMENT.*—As surgeon in charge of the Ophthalmic

*See *Am. Hom. Obs.*, vol. v., p. 466.

Department of Brown General Hospital, our experience in the treatment of this disease during the late war was by no means inconsiderable; and as the result of that experience, and of over twenty years practice in civil life, we desire at the outset to express our emphatic disapproval, except in the inveterate form called *trachoma ficosa*, of the escharotic method of treatment. We are convinced that the indiscriminate use of powerful escharotics in every form and stage of the complaint, has been the means of practicing, and, in many cases, of confirming this formidable affection; (1) by aggravating the local excitement; (2) by increasing the tendency to relapse; (3) by renewing and increasing the inflammation; and (4) by taking the place of more rational and efficient treatment. So far as local measures are concerned, the following distinctions will be found to be of great practical importance:

1. *When the conjunctiva, instead of having its natural polished surface, is villous or velvety, or when the granulations are small, pale, and sand-like; in short, when the so-called granulations are quite recent, or when they consist simply in a swollen or hypertrophied state of the conjunctival papillæ* escharotics are unnecessary, and generally harmful. In these cases, the application of cold salt-water compresses, whenever demanded by an increase of inflammatory action, and the employment, in the intervals, of mild astringent lotions, such as we have recommended for the acute form, with due attention to diet, pure air, and exercise, with repose and protection of the organ,* will generally be found to give the most prompt, marked and permanent relief.

2. *When the granulations are large, flabby, and easily torn*, the above treatment, aided by internal remedies, may still hold them in check, and even promote their absorption; if not,

* Dr. Dobrowelski, of St. Petersburg, in *Annales a Oculistique*, points out the comparative value of blue, and grey or smoked glasses as a protection against the sun's rays, giving the preference to the latter. See *Am. Hom. Obs.*, vol. xi. p. 555.

it may be aided by a wash of KALI HYDRIODICUM, or by touching them with a crystal of the SULPHATE OF COPPER, the latter being used only to suppress the exuberance of the granulations.

3. *When the granulations have a firm, pale, wart-like appearance, and cnt like cartilage,* escharotic treatment is not only admissable, but required. In these cases we have derived the greatest benefit from passing a pencil of ARGENT. CUM. CALCE freely over the granulated surface, being particular before restoring the lid to its natural position, to wash it carefully with water or diluted vinegar, in order to prevent any farther action of the escharotic. (*See Fig. 5.*) This application should never be repeated oftener than once a week, nor the sulphate of copper oftener than once in two, three or four days, according to the amount of local excitement produced by it; remembering in all cases that, whenever local treatment causes any aggravation of the symptoms, the irritation and increased vascularity must be allowed to subside before repeating it; that some cases will bear much stronger applications than others; that when their use is attended by a sense of relief, they are always beneficial; but when pain and increased vascularity are permanently excited by them, they will always do harm, especially if too frequently applied.

The internal remedies especially adapted to this variety of ophthalmic inflammation, in addition to those previously recommended, are:

Acidum nit.—This medicine is suitable for most cases of chronic purulent ophthalmia, especially such as are associated with a syphilitic or mercurial cachexia.

Graphites.—This medicine is especially indicated when the edges of the lids are implicated, particularly the meibomian follicles.

Iodium.—This remedy is adapted to every stage of the complaint, especially when there is a psoric state of the system.

Kali Hydriodicum.—In cases similar to those for which Iodium is recommended.

Lycopodium.—Specially adapted to cases attended with inflammation and ulceration of the tarsal edges.

Mercurius.—This remedy is no less useful in the chronic than it is in the acute form of purulent ophthalmia.

Sulphur.—The same remark may also be applied to this remedy, which is particularly adapted to the chronic form of the complaint, especially when attended with ulceration.

Thuja.—We mention this remedy because it is strongly recommended by others, and not because we have had any experience with it ourselves.

For other medicines and for fuller details, see *Tables XIV. and XV.;* consult, also *Therapeutic Indications*, at the end of the *Section on Ophthalmic Diseases.*

DIET AND REGIMEN.—As granular conjunctivitis is not only contagious, but, like the simple form of purulent ophthalmia, is aggravated by squalor, impure air, want of cleanliness, improper or deficient nourishment, over-crowding of apartments, dampness, miasm, etc., it follows that too much attention cannot be paid to hygienic regulations. Indeed, experience shows that without due attention to these particulars, in the vast majority of cases the improvement, if any, will be slow and unsatisiactory; while on the other hand, good nutritious food, clean clothing and comfortable surroundings contribute in no small degree towards affecting a permanent cure.

3.—DIPHTHERITIC CONJUNCTIVITIS.

OPHTHALMIA DIPHTHERITICA; CONJUNCTIVIVAL CROUP.

Closely allied in some respects to gonorrhœal conjunctivitis, but differing widely in others, is the diphtheritic. This disease, which seldom occurs in an idiopathic form in this country, and still more rarely in England and France, is not uncommon at Berlin and in Holland. As it appears with us it is most commonly associated with diphtheria in other parts, especially the throat, from which it is transferred either by dirict contact of the irritating secretions, by sympathy, or by extension of the disease from the nasal passages through the lachrymal canals.* The violence of the disease is such as to render it extremely dangerous to vision; and when secondary, the danger is greatly increased by the liability to constitutional infection. The idiopathic form is characterized by the following

SYMPTOMS.—The disease sets in suddenly, with heat, pain and stiffness of the lids, which soon become distended, hard and rigid, owing to a fibrinous exudation into the conjunctival and episcleral tissues. There is also chemosis of the ocular conjunctiva, from effusion of the same fibrinous material, the pressure of which upon its vessels, by interfering with the circulation, gives rise to scattered points of extravasated blood. The discharges are at first thin, watery, and of a dirty gray color, or yellowish and flocculent; afterwards they become more or less purulent, the pus globules being mixed with shreds of fibrin and disintegrated false-membrane. On examining the lids, the palpebral conjunctiva is found to be covered with a firm fibrinous membrane, which manifests a disposition to separate at the edges, and may be easily detached with the forceps. The rapidity with which it is reproduced is truly aston-

* See *Am. Hom. Obs.*, vol. v, pp. 70, 71.

ishing, the false-membrane sometimes attaining a thickness of two or three lines in the course of twenty-four hours.

ETIOLOGY.—The exciting causes of diphtheritic conjunctivitis are doubtless the same as those which give rise to diphtheria in other parts; hence it is found to prevail during the cold and damp seasons of the year. Although adults are sometimes attacked, it is generally confined to children between two and ten years of age. According to Williams, some families exhibit a constitutional predisposition to the complaint, the children being successively attacked on reaching a certain age.

PROGNOSIS.—The result, notwithstanding the greatest care and attention, is apt to be unfavorable. The chief danger lies in the great liability to ulceration and sloughing of the cornea from defective nutrition, the corrosive action of the secretions, and the strangulation of the implicated tissues. As an ultimate consequence, we sometimes have entropium, the result of contraction and other structural changes in the conjunctiva and tarsal cartilages,

TREATMENT.—The local treatment should be similar to that already recommended for *Acute Purulent Conjunctivitis*, using, when well borne, ice and ice-water compresses in the first stage, to which may be added a solution of *Kal. chl.*, ℈ij to Oj. In the second stage, when the discharge becomes thick and purulent, the escharotic treatment recommended for *Gonorrhœal Conjunctivitis*, should be adopted. (See the previous section.) If only one eye is affected, the other should be bandaged as a precautionary measure.

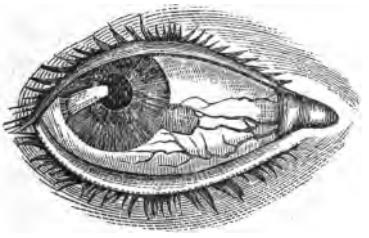
The internal remedies which have given the greatest satisfaction, and from which most benefit may be expected, are the following: *Aconite, Kali chl., Kali bich., Phytotacco dec.*, during the first stage: *Acidum nit., Argentum nit., Arsenicum, Hepar sulph., Mercurius*; during the purulent and ulcerative stage See also *Tables A. and B.*, and the *Therapeutic Indications* at the end of the *Section on Ophthalmic Inflammation.*

DIET AND REGIMEN.—Cleanliness, which is of primary importance in every form of contagious ophthalmia, should be rigidly enforced in this, especially if but one eye is affected since, should both eyes become involved, the danger to vision will be proportionably increased. For this purpose an abundance of soft clean rags should be kept on hand, which should, be burned, or otherwise destroyed, as fast as used. Care should be taken, also, to supply the patient with clean clothes nutritious and easily digestible food, clean and comfortable bedding, and an abundance of fresh pure air. If, as frequently is the rooms are small or over-crowded, a liberal use of *Carbolic Acid*, or other suitable disinfectant, should be made, while at the same time the freest possible ventilation should be secured.

4.—SCROFULOUS CONJUNCTIVITIS.

SCROFULOUS OR PHLYCTENULAR OPHTHALMIA.

Fig. 6.



SCROFULOUS CONJUNCTIVITIS.

Scrofulous ophthalmia, as its name imports, is an inflammation of the eye occurring in scrofulous subjects. Its principal seat is the conjunctiva oculi, but it also affects, the episcleral tissue and cornea; and sometimes, in complicated cases, it extends to the choroid coat and iris. The disease is almost entirely confined to childhood; it is said never to occur in infants at the breast, and it is rarely seen after puberty.

SYMPTOMS. — The disease seldom occurs in a purely simple form, but as already stated, is generally associated with more or less inflammation of the cornea and episcleral tissue, constituting what is called scrofulo-rheumatic ophthalmia. It is chiefly characterized by a number of

vessels occupying a circumscribed part of the orbital conjunctiva, generally that which borders upon the commissures of the eyelids, pursuing nearly a parallel course towards the cornea, and forming with each other fasciculi or bundles, which terminate abruptly near the edge of the cornea, without going beyond it. (*See Fig.* 6.) When, however, the disease is combined with catarrhal inflammation, the vessels may extend beyond the border of the cornea, where they assume the fascicular form characteristic of the scrofulous injection. These fasciculi generally terminate in one or more small vesicles, called phlyctæna, which, though not belonging exclusively to this affection, are nevertheless so characteristic of the disease, as almost to justify the term *phlyctenular ophthalmia*, by which it is sometimes called. The vesicle or phlyctæna generally appears first, and afterwards the vessels which run towards it become injected. The vesicle either dries up and disappears, or else breaks, leaving a superficial ulcuscle, which extends itself by ulceration. Sometimes the cornea, instead of being ulcerated, takes on a mammillated nebulous appearance, becoming as it were sanded or dotted over with a number of extremely fine points ; (*non-vascular* or *diffuse keratitis ;*) or a papulous exudation arises, (*vascular keratitis*) which forms a grayish vascular covering to the cornea, giving rise to what is called *pannus*.

The external redness, unless the disorder is complicated with catarrhal inflammation, is generally inconsiderable. On the other hand, owing partly to its combination with keratitis, and partly to nervous or ciliary irritation, the sensitiveness to light is so extreme as to constitute a distinguishing feature of the disease, under the name of *photophobia scrofulosa*. The access of light to the eye is so extremely painful as to cause the child to turn its head obstinately from the light, and, in severe cases, to hide away in the dark, or bury its face in its mother's lap, or in the bed. If the lids are forced open—which, however, need never be done, as both the pain and photophobia

generally abate at dusk, when the child will open its eyes of its own accord—although the cornea is turned up so as to hide the pupil from view, the orbicularis palpebrarum muscle becomes spasmodically contracted on the globe, producing so much pressure as to cause the child to cry with pain. In uncomplicated cases, neither pain nor tears accompany the disorder; but, as already stated, the complaint is generally associated with keratitis, so that, in addition to the pain—which, as already explained, depends partly upon inflammation of the cornea, and partly upon sympathetic or nervous irritation—there is generally a copious flow of tears, especially at the commencement of the disease. These greatly aggravate the complaint, by excoriating the parts over which they flow, producing more or less soreness and itching of the lids and face. This is still farther augmented by scratching and rubbing, which inflame the skin and sometimes give rise to an eczematous or impetiginous eruption, which not only incrusts the affected parts, but may even extend over the head and body.

Owing to the scrofulous disposition of the patient, the disease has a natural tendency to become chronic, or at least to be reproduced by every new influence of an exciting cause, so that after one attack has been overcome, another frequently takes its place, either in the same or the other eye, and thus the disease may continue for months and years, and perhaps never reach a permanent and satisfactory conclusion.

RESULTS.—The pustules or phlyctæna which form at the extremities of vascular fasciculi, or near the junction of the cornea with the sclerotica, frequently ulcerate, the ulcers sometimes extending superficially, at others penetrating into the corneal substance; in the latter case they may open into the anterior chamber, and cause prolapsion of the iris. In addition tion to these results, we have in some instances, pannus, interamellar effusions into the cornea, onyx, hypopion, leucoma, synechia anterior, and staphyloma. When the inflammation

extends to the choroid coat and iris, alterations, more or less serious, of those membranes occur.

DIAGNOSIS.—Scrofulous ophthalmia is generally easily distinguished by the great intolerance of light, the vesicular elevations of the conjunctiva, the vascular fasciculi, and the co-existence of scrofulous symptoms in other parts of the body. When, as frequently happens, the absorbent glands of the neck are inflamed and swollen, the alæ of the nose red, swollen and excoriated, and the ears sore and excoriated behind ; and when, in addition to these symptoms, there is a disordered state of the stomach and bowels, generally characterized by a fetid breath, furred tongue, morbid appetite, swollen abdomen and costiveness, it is scarcely possible to mistake the affection. Indeed, such is the severity of the ciliary irritation and consequent phophobia in these cases, as of itself to constitute an almost certain guide to the nature of the complaint. It is well to remember, in this connection, that there is a troublesome form of ophthalmic inflammation occurring in strumous children, which is mainly dependent upon the state of the primæ viæ and skin, but which does not exhibit, in any marked degree, the features of ordinary scrofulous ophthalmia. There is generally more external redness, especially of the lids, and but little intolerance of light ; still the disease is esentially scrofulous in its nature, and, like other scrofulous diseases, is extremely obstinate, and and continually apt to recur.

PROGNOSIS.—This, so far as vision is concerned, is generally favorable, provided the cornea remains clear, or, if opaque, the opacity is merely superficial, or is simply owing to interstitial deposition. Vascularity and inter-lamellar depositions generally disappear soon after the subsidence of the inflammation ; even pannus, though it may last a long time, does not endanger the sight. Ulceration produces more or less permanent opacity ; and when extreme, especially if attended with prolapsion of the iris, it generally causes serious injury to vision. Staphyloma

and bursting of the cornea are of course always attended by the most disastrous consequences.

ETIOLOGY.—The chief predisposing cause of scrofulous ophthalmia is a strumous condition of the system. The exciting causes are such as, by depressing the vital powers, are calculated to call into action the scrofulous diathesis, such as cold, damp and variable weather, inadequate clothing, poor and improper nourishment, dark and unwholesome dwellings, insufficient exercise in the open air, disorders of the digestive system, and an inactive state of the skin, bowels and uterine organs. It likewise occurs, for the same reason, after any protracted illness, such as the various exanthemic fevers, whooping cough, etc. On the other hand, if the strumous disposition be strong, the disease may by provoked by mechanical injuries, excessive use of the eyes, want of cleanliness, and even by a change of season. Not unfrequently the disease alternates with other affections, such as otorrhœa, cutaneous eruptions, etc.

TREATMENT.—This should be general as well as special, that is to say, the treatment should be directed against the general unhealthy state of the system—the scrofulous diathesis—as well as against the attack itself; this is necessary in order both to remove the local affection and prevent relapse. The treatment should also have relation to the particular form of the attack, whether as simple or complicated; the former will require, more especially, the antipsoric remedies, such as Calcarea, Hepar sulph., Sulphur, etc.; while the latter will require those best adapted to the particular complications, such as Belladonna, Mercurius, etc.

Cold applications are, as a general rule, injurious to scrofulous sore eyes, and should therefore seldom be employed; never, indeed, unless the inflammation is combined with some other form of ophthalmia; even in these cases warm applications will be more suitable, and will commonly give most relief. It is generally sufficient, so far as local treatment is concerned,

to bathe the eyes frequently with tepid water, and to shade them with a stiff crescent-shaped screen, which is preferable to a bandage, as it neither overheats the eyes, nor deprives them of the beneficial effects of fresh air.

The principal remedies for scrofulous ophthalmia are the following:

Acidum Nitricum is especially adapted to protracted cases, particularly when the cornea has become nebulous, or clouded with dark spots.

Apis mellifica.—This remedy, though it appears to be indicated in many cases, is generally of doubtful value. We have commonly found it to prove most useful in the first stage of purely scrofulous cases, attended with burning and stinging pains, redness of the conjunctiva, extreme photophobia and lachrymation, a nebulous state of the cornea, and an eczematous eruption on the lids and face.

*Arsenicum.**—This remedy is particularly adapted to protracted cases, especially such as are subject to frequent relapses, characterized by photophobia, keratitis, redness of the lids and burning, itching and excoriation of the surrounding integuments.

Belladonna.†—This medicine is indicated in cases complicated with catarrhal or rheumatic ophthalmia, especially if the pains are accompanied with acute febrile symptoms.

Calcarea Carb.‡—One of the best antipsoric remedies, especially adapted to purely scrofulous cases of a protracted character, and subject to frequent relapses.

Cannabis sat. is indicated in chronic cases attended with corneal opacity.

Conium mac.—Chronic cases, attended with photophobia,

* See *Am. Hom. Obs.*, vol. vii, pp. 120, 121. (*3d and 30th.*)

† *Ibid.* (3d).

‡ See *Am. Hom. Obs.*, vol. vii. p. 120. (*30th and 200th.*)

spasms of the orbicularis, redness, burning and itching of the eyes and lids, and an eczematous or impetiginous eruption, with soreness and excoriation of the neighboring parts.

Graphites.—This remedy is adapted to both acute and chronic cases, especially if accompanied with eruptions in the face and behind the ears.

*Hepar sulph.**—This is one of the best anti-scrofulous remedies, particularly adapted to protracted and relapsing cases, especially if attended with ulceration of the cornea.

Mercurius.—This medicine is well adapted to both acute and chronic cases, being equally applicable to the inflammatory, exudative and ulcerative stages of the complaint. It is one of our most valuable remedies for scrofulous ophthalmia, and should therefore, in most cases, be used early, and not too hastily discontinued.

Pulsatilla.—This medicine being well adapted to lymphatic constitutions, is especially suited to those cases depending on stomachic and uterine derangements, whether acute or chronic.

*Rhus tox.**—This remedy, notwithstanding its somewhat doubtful indications, has done good service in scrofulous ophthalmia, especially when attended with photophobia, lachrymation, spasms of the lids, and exanthematous or herpetic eruptions.

Silicea.—This remedy is well adapted to chronic cases, attended with ulceration and opacity of the cornea, swelling of the cervical glands, and cutaneous eruptions on the lips and face.

Staphysagria.—This medicine has been found useful in scrofulo-rheumatic ophthalmia, accompanied by spasmodic closure of the lids, glandular swellings, and cutaneous eruptions.

*Sulphur.**—This powerful antipsoric remedy is indicated

* See *Am. Hom. Obs.*, vol. vii., pp. 120, 121. (*3d and 30th.*)

in all chronic and relapsing cases, especially when the cornea is deeply involved, as in pannus, ulceration, interstitial deposition and onyx.

The remedies above mentioned are those of chief importance in the treatment of the ordinary forms of scrofulous ophthalmia ; but inasmuch as the disease is frequently complicated with other forms of ophthalmic inflammation, the prescriber is referred for additional remedies* and details to *Tables A. and B.;* and also to the *Therapeutic Indications* given at the end of the *Section on Ophthalmic Inflammation.*

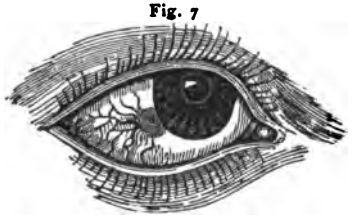
DIET AND REGIMEN.—The diet should be of the most nourishing and digestible character, consisting, for the most part, of good home-made wheat bread, graham bread, oat-meal pudding, fresh butter, tender and juicy beef, good ripe fruit, dried fruit, etc. ; while all such articles as pork, sausage, bacon, veal, coffee, pickles, pastry, etc., should be rigidly excluded.

Suitable and adequate clothing, with proper attention to light, air and exercise, will do much to ward off the disease from those that are predisposed to the affection, and to mitigate it when established.

5—PHLYCTENULAR CONJUNCTIVITIS.

APTHOUS, HERPETIC OR PHLYCTENULAR OPHTHALMIA.

Fig. 7



PHLYCTENULAR CONJUNCTIVITIS.

Phlyctenular Conjunctivitis, or, as it is sometimes improperly called, *pustular* ophthalmia, is a mild form of conjunctivitis, characterized by an eruption of vesicles, called *phlyctænæ* or *phlyctenulæ,* on or near the margin of the cornea. The eruption first makes it appearance in the form of small red, slightly elevated points upon the inflamed conjunctiva oculi; these points as they enlarge develope into vesicles; and finally, if the

* See *Am. Hom. Obs.*, vol. vi, p. 559.

inflammation goes on unchecked, the vesicles burst and form ulcers, which in mild cases gradually disappear, but in others manifest a disposition to spread. Numerous vessels, or bundles of vessels, (*vascular fasciculi,*) run toward the cornea, but never pass beyond the borders of the vesicles or ulcers, in which they always terminate. (*See Fig. 7.*) The phlyctænæ vary in size as well as in number, solitary ones being sometimes nearly as large as a split pea; generally, however, they are much smaller, their relative dimensions being usually in an inverse ratio to their number. Phlyctænæ are not peculiar to this form of ophthalmia, being, as we have already seen, sometimes observed in other forms of conjunctivitis, especially the catarrhal and scrofulous; indeed, some opthalmologists regard the phlyctenular as a modification of strumous conjunctivitis, intermediate in character between the catarrhal and scrofulous. Like the latter, it is almost entirely confined to children, but unlike it is seldom attended with ciliary irritation and photophobia, though generally occurring in scrofulous subjects. It is only when the vesicles are numerous, and are situated wholly or partly on the cornea, that there is much intolerance of light, lachrymation, or ciliary irritation.

TREATMENT.—Many cases are so mild as to require little more, in the way of treatment, than rest and protection of the organ. When arising from fatigue, the irritation of dust, or other similar causes, hygienic measures alone will generally suffice. This is especially true if the vesicles are solitary, or but one or two in number, and are situated over the sclerotica. Severe cases are benefited by warm fomentations, and by the particular treatment recommended for scrofulous conjunctivitis, (which see.) The most efficient remedy for ulceration is *Mercurius*, which may be prescribed with as much confidence in this affection as in aphthous stomatitis. Other remedies which have been found most useful for particular conditions, are the following:

Ciliary Neuralgia: Atrop., Bell., Cham., Spigel.

Photophobia: Ant. tart., Ars., Bell., Con., Hepar, Merc., Spigel.

Ulceration, with or without ciliary irritation and photophobia: Ars., Merc.

Obstinate, the disease appearing to be seated in the sub-conjunctival tissue: Ars., Cham., Merc.

6—ERYSIPELATOUS CONJUNCTIVITIS.

This form of ophthalmic inflammation is seated in the orbital conjunctiva, and in the subjacent cellular tissue. The injection of the conjunctival vessels becomes rapidly confluent, the membrane swells, assumes a uniform pale red color, becomes relaxed and wrinkled, except at the lower part of the globe, where it remains tumefied and presents a more or less œdematous appearance. As there is neither epiphora nor photophobia, it is reasonable to infer that the deeper structures are not involved. This description, however, applies only to idiopathic cases; when secondary to facial erysipelas, the inflammation is generally of much greater severity. In these cases the episcleral and neighboring tissues sometimes participate, and then there is a deeper redness, with more or less intolerance of light and ciliary irritation. As an idiopathic affection, it is mostly confined to persons who have reached the period of middle life, or beyond, and whose constitutions are generally more or less debilitated. The chief exciting cause is cold, though the disease is sometimes of epidemic origin.

TREATMENT.—*Aconite* and *Belladonna*, with warm fomentations, generally constitute all the treatment required. When secondary to facial erysipelas, remedies should be selected with special reference to the primary disease.

7—EXANTHEMATOUS CONJUNCTIVITIS.

The contagious exanthemata are accompanied by inflammations of the conjunctiva corresponding in intensity to the

eruptive inflammations of the skin with which they are associated. As they seldom demand special treatment, and are, for the most part, neither sufficiently important nor peculiar to require minute description, we shall give them but brief consideration.

A—Scarlatinous and Rubeolous Conjunctivitis.

OPHTHALMIA SCARLATINOSA AND MORBILLOSA.

In scarlatina and measles, we have more or less redness and inflammation of the external membranes of the eye, with moderate pain or uneasiness, lachrymation, and sensibility to light. Sometimes, though rarely, phlyctænæ and ulcers also appear upon the cornea, and occasionally interstitial depositions take place between its laminæ. The ophthalmic disorder generally keeps pace with the cutaneous affection. It is less frequently associated with scarlatina than with measles, of which it is a common attendant.

TREATMENT.—When the conjunctiva alone is affected, the treatment is the same as required for catarrhal ophthalmia, (which see.) Cool and tepid washes are generally agreeable, and with protection from light, and the occasional administration of *Aconite*, the inflammation usually runs a satisfactory course. When the exanthemata are succeeded by severe conjunctivitis extending to the submucous tissues, and especially when attended with ulceration of the cornea, the treatment should be much more active, in order to prevent opacity and loss of vision. In these cases, *Aconite* and *Mercurius*, with the diligent use of the cold compress, will be required.

B—Variolous Conjunctivitis.

OPHTHALMIA VARIOLOSA.

This form of ophthalmia is seated in both the orbital and palpebral conjunctiva, and in the cutaneous covering of the lids. It occurs conjointly with, and subsequently to the variolous disease; and not unfrequently it assumes a chronic form.

Most commonly it is confined to the lids, the external surface of which, with their ciliary margins, are covered with a greater or less number of variolous pustules, which produce extensive swelling, and close the eyes. As the eruption declines, the swelling abates, and the globe of the eye is found uninjured.

In a small proportion of cases, however, (stated by some authorities at about four per cent. of the whole number,) the inflammation likewise involves the conjunctiva and cornea. This is what constitutes the true variolous ophthalmia, and is always a dangerous disease. The inflammation is so violent, and proceeds with such rapidity, as to cause suppuration and more or less sloughing. The results are in proportion to the extent and violence of the inflammation. Staphyloma, prolapsion of the iris, synechia anterior, obliteration of the pupil, opacity of the cornea, collapse of the globe, and partial or complete blindness, are not uncommon terminations.

TREATMENT.—The suppurative form of variolous ophthalmia, which does not generally set in until after the decline of the cutaneous affection, requires the same treatment as purulent conjunctivitis, (which see.) Treatment for the palpebral inflammation will be given in the next article (which see.)

ART. II.—BLEPHARITIS.

The term *blepharitis*, signifying inflammation of the eyelids, is a general one, and may therefore be properly used to denote any variety of inflammation to which the lids are subject; but inasmuch as these inflammations are mostly of a subacute or chronic character, as they occur for the most part in scrofulous subjects, and as they are chiefly limited to the tarsal borders; in other words, as they possess many features in common, we shall include under it the several conditions known as Ophthalmia Tarsi, Psorophthalmia, Blepharitis Ciliaris, Eczema Palpebrarum, etc., reserving the more acute, but less common forms of palpebral inflammation for separate consideration.

1—BLEPHARITIS CILIARIS.

FOLLICULAR INFLAMMATION OF THE LIDS.

Blepharitis ciliaris is an ulcerative inflammation of the edges of the eyelids, depending on a psoric or scrofulous condition of the system, or occurring as a sequence of measles and other exanthemata, styes, etc.

SYMPTOMS.—The disease commences as an eczematous inflammation of the cuticle of the edge of the lid, the epidermis of which either desquamates or suffers ulceration. The inflammation and ulceration produce suppuration, and the purulent matter collecting at the roots of the cilia forms scabs, beneath which the ulcerative process continues. As the ciliary follicles become inflamed, the cilia loosen and drop out. The inflammation also invades the meibomian glands, or follicles, which with the ciliary apertures may become permanently occluded. In this manner the disease may continue until the whole ciliary border becomes ulcerated, the outer surface of the lids, as well as the conjunctival lining, inflamed, the cilia destroyed, the tarsal edges thickened and indurated, and the puncta lachrymalia everted, so that the tears overflow the lids; ultimately, the skin contracts so as to cause more or less ectropium. This is the state called *lippitudo* or *blear eye*. Sometimes, in chronic cases, the edges of the lids turn inwards instead of outwards, producing trichiasis and entropium. The cilia by constant contact with the globe may inflame the cornea, causing a superficial vascular keratitis which may result in pannus.

RESULTS.—These are: loss of cilia, epiphora, lippitudo, ectropium, entropium, trichiasis, diatrichiasis, opacity of the cornea, pannus, and more or less impairment of vision.

ETIOLOGY.—In addition to the causes already enumerated, namely, scrofula, small pox, measles, erysipelas, etc., may be mentioned such causes as cold and damp air, smoke, dust, and other irritants, especially when acting on a psoric or strumous constitution.

PROGNOSIS.—This disease is always protracted, and subject to frequent relapses. In its earlier stages, before ulceration has involved the entire margin of the lids, destroyed the cilia, and produced hypertrophy of the palpebral tissues, the disease may be cured; but after these changes have occurred, it only admits of palliation.

TREATMENT.—The edges of the lids should be kept free from scabs and purulent accumulations by cleansing them as often as may be necessary with tepid water, after which they should be bathed with some mild astringent lotion, such as a weak solution of alumen or muriate of hydrastia. At night, they should be anointed with simple cerate or spermaceti, in order, to prevent, as far as possible, their becoming glued together with the discharges; and in the morning the agglutinating matter should be softened with tepid milk and water, or, what is better, with warm cream, until the lids can be separated without the use of force, the employment of which will surely aggravate the disease. If trichiasis exists, the inverted hairs should be carefully removed, as they are not only a great annoyance to the patient, but they keep up such a constant irritation as greatly to aggravate the inflammation, and ultimately produce opacity of the cornea. Stimulating ointments without number have been recommended, but the most popular, and, in most cases, effective, is the red precipitate, of the strength of about fifteen grains to the ounce of simple cerate, which should be carefully applied to the tarsal edges at night.

The internal treatment should be similar to that recommended for scrofulous ophthalmia, (which see.) Consult, also, TABLES A. and B., and the THERAPEUTIC INDICATIONS at the end of the section on *Ophthalmic Inflammation*.

DIET AND REGIMEN.—The diet should be carefully regulated; and should consist of nutritive and easily digestible food, such as milk, soft-boiled eggs, and wholesome meats, stale bread with fresh butter, and a due admixture of fresh

vegetables and fruit. The clothing, also, should be carefully attended to, so as to protect the patient against the effects of sudden atmospheric changes. Special caution should be observed against reading at night, or exposing the eyes to dust and smoke, or to the glare of the sun, gas, and other bright lights: Frequent ablutions, exercise, and fresh air, are important adjuvants in the treatment, and should not be overlooked.

2—INFLAMMATIO PALPEBRARUM.

SIMPLE INFLAMMATION OF THE LIDS.

Simple inflammation of the eyelids is characterized by redness, swelling, and soreness of the tarsal border, whence it spreads over the entire lid. It is generally of catarrhal origin, and is almost always associated with more or less conjunctivitis. When severe, the cellular tissue is apt to become involved, giving rise to œdema and, in some cases, to abscess.

Œdema.—Effusion of serum into the cellular texture of the eyelid, is a frequent result of ophthalmic inflammation, whether simple or specific. When severe, as in the various forms of purulent ophthalmia, the tumefaction of the lids becomes very great, the upper projecting over the lower, and presenting a smooth convex surface of a bright red color. In other cases, the vascular congestion is such as to cause considerable swelling with little or no external redness. In inflammation of the lachrymal sac, the lids are often greatly distended, subsiding only when the cause is removed. Œdema of the lids also occurs in cases of hordeolum, or stye, from the bites and stings of insects, from erysipelas and anasarca of the face, and from other causes.

Abscess, though necessarily dependent upon inflammation, is frequently the result of injury. It may form on either side of the palpebral cartilage, or it may exist in both situations at the same time; consequently, the matter may approach the surface in either direction. Neglected cases sometimes result

in very great deformity, giving rise to ectropium or lagophthalmus, and sometimes to both.

TREATMENT.—For simple uncomplicated inflammation of the lids, *Aconite*, or *Aconite* and *Belladonna* in alternation, with the early use of the cold compress, is generally sufficient to effect a cure. Œdema usually requires *Apis*, *Arsenicum* or *Rhus tox.* Abscess calls for such additional remedies as *Hepar*, *Silicia* and *Calcarea.* In order to prevent deformity, the lancet should be used as soon as fluctuation can be detected, being careful to make the incision in a horizontal direction, so that the cicatrix remaining may be concealed by the natural folds of the integument.

ART. III.—KERATITIS.

Inflammation of the cornea is not only frequently associated, as we have seen, with several forms of ophthalmia, but also occurs as a primary or idiopathic affection. It is only when the inflammation begins in the cornea, however, that the disease is to be classed as *keratitis*. The affection assumes a great variety of forms, according as it is simple or complicated, vascular or non-vascular, inflammatory or non-inflammatory, partial or total, acute or chronic, active or indolent, fascicular, phlyctenular, diffuse, suppurative, neuro-paralytic, etc. These and various other distinctions we shall find it convenient to consider under the following four heads, namely: (1) diffuse keratitis; (2) suppurative keratitis; (3) vascular keratitis, and (4) phlyctenular keratitis. Keratitis punctata being a secondary form will be described under iritis. (See *Serous Iritis.*)

1—DIFFUSE KERATITIS.

PARENCHYMATOUS, OR INTERSTITIAL CORNEITIS.

SYMPTOMS.—Diffuse inflammation of the cornea, when fully formed, is characterized by more or less impairment of vision from interstitial deposition. At first the cornea has a somewhat hazy, cloudy, or smoky appearance, which partially impedes the transmission of light. This condition is called

nebula, and constitutes the slightest form of corneal opacity. As the disease progresses, the opacity increases, and vision becomes less and less distinct; but owing to inequalities in its developement, the sight is less troubled than it would otherwise be. This arises from the fact that clearer, or less affected portions of the cornea remain scattered among the more opaque, as if the infiltration had occurred only in detached points, though as a general rule the opacity first begins at the limbus, where its density is greatest, and spreads gradually more and more towards the centre, until finally it involves the whole cornea. Sometimes, however, the reverse of this occurs; the infiltration beginning at or near the centre, and gradually extending towards the circumference. The more opaque parts are sometimes of a yellowish hue, as though suppuration had occurred there, but this is seldom the case in the form of keratitis we are now considering. In addition to these changes, the surface of the cornea loses its usual polish and becomes unequal, as if sanded or dotted over with fine points. (*See Fig. 8.*) It is this fine stippled appearance of the surface which causes nebulous vision, and gives to the eye its peculiar dull expression at the beginning of the complaint.

Fig. 8

KERATITIS.

The degree of inflammation and vascular injection varies greatly in different cases. Sometimes the injection is inconsiderable, and then the disease is called non-vascular. In other cases, with a varying amount of conjunctival injection, the disease is marked by a zone of deep parallel vessels running towards the cornea—the distended trunks of which lie beneath the conjunctiva, in the sub-conjunctival or episcleral tissue, and known as the episcleral or circumcorneal zone—whose minute branches or extremities passing the border of the cornea, form upon the limbus a small circle, or oftener a segment of a circle,

of a dark red tint, which presents a marked contrast with the opaque centre of the cornea and the pink-colored zone of the border. (*See Fig. 8,*) Vascular diffuse keratitis is also characterized by the presence of delicate vessels in the deeper layers of the cornea, extending from the corneal zone to the several centres of exudation.

In addition to the above symptoms, diffuse keratitis also gives rise to more or less ciliary irritation, photophobia and lachrymation, especially on exposure to light. Occasionally these symptoms are so slight as scarcely to attract attention; but in the majority of cases they are quite marked, especially at the beginning of the disease, and before exudation has taken place. Afterwards, as the process of infiltration goes on, they generally become less prominent and sometimes disappear altogether; in some cases, however, they remain unchanged, or with varying degrees of intensity, throughout the progress of the disease. Having reached its height, the affection frequently continues for weeks and months apparently stationary before beginning to decline. The retrograde metamorphosis takes place with great slowness, and several months often elapse before the cornea fully recovers its transparency. Vascular diffuse keratitis generally runs its course more rapidly than the non-vascular, which is extremely indolent.

The disease is seldom confined to one eye; the second eye is generally attacked soon after the first. This is very discouraging to the patient, and it is generally difficult to make him believe that he is not going blind. The affection is frequently complicated with iritis, irido-choroiditis, cyclitis, or with some other form of keratitis. As the iris is hid from view during the progress of the case, the practitioner should be particularly on his guard, lest when the cornea becomes clear he find his patient affected with posterior synechia.

ETIOLOGY.—Diffuse keratitis has been called syphilitic, under the mistaken notion that it owes its origin to hereditary

syphilis. There is probably no good foundation for this belief, any more than there is for referring it to scrofula or tuberculosis. It is true it is frequently met with in persons affected with hereditary or constitutional syphilis, but it is also true that it occurs just as often in those in whom not a trace of syphilitic taint can be discovered. The disease occurs at all times and under all conditions of life; but chiefly in children between the ages of ten and fifteen years, especially those of a delicate constitution, many of whom are more or less weakly, anæmic and scrofulous. It is highly probable, therefore, that delicacy of constitution, defective nutrition, or a broken-down state of the system—in short, deficient vital action—contribute more to its production than syphilis, either hereditary or acquired.

PROGNOSIS.—This is generally favorable; for notwithstanding its chronicity and tendency to relapse, the disease is seldom attended with ulceration, and, if properly treated, the cornea finally clears up, leaving little if any trace of its previous diseased condition. Some slight inequality in its curvature may remain, however, especially if there has been much bulging from intra-ocular pressure; but the causes which commonly give rise to this condition generally prove more serious in other ways. Hence the prognosis will be more or less favorable, according as the inflammation does or does not affect the deeper tissues of the eye.

TREATMENT.—The employment of caustics, or even astringent collyria, should be carefully avoided, as such applications not only do no good, but often do much harm. This caution is all the more necessary, as the temptation to use them is often stimulated by the importunities of the patient, under the idea that the long duration of the disease may in this way be abridged. The danger lies in their tendency to cause serious complications, such as iritis, cyclitis, ulceration of the cornea, etc. Atropine should be instilled as soon as it can be well

borne, for although it will not be absorbed to any great extent until the cornea begins to clear, it is important to obtain its early action in dilating the pupil, and thereby prevent the formation of posterior synechiæ. (See *Iritis*.) Paracentesis and iridectomy prove useful in accelerating the cure, and sometimes succeed in arresting the disease at an early stage. They are especially indicated if symptoms of cyclitis supervene, or if there is continued increase of intra-ocular pressure. (See *Iritis* and *Cyclitis*.) In very chronic cases, especially those of the non-vascular variety, Von Graefe recommends the employment of warm compresses. If used with sufficient care in this class of cases, and discontinued immediately they have fulfilled their mission, namely, to stimulate the action of the bloodvessels of the cornea, they will doubtless do much good in promoting absorption of the exudations; but it is evident that such applications cannot be safely left to the judgment of inexperienced attendants. The same end may be accomplished by applying mild irritants, such as Mercurius dulcis, to the diseased membrane. This may be employed once a day by insufflation with great advantage, being careful to see that the calomel is pure and free from lumps. Wells recommends a collyrium of Kali hydriod, (gr. ij. @ ℥j), for the same purpose.

THERAPEUTIC INDICATIONS.

Aconite.—This remedy is useful whenever the vascular reaction is in excess.

Arsenicum.—This is one of the best internal remedies for ulceration of the cornea, and is also frequently serviceable in a weak and impoverished state of the general system.

Belladonna is indicated whenever there is much conjunctival injection and ciliary neuralgia.

Cactus frequently relieves nervous and vascular irritation in the ciliary region, and also the accompanying asthenopia.

Cimicifuga.—This remedy is often useful when there is much neuralgia and ciliary irritation.

Conium is often a valuable remedy in allaying photophobia, especially when accompanied with much ciliary irritation.

Gelseminum is indicated in cases attended with asthenopic symptoms and photophobia, especially when associated with marked hyperæmia and hyperæsthesia of the retina and ciliary nerves.

Hepar sulph.—This remedy is useful in promoting absorption of the exudation and clearing the cornea, more particularly in indolent and chronic cases.

Kali hydriodicum is an important constitutional remedy, especially in syphilitic cases.

Mercurius is very serviceable in cases attended with ulceration, either with or without photophobia, but is more particularly useful in promoting interstitial absorption. It may often be advantageously alternated with Hepar sulphuris.

Nitric acid is especially indicated when, in addition to photophobia, lachrymation and nervous irritation, the patient is laboring under syphilitic dyscrasia, or a weak and impoverished state of the constitution.

Spigelia.—This is one of our best remedies for ciliary irritation and neuralgia, especially when there is much hyperæmia of the ciliary vessels, and photophobia.

For additional remedies, see *Tables A* and *B.*, and consult the *Therapeutic Indications* at the end of the section on *Ophthalmic Inflammation.*

DIET AND REGIMEN.—The diet will in most cases require to be of the most liberal and nutritious character, consisting chiefly of such articles as roast beef, eggs, milk, and other kinds of nitrogenous food, together with a due proportion of vegetables and ripe fruit. In some cases benefit will be derived from partaking freely of malt liquors, wine, kumiss, and other like stimulants.

Care should be taken, by shading the eyes or otherwise, not to expose them while under treatment to any irritating or in-

jurious influences, such as wind, dust, smoke, heat, bright light, etc., and at the same time to guard against the debilitating effects of confinement and vitiated air, by regular out-door exercise, ventilation, and the observance of such other hygienic regulations as the habits and surroundings of the patient may demand.

2.—SUPPURATIVE KERATITIS.

SYMPTOMS.—Suppurative keratitis is characterized by the development of purulent collections in the substance of the cornea, and by ulceration and disintegration of its tissues. These changes are generally preceded and accompanied by symptoms denoting high inflammatory action; while on the other hand we sometimes meet with cases in which the symptoms of inflammation and ciliary irritation are almost entirely absent.

In the inflammatory form, as it is called, the conjunctival and episcleral injections are strongly marked, the corneal zone being of a bright rose color; generally, also, there is severe ciliary neuralgia, with photophobia and lachrymation. The pupil is frequently much contracted, and there is also, in most cases, more or less chemosis. We first notice a small grayish opacity, generally near the center of the cornea, which afterwards becomes cream-colored or yellow, the infiltrated tissue breaking down into an abcess, which may find its way to the surface, forming an ulcer of corresponding depth. Or several small abcesses may coalesce and form a corneal abscess of large dimensions. Sometimes the pus sinks down between the lamellæ of the cornea, separating them, and leaving a condition called onyx, from its resemblance to the lunula of the nail. This may be so small as to be difficult of detection, appearing only as a narrow yellow line near the limbus of the cornea, or so large as to cover more or less of the pupil, when it may be mistaken for an hypopyon. The latter is generally due to the bursting of a corneal abcess, and the precipitation

of its contents at the bottom of the anterior chamber. It may also arise from inflammation of the iris, as will be explained under iritis.

The non-inflammatory form of suppurative keratitis is distinguished by the absence, more or less complete, of all the usual symptoms of the inflammatory form. Thus, there is little or no ciliary neuralgia, photophobia or lachrymation; the sensibility of the eye is also greatly diminished, responding imperfectly, and as it were with difficulty, to external irritation. Sometimes the disease sets in with the usual symptoms of inflammatory irritation and severe ciliary neuralgia, and then these symptoms suddenly disappear, the cornea rapidly breaking down, and forming abcesses of a deeper and more uniform yellow color than those of the inflammatory variety. The tendency in this form of keratitis, is to rapid suppuration and sloughing of the corneal tissue, the suppurative process extending in circumference rather than in depth, contrary to what usually occurs in the other form. The inflammation frequently extends to the iris, and then we are apt to have large hypopyon. (*See Iritis.*)

ETIOLOGY.—Suppurative keratitis sometimes results from paralysis of the fifth pair of nerves, and is then called neuro-paralytic keratitis. If the paralysis is incomplete, the cornea frequently escapes, or is but partially and lightly affected; but when complete, the entire cornea is generally involved, becoming opaque, swollen and discolored from purulent infiltration; ulceration ensues, and more or less of the corneal texture is destroyed. Neuro-paralytic keratitis is supposed to be due, not to mal-nutrition of the cornea, but simply to the irritation excited by external irritants, such as air and dust, the action of which is allowed to continue in consequence of the insensibility of the eye. Meissner and others, however, have shown that this form of keratitis is not entirely due to insensibility of the organ, deeming it probable that the integrity of the nerve renders the eye more able to resist the noxious effects of external irritants.

Suppurative keratitis, both inflammatory and non-inflammatory, is frequently of traumatic origin. This is most frequently the case in the aged and infirm, especially after operations upon the cornea, such as cataract; also after mechanical or chemical injuries arising from blows, or from the lodgment of foreign bodies, such as bits of steel, in the substance of the cornea. The inflammatory form is met with in severe cases of purulent and diphtheritic conjunctivitis; and the non-inflammatory, after certain very debilitating diseases, such as cholera, diabetes, typhus fever, etc.

PROGNOSIS.—From what has been said, it follows that in most cases the cornea suffers irreparable injury, especially in the non-inflammatory form. Perforation of the cornea frequently occurs, followed by extensive ulceration and sloughing, the formation of anterior senechia and staphyloma, and, when the deeper tissues of the eye are involved, the disease may end in panophthalmitis and atrophy of the globe. On the other hand, ulcers may heal without permanent opacity, onyces and hypopya may be rapidly absorbed, anterior senechiæ may be broken through, and in a large proportion of cases, under proper treatment, the cornea may preserve its continuity, and regain to a great extent its transparency and usefulness.

TREATMENT.—In the inflammatory form of suppurative keratitis, attended with high vascular and nervous excitement, chemosis, etc., frequent instillations of a neutral* solution of the sulphate of atropine, together with the diligent use of cold compresses, will be required. If the abscess is so situated that perforation would endanger prolapsion of the iris by dilatation, that is, towards the circumference of the cornea, the atropine should be omitted, and, if necessary, calabar bean substituted in its stead.

In the non-inflammatory form, the protective bandage will be the best local application, unless there should be very severe

* Some chemists are accustomed to add a few drops of sulphuric acid to the solution, which appears to render it highly irritating to some eyes.— WELLS.

ciliary neuralgia, when it should be combined with the diligent use of atropine. If this fails to relieve, warm water compresses, of a temperature slightly above that of the blood, may be used in connection or in alternation with the bandage until the pain is moderated, when the compresses should be omitted, as their continued use would aggravate both the conjunctival and corneal inflammation, and also tend to increase the suppurative process.

If the case should become indolent, either warm or hot fomentations will be required, according to the degree of passive congestion or vascular stasis then existing, the object being to excite just sufficient inflammatory reaction to promote resolution, but no more. This, it is evident, will call for the exercise of sound judgment, as well as the greatest care, on the part of all to whom their application is intrusted. If too long continued, or if the temperature is too high, the inflammatory symptoms will be apt to pass the bounds of healthy reaction, in which case they will require to be subdued by cold.

Ulceration is generally best treated by pressure, after the inflammatory process has been regulated by the local measures already recommended. The bandage should be elastic, like flannel, and long enough to pass twice round the head, so as to exercise the requisite pressure on the cornea. The pressure bandage is also frequently useful in limiting the extent of suppuration, but, according to Graefe, is not applicable to those cases of rapid suppurative necrosis which sometimes succeed the sudden disappearance of acute symptoms.

If, in spite of the foregoing treatment, suppuration still continues, especially if it threatens perforation, benefit will be derived from puncturing the cornea, *(paracentesis,)* not so much by the simple removal of the purulent infiltration, as this is rarely so fluid as to escape freely from so small an opening, but rather, by diminishing intra-ocular tension, to promote absorption of the infiltration, and hasten the restoration and cicatrization of the corneal tissue. If the ulcer is compara-

tively small, the operation may be performed with a small needle, such as is represented in Plate I, Fig. 10; but if the ulcer is a large one, or if it has opened into the anterior chamber and formed an extensive hypopyon, the incision should be made with a broader instrument, such as the ordinary lance-shaped knife, or what is better, Desmarre's stop-knife, represented in Plate I, Fig. 15. (*See Paracentesis Corneæ*). In order to empty the abscess entirely, it will generally be found necessary to carry the instrument into or through the bottom of the ulcer, and also to repeat the operation several times, at short intervals, as the opening made by the incision is usually soon obliterated.

But paracentesis, as usually performed, is generally less effective than *iridectomy*, especially if the iris is involved, or if the ulcer or hypopyon is of considerable size. This operation not only acts beneficially upon the inflamed iris, but lessens more completely, and for a longer period, the intra-ocular pressure, and thereby exerts a greater influence in diminishing the corneal suppuration, in promoting absorption of the infiltration, and in facilitating the regeneration of the corneal tissue. (*See Iridectomy*).

Another operation, called *Saemische's*, has more recently been introduced, which consists in a free transverse section of the cornea, after the manner of operating in cataract. This operation is especially suited to the non-inflammatory form, in which the necrosis takes place superficially, or towards the circumference, and which may or may not be complicated with iritis or hypopyon. The operation consists in laying open the base of the ulcer with a Graefe's cataract knife, (Pl. II. Fig. 34), the eyelids being separated with the stop speculum, (Fig. 33). The point of the knife is entered on the temporal side, about one millemetre from the margin of the ulcer, and having penetrated the anterior chamber the blade, with its edge turned towards the bottom of the ulcer, is carried through the chamber

behind the ulcer, the counter-puncture being made at a corresponding point on the opposite side of the cornea, and just beyond the margin of the ulcer. The fixing forceps, (Pl. II., Fig. 36), with which the globe has been steadied, are now laid aside, and the knife is made to cut its way out through the bottom of the ulcer, being so managed as to allow the aqueous humor to escape gently beside the blade, and with it any coexisting hypopyon. The eye is then covered with a light compress, and afterwards treated with Atropine. The success of the operation, according to Saemisch, has been of the most gratifying character, the progress of the disease having been immediately arrested in almost every instance.

With respect to the general treatment of corneal ulcers, we should be guided to a considerable extent by general principles. Thus, if the degree of local inflammation is excessive, we should aim to subdue it without going to the other extreme, which would favor the disintegrating process, and at the same time hinder the filling up of the ulcer. The remedies best adapted to fulfill these opposite conditions, can be best selected according to the law of similia, choosing such as correspond both to the general constitutional condition and to the pathological state of the cornea. The inflammatory process is so intimately related to the suppurative, that, so far as medicines are concerned, the chief aim should be to regulate it, neither attempting to subdue it altogether, nor on the other hand, allowing it, if excessive, to go on uncontrolled. It follows, therefore, that such remedies as Aconite, Belladonna, Cactus, Digitalis, Gelseminum, Mercurius, Tartar-emetic, Veratrum, etc., will be of frequent benefit, and may be prescribed agreeably to the indications already pointed out. The same may be said of the ciliary irritation and neuralgia, which may be combatted with such remedies as Atropine, (used topically), Belladonna, Cimicifuga, Conium, Spigelia, etc., while the suppuration may be measurably controlled by Arsenicum, Hepar Sulphuris, Kali hydri-

odicum, Lycopodium, Mercurius, Sulphur, etc. See *Therapeutic Indications* on page 64, ; and consult *Tables A. B.* at the end of the *Section on Ophthalmic Inflammation.*

DIET AND REGIMEN.—The fact that most cases of suppurative keratitis occur at the two extremes of life, and in delicate and weakly constitutions, will suggest the importance of making use, especially in non-inflammatory cases, of a liberal and nourishing diet, coupled if necessary with the milder stimulants, such as wine, ale, porter, etc. Too much emphasis can not be laid upon the importance of pure air, cleanliness, and attention to the general health. The digestive and assimilative organs should be kept in the best possible condition, the secretions, particularly those of the bowels and skin, should be carefully regulated, and in fine every suitable means should be taken to cleanse, invigorate and build up the system.

3.—VASCULAR KERATITIS.

KERATITIS PANNOSA.

SYMPTOMS.—Vascular keratitis is chiefly characterized by a development of vessels on the surface of the cornea. The membrane first becomes more or less opaque, loses its brilliancy and polish, and not unfrequently appears sandy, as if dotted over with a multitude of extremely fine points. (*See Fig. 8.*) Vessels afterwards begin to show themselves upon the surface, advancing towards the centre, and becoming more and more numerous as the opacity increases, until finally the cornea is over-run with a fine vascular net-work called pannus, (*Keratitis pannosa*). Occasionally the vascular turgescence is so great as to cause a rupture of some of the vessels, giving rise here and there to extravasations of blood, which appear as small ecchymosed spots in the interstices. The deeper portions of the cornea generally remain unaffected.

Vascular keratitis, like other forms of corneal inflamma-

tion, generally begins with more or less ciliary irritation, which precedes, sometimes for days, the opacity of the cornea. This is accompanied with conjunctival and episcleral injection, the corneal and circum-corneal zones being generally well-marked. (*See Fig. 8.*) When the inflammation is severe, the surrounding parts participate more or less in the inflammatory process, the conjunctivæ and lids becoming red and swollen, and accompanied in some cases with a marked elevation of temperature.

The pain is frequently extreme, especially when the nerve fibres are exposed by the shedding of epithelium, or by excoriation. In these cases there is generally severe photophobia, with lachrymation and spasm of the lids; sometimes, however, there is little or no pain accompanying the photophobia, and *vice versa*, even when associated with spasmodic contraction of the pupil.

The duration of the disease varies considerably, according as the cause is temporary or lasting. In the one case it may run its course in a few days, while in the other, even under the best treatment. it may continue for many weeks.

ETIOLOGY.—The chief causes are such as produce mechanical irritation of the corneal surface, especially trachoma, inverted cilia, dust, cinders and other foreign bodies. Besides these, other deleterious external influences, such as heat, smoke, steam, irritating collyria, salves, caustic fluids, sudden changes of temperature, and even long exposure to air itself, as in ectropion, sometimes induce it. The vascularity may also result from the excitement of active inflammation in neighboring parts, as in the different forms of conjunctivitis. It is also an accompaniment of other forms of keratitis, especially the phlyctenular. Finally, it may owe its origin in some cases to internal causes, either pathological or functional, especially such as give rise to protrusion of the globe, or to spasmodic pressure of the lids.

PROGNOSIS.—This is generally favorable, as the causes producing it are such as may be usually, and, in many cases,

speedily overcome. When the cause is not removable, of course the prognosis is bad, as then the pannus and opacity are likely to continue in spite of the very best treatment. On the other hand, many cases amenable to treatment are rendered tedious and difficult of cure, by reason of the long existence of the inflammation, and the extent and character of the resulting opacity. Relapses are also common, and the utmost care is required on the part of both the surgeon and the patient to prevent them.

TREATMENT.—The first, and in many cases the only treatment required, will be the removal, whenever possible, of the cause. Hence, misdirected cilia, or any foreign substance which may have found a lodgment in the conjunctival sac, should be carefully sought for and extracted. For the same reason, trachomatous elevations should be destroyed by caustics, the removal of which generally leads to speedy improvement.

After remedying as far as possible the action of external causes, if the inflammation continues unchecked, and especially if there is much heat of the neighboring tissues, cold compresses should be applied until the vascular action is sufficiently reduced, when additional benefit will be derived from the instillation of Atropine, and the application of a protective bandage. If these measures, aided by suitable internal treatment, fail to relieve the excessive ciliary neuralgia, photophobia and spasm of the lids, and especially if, as is generally the case under such circumstances, the patient is delicate or debilitated, such hygienic, dietetic and constitutional treatment should be adopted as will be best calculated to invigorate the general system.

After the inflammatory and nervous symptoms subside, if the cornea still remains cloudy, or if the disease threatens to become chronic, the vascular stasis may be overcome by dusting the corneal surface once or twice a day with Mercurius dulcis. The calomel, which of course should be entirely free from all impurities or lumps, may be applied by insufflation, or

which is better, by means of a short camel's hair pencil, by tapping the brush, not too heavily loaded, immediately in front of the cornea. The remedy is generally well borne, but if not, it should be used less frequently, or else entirely omitted.

Vascular keratitis, whether arising from trachomatous irritation, herpes corneæ, or pannus, is often greatly benefitted by the operation called *canthoplasty*. This operation consists in dividing the outer canthus with a bistoury or pair of strong scissors. If the former is employed, the instrument (Pl. I, Fig. 30) is introduced upon a director, behind the external canthus, and is made to emerge near the orbital border. The commissure is then divided horizontally, that is, in the direction of the palpebral fissure. If the scissors are used, one blade should be passed behind, and the other in front of the outer canthus, and the commissure divided as before. An assistant now causes the incision to gape by holding the lids widely apart, and the raw edge of the conjunctiva is united to that of the skin by means of two or three fine sutures, one of which should be at the upper and another at the lower angle of the wound. The operation as described is a perfectly safe one, and highly serviceable in allaying irritation of the cornea, by diminishing the friction between it and the palpebral surfaces.

The internal remedies best adapted to this affection, together with their therapeutic indications, will be found on pages 50 and 51.

Consult, also, *Tables A and B*, and the *Therapeutic Indications* at the end of the *Section on Ophthalmic Inflammation.*

4.—PHLYCTENULAR KERATITIS.

HERPES CORNEÆ.

SYMPTOMS.—Phlyctenular keratitis is principally characterized by the development of herpetic vesicles, or phlyctenulæ, on the surface or in the substance of the cornea. The disease is frequently associated with phlyctenular ophthalmia, and is of the same nature, differing only in its seat and the consequent severity of the subjective symptoms. (See *Phlyctenular Conjunctivitis*.)

The vesicles vary considerably in number, size and arrangement. Sometimes they are solitary, or nearly so; at other times they are numerous, and scattered irregularly over the surface; or they may be arranged in groups at or near the margin of the cornea, where they frequently form an arc of considerable extent. Occasionally they are very superficial, appearing like beads of sweat just under the epithelium. Most commonly, however, they are larger and more deeply seated, having at first the appearance of little rounded tubercles, of a grayish or pearly color, imbedded in the superficial layer of the cornea, with their apices slightly raised above its surface. The portion of cornea immediately surrounding the tubercle is generally somewhat swollen, the puffed appearance being due to a cloudy border of infiltration, which is most marked in places where the phlyctenulæ are most closely aggregated. Sometimes a transparent vesicle forms on the summit of a tubercle, the bursting of which gives rise to a small ulcer, with a grayish, or grayish-yellow, base and well-defined edges. Occasionally the ulcer extends at its circumference, at the expense of the cloudy border surrounding it, constituting what is called the *resorption ulcer*. Sometimes no vesicle forms, and then the tubercle becomes denuded of its epithelium, and melts away, as it were, into an ulcer of corresponding dimensions. The phlyctenulæ, and their associated tubercles and ulcers, do not all appear at once, but in

successive crops, so that they may be seen in various stages of development at the same time. The ulcers when properly protected generally heal readily, gradually filling up and becoming covered with epithelium,without, as a general rule, permanently impairing the transparency of the cornea.

When the Phlyctenulæ are numerous and scattered, the conjunctival and episcleral injections are generally strongly marked, especially the rose-colored zone around the cornea; but when confined to one side of the cornea, the hyperæmia is usually limited to the corresponding portion of the ciliary region. In this case the phlycten forms the apex of an irregular vascular triangle, whose base is turned towards the circumference of the globe. As the eruption is situated exactly at the apex, and the vascular net-work extends at first only to the border of the cornea, if the vesicle happens to be seated at a distance from the corneal border, the vascular triangle will be incomplete, a clear or non-vascular portion of the cornea intervening between the eruption and the marginal cut-off. This appearance, however, is sometimes only temporary; after a while the irritation developes vascular keratitis, and the vacant portion of the triangle becomes bridged over with a net-work of vessels,constituting what is sometimes called the *herpetic bridge.* When the vesicles are much scattered, each group or phlycten may be connected with a separate bundle of vessels, and these may so intermingle and overlap each other, as to destroy in a great measure their individuality.

The disease is preceded and accompanied with more or less pain, heat, photophobia, spasm of the lids, and lachrymation. These symptoms vary greatly in different cases, and in different stages of the same case, being sometimes so intense as to be almost intolerable, and at others so light as scarcely to attract attention. As a general thing, however, they are much more prominent and persistent then when the disease is confined to the conjunctiva.

ETIOLOGY.—The causes of phlyctenular keratitis are as varied as they are numerous. Not only is it capable of being excited by external irritants, such as usually give rise to other forms of keratitis, but it is so frequently associated with a similar eruption occuring in the course of the distribution of the trifacial nerve, that many observers refer its origin in such cases to irritation of the ophthalmic branch of that nerve, or to accompanying branches of the sympathetic. Another supposed cause is the scrofulous diathesis, the disease appearing most frequently in scrofulous children, and in persons of a feeble, irritable and cachetic habit, (See *Scrofulous Conjunctivitis.*)

PROGNOSIS.—Notwithstanding the great tendency to relapses in this disease, and its consequent liability to become chronic, it frequently terminates in perfect recovery. When the phlyctenulæ are few and superficial, excoriations or ulcusles formed from them soon fill up, and under favorable circumstances leave no trace of their previous existence. But the more deeply-seated tubercles rarely disappear altogether, but leave opacities of greater or less size, the effects of ulcers that may have existed for weeks or even months. Occasionally the history of the herpetic tubercle is still less favorable, the resulting ulcer extending deeper and deeper, and finally ending in perforation. Or it may undergo cartilaginous or calcareous degeneration, forming opacities of a dense and permanent nature. Finally, the disease sometimes becomes complicated with iritis, trachomatous conjunctivitis and pannus, with their attendant consequences.

TREATMENT.—The treatment of phlyctenular keratitis is similar to that we have recommended for phlyctenular conjunctivitis and vascular keratitis, (which see). The most important points are, the instillation of Atropine and the application of a protective bandage. The Atropine acts beneficially by diminishing ciliary irritation, and also by lessening intra-ocular pressure. The latter is of special consequence in the case of

deep ulcers, the floor of which may be so thin and weak as to render it unable to sustain the normal amount of pressure. In case the Atropine is found to disagree, Belladonna collyrium should be substituted. In a few rare instances, owing to some peculiar idiosyncrasy of the patient, neither of these preparations will be well borne, in which case their use will have to be abandoned. The protective bandage, however, is of universal application. It effectually protects the ulcerated surface from contact with the air, which is always highly irritating, not only to corneal ulcers, but to ulceration in every part and tissue of the body. It is likewise equally serviceable in allaying the ciliary irritation, pain, photophobia, and other sympathetic symptoms. The bandage may be made of flannel, and of sufficient length to extend twice around the head. The best way of applying it is to place a piece of fine muslin over the closed eye, and then to fill the orbital depression with fine charpie, so that the bandage may exert a uniform pressure upon the diseased organ.

Other local measures, as well as the most appropriate hygienic and constitutional treatment, will be found under the two heads above referred to, and therefore need not be repeated. (See *Phlyctenular Conjunctivitis and Vascular Keratitis.*)

ART. IV.—SCLERITIS.

Although inflammation of the sclera is a very frequent accompaniment of conjunctivitis and keratitis, it is doubtful whether it ever occurs as a primary or idiopathic affection. As a secondary disease it is quite common, but its symptoms are so often masked by those with which they are associated, that they frequently escape observation. The inflammation is generally partial, affecting only the anterior and superficial portions of the membrane; but it is sometimes general and deep-seated, in which case it is nearly always associated, perhaps always,

with general choroiditis. It seldom leads to suppuration; but sometimes portions of it undergo fatty degeneration, breaking down into fatty and purulent products, and nearly destroying the tissue. As commonly met with, the disease occurs in two distinct forms, both of which are usually described under the head of

EPISCLERITIS.

SYMPTOMS.—Episcleritis, properly so called, is a partial or circumscribed inflammation of the anterior portion of the episcleral tissue. It is characterized by the appearance near the cornea of one or more small dusky-red spots, which as the disease progresses generally become more or less elevated and nodular, and of a deeper or somewhat purplish hue. These elevations are commonly situated near the insertion of the recti muscles; most frequently near that of the external rectus. The conjunctival and episcleral injection, which usually precedes and accompanies the formation of the little tumors, is generally limited to their immediate vicinity, at which points the episcleral tissue is more or less infiltrated and swollen, the vessels distended and vein-like, and the affected portion of the membrane of a dark, bluish or purplish color.

The subjective symptoms are not generally very strongly marked, unless the cornea is implicated. As a general rule there is little or no pain, perhaps only a sense of uneasiness, though sometimes there is a dull, heavy, aching feeling in the eye, which renders the patient quite uncomfortable. Photophobia and lachrymation are more constant symptoms; but, although sometimes considerable, they are often insignificant.

At first the disease is liable to be mistaken for phlyctenular conjunctivitis, but the little tumor or nodule continues to increase in size, especially at the base, until it sometimes threatens to develope into what is called *anterior sclerotic staphyloma;* but after existing for weeks, and perhaps months, it generally begins to diminish in size, and at last gradually dies away and

disappears. Or it may recede only to return in the same or some other spot, and in this way the disease is sometimes prolonged for an indefinite period.

ETIOLOGY.—Very little is definitely known concerning the origin of this affection. Its frequent occurrence in young women has led some to infer that it is in some way connected with the menstrual function, but this is mere conjecture. It is perhaps most frequently met with in persons of a rheumatic or gouty habit. Its extreme obstinacy in subjects affected with syphilis, except when treated with anti-syphilitic remedies, renders it probable that it may sometimes owe its origin to that disease, especially when we consider how often syphilis affects other similar tissues. When occurring independently of other constitutional causes, it is probably due, in most cases, to overwork, debility, or some other depressing influence.

PROGNOSIS.—This is almost always favorable. If, however, the disease goes on uncontrolled, or if resolution fails to occur, the tumors may suppurate, giving rise to small abscesses in the sub-conjunctival tissue; or they may degenerate, becoming cartilaginous or calcareous; or, finally, deep-seated ulceration may occur, resulting in anterior sclerotic staphyloma, or prolapse of the uvea.

TREATMENT.—Little treatment is generally necessary, provided the patient will abstain from using the eyes, and will protect them from bright light by wearing a shade. The instillation of Atropine at night, and the use of warm fomentations when necessary, will generally relieve the ciliary neuralgia, which is not often very severe. Caustic collyria not only do no good, but frequently do harm by increasing the ciliary irritation. Wells, however, strongly recommends a weak collyrium of chloride of zinc, beginning with one-half grain to the ounce of water, and if well borne, increasing the strength to one or two grains to the ounce. When syphilis is at the bottom of the trouble, Kali hydriodicum is by far the best constitutional

remedy, though good results have been obtained in these cases from Mercurius protoiodatus. Colchicum is generally the best remedy for rheumatic and gouty subjects, Bryonia being most serviceable for aggravations resulting from fatigue. Sepia is particularly useful when the catamenia are deranged. Nux vomica is a good remedy when the disease is induced or aggravated by over-taxing the eyes, especially when there is debility of the digestive organs or constipation.

DIET AND REGIMEN.—Whatever benefits the general health is likely to have a salutary influence on the disease. The diet should therefore be liberal, nutritious and easily digestible. The several animal functions, especially those of digestion and secretion, should be carefully regulated; and the patient should take regular but moderate exercise in the open air.

ART. V.—IRITIS.

Ophthalmic writers have divided iritis into numerous forms or varieties, distinguishable for the most part by the special causes which are supposed to give rise to them. Thus, we have the simple or rheumatic, the arthritic, the gonorrhœal, the syphilitic, the serous or œdematous, the suppurative or parenchymatous, the idiopathic, the sympathetic, the traumatic, etc. We may, however, reduce them all to the following four groups: (1), simple iritis; (2), serous iritis; (3), suppurative iritis; and (4), syphilitic iritis.

1.—SIMPLE ACUTE IRITIS.

SYMPTOMS.—The principal symptoms of simple acute iritis are: Episcleral redness, pain, lachrymation, photophobia, chemosis, structural changes in the iris, sluggishness or immobility of the pupil, and more or less febrile disturbance of the system.

The characteristic redness is due to sub-conjunctival or episcleral injection, in the form of a narrow band or zone,

immediately around the cornea. This zone, commonly called the corneal zone or circle, is composed chiefly of deep-seated arterial twigs, of a rose-red, or violaceous hue, straight, and arranged parallel to each other, commencing at the junction of the sclerotica with the cornea, becoming finer and finer as they radiate from the latter, and terminating about a line from the corneal border. The vascularity of the conjunctiva is in some cases confined to the palpebral portion of the membrane; in others the ocular conjunctiva is involved, the distended vessels proceeding from the circumference of the globe, following an irregular but nearly parallel course towards the cornea, and, dividing into numerous branches, are at length lost in the narrow, but deeper-seated, more constant and characteristic circle of vessels situated immediately around the cornea. The conjunctival vessels are readily distinguished from those composing the corneal zone, by being of a deeper red color and of larger calibre, by being displaced by the movement of the conjunctiva, by their more or less irregular distribution, and by their connection with other similar vessels coming from the palpebral surface. The episcleral redness is much more evenly diffused than the conjunctival, owing to the fineness, closeness and parallelism of the vascular injection. It is generally limited, at first, to the corneal border; but as the disease progresses, the injection frequently becomes deeper and more general, until, in some cases, the entire surface of the subjacent sclera presents a reddish or rose-carmine appearance. Occasionally, however, we meet with severe cases in which the sub-conjunctival injection is but feebly developed, as in pyæmia, typhus, puerperal, and other low forms of fever.

Some degree of chemosis of the ocular conjunctiva is generally present, and this may be so great as to cause considerable bulging of the conjunctiva around the cornea. The eyelids also participate in the affection, especially the upper lid, which frequently becomes more or less inflamed and œdematous, when-

ever the attack is severe. These complications, however, are frequently absent.

The pain, also, which is occasionally throbbing, and accompanied with a feeling of distension or pressure, is sometimes almost entirely wanting; but in most cases it is severe, often extremely so, and of a lancinating, burning or aching character. When confined to the eye it is generally superficial, but as the inflammation spreads the pain augments, and extends to the orbit, temple and side of the head. It undergoes frequent exacerbations and remissions, chiefly of a periodical character, and is always most severe during the night. So long as the inflammation is confined to the iris, the globe is not particularly painful to the touch; but when it extends to the ciliary body, constituting cyclitis, there is more or less tenderness and pain in the ciliary region.

At first the eye is preternaturally dry, but soon the lachrymal secretion is re-established, and becoming excessive, constitutes the condition called *epiphora*. This hyper-secretion, which is due to the sympathetic influence of the inflammation on the lachrymal gland, sometimes becomes so great as to overflow the lids. The tears are frequently hot and burning, particularly if there is much co-existing inflammation of the neighboring parts, and so irritating as sometimes to inflame the skin over which they flow.

Photophobia is another prominent symptom of acute iritis, especially if the cornea is implicated, and is generally in proportion to the violence of the inflammation. The eye is unable to bear the full light of day, and suffers more or less when exposed to a diffused light; hence the patient generally keeps the eyes closed or deeply shaded.

The constitutional disturbance, though modified to some extent by the age and health of the patient, commonly varies in proportion to the amount of local disorder. When severe, there is generally considerable febrile excitement, which is

sometimes accompanied by more or less derangement of the digestive organs.

Vision is always more or less impaired, and in mild cases this is sometimes the only symptom that attracts attention. Many causes contribute to this result. Sometimes it is chiefly due to haziness or opacity of the cornea, the membrane appearing as if dotted over with fine points of opaque matter, as represented in Fig. 8. In most cases of simple iritis, however, the cornea remains unaffected, or at most is rendered only slightly hazy. Vision may also be affected by cloudiness of the aqueous humor, or by diffuse opacity of the vitreous, due to co-existent inflammation of the ciliary body, in which case the power of accommodation is also impaired. But the chief, or rather the most constant causes of impaired vision in iritis, are such as result from paralysis of the muscles caused by proliferation of tissue, from immobility of the iris, or from a greater or less amount of occlusion or obstruction of the pupil by inflammatory products.

In all cases the pupil is rendered more or less sluggish. This is owing partly to hyperæmia of the vessels, but chiefly to plastic or serous exudations into, or upon the surface of the iris, whereby its motions are mechanically hindered.

Contraction and irregularity of the pupil are characteristic symptoms, dependent upon exudations between the iris and capsule of the lens, giving rise to a greater or less amount of adhesion between them. These exudations may be so situated, or so minute, as to escape detection until the pupil is artificially dilated, or is examined by lateral illumination, when we may discover the beads of lymph which tie it to the anterior capsule. The exudations coalesce as they increase in size, until in some cases the entire pupillary margin becomes adherent, constituting what is called *annular synechia.* This condition does not materially interfere with vision, as the centre of the pupil still remains clear; but when the exuda-

tions invade the pupillary opening, a greater or less portion of its area is covered with lymph, and then, of course, vision is proportionally obstructed.

The contraction and immobility of the pupil are always associated with more or less dullness and discoloration of the iris. These symptoms are all due to the same causes, namely, to hyperæmia and effusion, and are among the earliest signs of the disease. The iris in its natural state has a more or less bright, glistening appearance, which is changed by inflammation to a dull, lustreless aspect, as though the membrane had lost its vitality. In addition to this the color itself changes. Blue and gray irides become slate-colored or greenish, while brown and black irides change to a reddish-brown or cinnamon color. As such changes are sometimes only apparent, the affected iris should always be carefully compared with that of the sound eye, remembering at the same time that dullness and discoloration of the iris may be caused by cloudiness of the cornea and of the aqueous humor.

ETIOLOGY.—The chief predisposing cause of simple iritis is the rheumatic or gouty diathesis. But the same form of iritis may occur independently of rheumatism in other parts of the body, and unassociated with the gouty or rheumatic constitution. In such cases, however, the same exciting causes generally give rise to it, namely, exposure to sudden atmospheric changes, dampness, wind, cold draughts of air, etc., and hence, as there are no characteristic symptoms by which to distinguish one form from the other, it has been customary to call them both rheumatic. Simple acute iritis, though frequently of traumatic origin, is most generally secondary, inflammation originating in other parts being transmitted to it in consequence of the close anatomical or functional relation they sustain to each other. Hence we have found it to be frequently associated with various forms of ophthalmia, especially the purulent. On the other hand, also, as we have seen, acute iritis is frequently complicated

with inflammation of the neighboring parts, constituting what is frequently called rheumatic ophthalmia.

PROGNOSIS.—The prognosis in the great majority of cases is favorable. The disorder is often obstinate, owing to its frequent complication with other forms of ophthalmic inflammation, the diathesis of the patient, atmospheric influences, etc.; but sooner or later the inflammation undergoes resolution, and, unless complicated with more serious affections, such as unyielding posterior synechiæ, the organ fully recovers. Of course, in traumatic iritis the prognosis will have to depend, in a great measure, upon the nature, extent and precise seat of the injury, and should therefore always be particularly guarded.

DIAGNOSIS.—The diagnosis has already been given with sufficient accuracy. Iritis is distinguished from simple inflammation of the conjunctiva, with which it is sometimes confounded, by the injection being originally confined to the episcleral tissue; by its pinkish or violaceous hue; by its forming a narrow zone about the cornea, composed of straight, deep-seated, parallel vessels, disconnected with those of the conjunctiva; by the epiphora, photophobia, and orbital and circumorbital pain; by the dullness and discoloration of the iris by exudations of plastic lymph upon its surface or margin; and by the contracted, irregular and sluggish state of the pupil. Not unfrequently the points of some of the vessels constituting the corneal zone encroach upon the edge of the cornea, forming upon its border a small vascular circle, or segment, varying in breadth from one-eighth to three-eighths of a line; this is supposed to constitute one of the differential signs of rheumatic iritis.

RESULTS.—The chief results attending this form of iritis are: exudations upon the surface of the iris, or upon its margin, and in the pupillary aperture; adhesions to the anterior capsule; (*posterior synechiæ*); occlusion of the pupil; and, when complicated with keratitis, the development of phlyctænæ on the cor-

nea; superficial ulceration resulting from their rupture; and more or less opacity of the cornea arising from depositions upon the inner surface or between its laminæ. (*See Fig. 8.*)

TREATMENT.—The medical and surgical treatment of iritis is so varied, and at the same time is of such great importance, that we deem it best to defer its consideration until after the other forms of iritis have been described.

2.—SEROUS IRITIS.

DESCEMETITIS, KERATITIS PUNCTATA.

SYMPTOMS.—This form of iritis is chiefly characterized by an increase of the aqueous humor, and by the absence of plastic exudations. Instead of the usually contracted state of the pupil, this aperture is generally more or less dilated, in consequence of the increased intra-ocular pressure. Discoloration of the iris is not very perceptible, nor are the other symptoms of acute iritis sufficiently marked to attract attention. Pain and photophobia are generally absent, and the injection is usually limited to the vessels composing the narrow circum-corneal zone of the episcleral tissue. The aqueous humor is more or less turbid, the cloudiness arising from minute particles of floating lymph in the anterior chamber. Similar particles are deposited in the form of points upon the posterior surface of the cornea, from which they occasionally project, giving to that membrane a punctated appearance, (*keratitis punctata*). Interstitial opacities also occur in the different layers of the cornea, especially of the posterior laminæ, similar in appearance to those observed on the posterior wall of Descemet's membrane. These, however, are supposed to be caused by inflammatory changes, and not by deposits from the aqueous humor. Vision is always more or less impaired, owing partly to cloudiness of the cornea and aqueous humor, partly to intra-ocular tension caused by hypersecretion of the aqueous, and sometimes of the

vitreous humor, and partly to deeper seated inflammation, es pecially cyclitis and choroiditis, with which it is frequently associated.

ETIOLOGY.—Anæmia, chlorosis, scrofula, and especially syphilis, both constitutional and hereditary, have all been regarded as predisposing causes. It is often observed in children affected with the peculiar notching of the central incisors, of the second dentition, which indicates congenital syphilis. It also constitutes one of the forms of sympathetic ophthalmia.

PROGNOSIS.—Serous iritis is usually very chronic, but is generally less serious than either the suppurative or the syphilitic. When timely recognized, if the affection which causes it can be overcome, the disease will generally soon disappear. On the contrary, if the deep structures of the eye have become implicated, and especially if there is at the same time a syphilitic dyscrasia to contend with, the prognosis is particularly bad.

TREATMENT.—This we shall defer until we come to consider the treatment of the other forms of iritis.

3—SUPPURATIVE IRITIS.

SYMPTOMS.—Suppurative or parenchymatous iritis is characterized by the presence of pus-cells in the stroma or tissue of the membrane. In some cases their situation corresponds to the course of the vessels; in others they coalesce and form small collections, constituting true abscesses. These find their way to the surface, either by ulceration or rupture, and sinking to the bottom of the anterior chamber, form an *hypopyon*. Generally, however, the exudation takes place on the surface of the iris, either in the form of a thin gray secretion, covering the iris like a veil, or else thick and puriform, interpersed here and there with minute patches of extravasated blood. The tissues of the iris swell and impede the circulation, and soon large varicose veins become visible on its surface.

Neoplastic exudations also take place along the edge and

into the area of the pupil, as well as upon the posterior surface of the iris, giving rise to extensive adhesions between it and the anterior capsule. Frequently the deposits assume the form of irregular masses, or nodules, especially around the pupillary opening, where they sometimes give rise to annular synechiæ, or, by extending into the area, fill up and completely occlude the pupil. Occasionally some of these nodular masses become detached, and melting down become mixed with the aqueous humor, and render it more or less turbid. The particles of disintegrated lymph and the pus globules, thus liberated, gradually settle to the bottom of the anterior chamber. The hypopyon thus formed is sometimes so small as to be seen with difficulty, appearing only as a narrow yellow line along the floor of the anterior chamber; in other cases it reaches the level of the pupil; and in some rare instances it fills the whole chamber of the aqueous humor.

According to Von Graefe and other authorities, these collections of puriform matter are not always entirely due to inflammation of the iris, some portions of them being derived from the membrane of Descemet, and some from the ciliary muscle, which is occasionally affected with the same form of inflammation. Suppurative iritis may also be complicated with choroiditis, constituting irido-choroiditis, one of the forms of sympathetic ophthalmia, (which see).

ETIOLOGY.—As suppurative iritis is generally the result of a higher grade of inflammation than the simple, it follows that the same causes in some instances give rise to it. It is rarely the case, however, that catarrhal and traumatic iritis take on the suppurative form; and when they do, it is generally by the extension of the disease from other parts. On the other hand, it is not unfrequently the result of the continuation of the suppurative process from parts which are in anatomical or functional relation with it, as in keratitis and choroiditis. In other cases, again, it seems to depend upon certain constitutional affections,

especially syphilis. According to some authorities, it is occasionally due to a neurotic condition caused by malaria, in which case it assumes the intermittent form. That it may be caused by an irritative condition transmitted through the nervous system, has been established by the testimony of many recent observers. In this case it generally assumes the form of an irido-choroiditis. (See *Sympathetic Ophthalmia.*)

PROGNOSIS.—Suppurative iritis is generally a much more serious affection than either simple or serous iritis, in consequence of the greater amount of neoplastic formations associated with it, and which frequently give rise to extensive posterior synechiæ that effectually resist the action of Atropine. Moreover, the disease is much more apt to be complicated with destructive changes in the cornea, and also in the deeper-seated tissues of the eye. In these cases, of course, it is the complications and sequelæ, rather than the iritis,which often renders the prognosis doubtful, as the tissue of the iris may recover its normal condition, and yet its function, as well as that of the eye itself, may remain greatly impaired, or even be entirely destroyed.

TREATMENT.—This will be given in connection with that of syphilitic iritis, (which see).

4.—SYPHILITIC IRITIS.

SYMPTOMS:—Syphilitic iritis is characterized by the production of true *gummy tubercles* (*gummata syphilitica*), originating in the stroma of the iris, and projecting above its surface in the form of condylomata or warts. They are often solitary, or nearly so ; but occasionally they are more numerous, and are either scattered about over the surface of the iris, or collected into a ring upon its pupillary or ciliary border. The tubercles vary in size from that of a millet seed to a split pea, their apices sometimes extending to the posterior surface of the cornea. They are

mostly of a reddish or copper-colored tint, suggestive, if not characteristic, of their syphilitic origin. In this respect, however, they vary considerably, according to the natural hue of the iris. Thus, in light irides, they are generally of a yellowish-red or cinnamon color, while in dark irides they are commonly of a dull reddish or muddy brown. They also become darker by age.

The subsequent condition of the tumors varies according to circumstances. Sometimes they are rapidly absorbed; at other times they undergo fatty degeneration and purulent solution, the detritus mixing with the aqueous humor. Occasionally, on the other hand, after passing through certain metamorphic processes, they assume a more or less permanent form, as we shall see hereafter.

The inflammatory changes in the iris are most marked in the vicinity of the tuberculous nodules, and as these are often confined to a particular portion of the membrane, the thickening and vascularity of the iris are greatest at that point. This feature of the disease, like that of the gummy tumors on which it depends, is a peculiarity of syphilitic iritis.

Although the appearance of gummy tubercles in the iris is an almost certain indication of their syphilitic origin, yet it is generally conceded that their presence is not necessarily connected with secondary syphilis; nor, on the other hand, does their absence establish the non-syphilitic character of the affection. It is well to remember, therefore, that while the existence of gummy tubercles may be regarded as satisfactory evidence of the syphilitic nature of the inflammation, the disease may have an undoubted syphilitic basis, and yet appear in the simple idiopathic or suppurative form.

DIAGNOSIS.—As there are no local symptoms sufficiently characteristic to establish beyond a doubt the syphilitic nature of the affection, it follows that it can only be positively determined by the existence of constitutional syphilis. Thus,

the specific character of the disease may reveal itself by a co-existent papular eruption, by the presence of syphilitic ulcers in the pharynx, by enlargement of the lymphatic glands, or by the cicatrix of a chancre. In the absence of any of the peculiar evidences of constitutional syphilis, the history of the case, though it may not supply positive proof, may serve to elucidate the nature of the disease, or at least furnish probable grounds for suspicion.

PROGNOSIS.—The prognosis in many cases of syphilitic iritis is most grave. Although the gummy tubercles are often quickly absorbed, they sometimes undergo permanent degeneration, shrinking into hard nodules, or changing into tough, tendon-like masses, which either lie upon the surface or are buried in the stroma of the iris. In other cases, as we have seen, the suppurative process gives rise to formidable hypopya, many of which never entirely disappear, but leave behind permanent products, which in some cases undergo fatty and calcareous degeneration. In other cases, again, the deeper structures of the eye become involved, the disease finally terminating, it may be, either in atrophy of the globe or in panophthalmitis.

TREATMENT OF IRITIS.

The leading indications in the treatment of iritis are, first, to prevent, and afterwards, if necessary, to destroy or break up any adhesions of the iris to the anterior capsule; *(posterior synechiæ)*; to relieve ciliary irritation and neuralgia; to lessen intra-ocular tension; and to quiet the muscular action of the inflamed tissue. These indications are best met by the instillation of a strong neutral solution of Atropine (grs. ij—v., ad water ʒ j), the free application of which produces complete dilatation of the pupil, sets the muscular fibres of the iris at rest by paralyzing the constrictor pupillæ, and relieves the interior circulation of the eye, thereby diminishing congestion

of both the ciliary body and iris. These results, however, can only be accomplished by the free and judicious use of the Atropine, as the inflamed, swollen and infiltrated state of the iris prevents, to a great degree, its absorption, and also diminishes its mydriatic effect, by producing stiffness and want of freedom of the muscular fibres of the membrane. It is therefore advisable, and in most cases necessary, to apply the Atropine fifteen or twenty times during the day,or which is better, at intervals of only a few minutes, until it affects the pupil, so as to produce at once, if possible, sufficient dilatation to prevent adhesions and to set the membrane at rest. And should adhesions have already formed, the synechiæ, if recent, narrow, or easily ruptured, may also by this means be broken through, and their reunion prevented, by keeping the pupil completely dilated. But this is not all; the ciliary irritation and pain are generally greatly lessened, and in many cases entirely overcome, by the instillations, in which case nothing remains to hinder speedy recovery.

But sometimes, owing to the peculiar state of the eye or the idiosyncrasy of the patient, the Atropine does not agree; instead of lessening the ciliary irritation it seems to increase it. This result is most apt to occur when its influence upon the iris is resisted, the remedy not appearing to be absorbed sufficiently to produce its mydriatic affect, but, spending its action chiefly upon the ciliary region, greatly increases the hyperæmia and irritability of the eye. In such cases the difficulty may often be overcome, and the best results obtained, by simply applying warm fomentations, the effect of which seems to be to relax the affected tissues, and thereby favor the absorption of the remedy. In some of these cases the irritability may be allayed by substituting a collyrium of Belladonna in place of Atropine, at the same time rubbing in Belladonna ointment around the eye.

Should the foregoing treatment fail in producing sufficient

dilatation of the pupil, a precious resource remains to us in *paracentesis corneæ*. This operation not only favors absorption of the Atropine,but also lessens irritability of the eye, by diminishing intra-ocular tension and relieving the internal circulation. The mydriatics will now be almost certain to act favorably, even in cases in which they had previously seemed to have lost their power.

When extensive adhesions exist, it is well to bear in mind that if the Atropine does not quickly succeed in breaking them up, it is better to use them simply with the view of allaying irritation and lessening intra-ocular tension, as a too energetic use of them under such circumstances serves only to fret the imprisoned iris, and consequently to augment the inflammation. Should any doubt exist as to the inability of the iris to overcome the synechia, Calabar bean, which sometimes proves effective after Atropine has failed, may be tried.

We have already suggested the use of warm fomentations, in case the Atropine fails to act on the pupil. Similar applications, used as hot as they can be borne, and frequently changed, are equally beneficial in promoting absorption of recently effused lymph, and also of hypopyon. This remedy, simple as it appears, is invaluable in the treatment of both suppurative and syphilitic iritis. To be effective, however, the applications will require to be faithfully followed up. If for any reason this is found to be impracticable, heat and moisture may be applied, and the same end attained, by the use of hot emollient poultices, which should be changed every half hour or so, according to the severity of the case. These measures will not, of course, be required after the acute symptoms have subsided ; but the use of Atropine should be continued for several weeks, the object being to keep the pupil dilated and at rest. Unabsorbed hypopya will require to be removed by paracentesis. (*See Paracentesis Corneæ.*) Other operative procedures will be considered after we have given the

THERAPEUTIC INDICATIONS.

Aconite.—In the first stage of iritis, especially when the pupil is greatly contracted. Its usefulness is generally measured by the acuteness of the symptoms and the earliness at which it is given.

Arnica is most serviceable for nervous and plethoric patients, and when the iritis is of traumatic origin.

Arsenicum is one of our best remedies in serous iritis, especially in scrofulous subjects. It may sometimes be advantageously alternated with Kali hydriodicum.

Belladonna is best adapted to cases attended with much conjunctival injection and swelling, especially when there is considerable ciliary neuralgia and photophobia. It is often alternated with Aconite, particularly at the commencement of the disease.

Bryonia is especially suited to rheumatic cases, or when the eyeballs are sensitive to the touch or on motion. It may be given in alternation with Aconite or Mercurius, whenever these remedies are indicated.

Chamomilla is useful in the iritis of scrofulous children, especially when characterized by severe ciliary neuralgia.

*Cimicifuga** is indicated when there is much pain and intraocular tension. It is especially adapted to rheumatic cases.

Colchicum is also indicated in rheumatic cases, especially when there is very great soreness of the eyeballs.

Digitalis is another useful remedy in rheumatic iritis, especially in the early stages, when there is contraction of the pupil and great tenderness of the globe, with more or less aching in and around the eye.

Kali hydriod.—This remedy is adapted to nearly every form of iritis, especially the serous and syphilitic.

Mercurius.—This is, without exception, the most reliable general remedy for iritis, especially after exudation has taken

* See *Am. Hom. Obs.*, vol. 4, p. 229.

place. It is adapted to acute, sub-acute and relapsing cases; also to those which become complicated with inflammation of other parts of the eye, particularly the cornea, ciliary body and choroid.

Spigelia.—This is generally the best internal remedy with which to relieve ciliary neuralgia and photophobia. It is particularly adapted to children, especially those of scrofulous constitutions. See "*Additional Therapeutic Indications*" at the end of section on *Ophthalmic Inflammation.*

DIET AND REGIMEN.—The diet should be simple and unstimulating. If the disease is chronic, or subject to frequent relapses, the patient will need to be particularly on his guard against everything calculated to favor hyperæmia and congestion, such as exposure of the eyes to bright light, wind, draughts of air, etc., or to straining them with reading, sewing, or any fine work. If necessary he should wear blue or smoke-colored glasses. (See NOTE, on page 40.)

OPERATIONS FOR ARTIFCIAL PUPIL.

We have already passed in review the following circumstances and conditions in which the operation for the formation of an artificial pupil is recommended: (1), permanent opacity of the cornea interfering with normal vision; (2), permanent closure of the pupil, (*atresia pupillæ.*) either by contraction; occlusion, or complete posterior synechiæ of the pupilary margin; (3), suppurative keratitis, threatening extensive perforation of the cornea; (4,) corneal perforation, and prolapse of the iris; (5), to diminish intra-ocular tension; and (6), to lessen inflammatory symptoms. We shall also have occasion to recommend it in (7), glaucoma; (8), staphylomata; (9), cataract; and (10), to facilitate the removal of foreign bodies from the aqueous chamber of iris.

(a.) Iridectomy.—Of the numerous operations daily performed on the eye, this is both the most frequent and the most important. Being the safest and most successful operation for

the formation of an artificial pupil, it has almost entirely superceded every other method. It consists in excising a small portion of the iris, after it has been drawn through an opening in the cornea made for that purpose. The instrument generally made use of for dividing the cornea is called a *keratome*. The blade is of triangular or lance shape, and when the iridectomy is made on the temporal side, is set straight with the shaft; (See Pl. I., Fig. 24); but when it is required to be made inwards or upwards, the blade is bent to suit the plane of the nose or orbit. (Fig. 26). The forceps should for the same reason be straight, as in Pl. II., Fig. 36, or bent at an acute angle as shown in Fig. 37. They should be so constructed that when closed the extremity will be perfectly smooth, so that they may be passed through the lips of the incision without lacerating them, or doing any injury to the iris.

The operation is most conveniently performed as follows:—The patient having been placed upon a couch or bed in a good light, with his head slightly raised, and chloroform administered to him by an experienced assistant, the operator places himself either behind or in front of the patient, as may be found most convenient, and having separated the lids to the desired extent by means of the stop speculum, (Pl. II., Fig. 33), and having fixed the globe by seizing the ocular conjunctiva with the fixing forceps (Fig. 36), at a point exactly opposite where the incision is to be made, he takes either the straight or angular keratome, (Pl. I., Figs. 24, 26), as the case may require, and forces it in at the desired point, parallel with, and generally near to, the sclero-corneal junction, being careful to lay the handle of the instrument well back, so as to guide the point of the keratome into the anterior chamber in such a manner as to permit of its being safely pushed forward between the iris and cornea until the incision is of the requisite length.

When the iridectomy is performed with the view of lessen-

ing intra-ocular tension, or for the purpose of relieving the interior circulation, as in iritis or glaucoma, or when there is but a limited space for the pupil on the margin of the cornea, the incision should be made in the sclerotica, about half a line from the corneal border, so as to penetrate the chamber exactly at the ciliary edge of the iris. But when it is intended for optical purposes only, the incision should be made through the cornea ; the preferable point being a little to the inner side of the center that being the direction of the visual ray. Other things being equal, however, the corneal opening should if possible be made near the superior border of the cornea, so that the upper lid will conceal to some extent the obliquity of the pupil, and at the same time reduce the amount of irregular refraction resulting from it.

In withdrawing the keratome, care should be taken not to allow the aqueous humor to flow off too rapidly, otherwise the sudden reduction of the intra-ocular tension will cause congestion of the interior vessels, which may result in a greater or less amount of hemorrhage, from rupture of the choroidal and retinal capillaries. In case the incision, made by the keratome, is not sufficiently broad, or if, for any reason, it becomes necessary to widen it, it may readily be enlarged in either direction by an instrument designed for that purpose, represented in Pl. I., Fig. 20.

On completing the section of the cornea as above described, if the iris does not protrude into the wound, the surgeon should pass the iris forceps, closed, through the lips of the incision, and having seized a fold of the iris, should draw it gently through the opening ; and when a sufficient portion of it protrudes, the prolapsed part should be divided, either with a scalpel or bistoury, (Pl. I., Fig. 22), or, what is better, a pair of iris scissors, (Fig's 1, 18, 19). If on withdrawing the keratome the iris prolapses, there will of course be no necessity of entering the anterior chamber with the forceps, but the protruding

portion should be immediately seized, drawn out to the required extent, and then excised.

(*b.*) *Iriodesis.*—This operation, consisting of an artificial prolapse of a portion of the pupillary margin of the iris, is often substituted for iridectomy in cases requiring simple displacement of the pupil. The general management of the patient, and the method of making the corneal incision, are the same as in iridectomy, except that the incision is always made near the border of the cornea. Sometimes the stop needle (Pl. I., Fig. 15.) is used in making the corneal incision instead of the keratome, in order to prevent the too sudden evacuation of the aqueous humor. After withdrawing the needle, a small loop of fine silk thread is placed directly over the opening in the cornea, and then a small blunt iris hook, bent at the proper angle, (Pl. I., Fig. 35, *b.*), is introduced through the loop into the anterior chamber, pushed forward until it catches in the proximal side of the pupil, which is then gently pulled out through the loop and tied by an assistant. The ends of the loop should be cut off; but if the corneal incision has been made so large as to render the position of the prolapsed portion of the iris insecure, they should be cut long enough to be attached to the integument by means of a narrow adhesive slip. The loop will fall off in two or three days; if not it may be removed. If the operator chooses, he can make use of the canula forceps, (Pl. I., Fig. 3.) instead of the hook, for seizing the iris, and in many cases it is to be preferred, especially when the pupil is required to be only slightly displaced. The operation, it is seen, is quite simple, but requires care in order to avoid separating the opposite border of the iris from its ciliary attachment.

(*c.*) *Iridenkleisis.*—This operation is similar to the last. It consists in strangulating a portion of the pupillary margin of the iris in a long narrow opening made in the corneal border of the sclerotica. The incision is generally made with a

keratome or lance-shaped knife (Pl. I., Fig. 24.) precisely as in iridectomy, except that the instrument is entered very obliquely three-fourths of a line from the corneal border, and only far enough to admit of the easy entrance of the canula forceps, (Pl. I., Fig. 3.) by means of which the iris is pulled out of the opening in the sclerotica, and there left. The strangulated portion generally drops off in a few days; if it should not it may be removed.

(*d.*) *Iridotomy.*—This operation consists in simply making an opening in the iris with a knife in cases in which, the lens being absent, the pupil closed, and the cornea clear, or if partially opaque, the opacity not interfering with the formation of an artificial pupil, one may be made by simply dividing the membrane. The operation may be performed either with a straight, spear-pointed, or lance-shaped knife, by passing the instrument through the cornea perpendicular to its surface, and after incising the iris to the required extent, immediately withdrawing it. The edges of the incision generally retract sufficiently to form a useful pupil; but in case they do not, one of them may be drawn out with a blunt iris hook (Pl. I., Fig. 35.) and excised.

(*e.*) *Iridodialysis.*—This is a convenient method of forming an artificial pupil in cases where the central part of the cornea is opaque, or in which the only transparent portion is a narrow line at the circumference. The operation consists in entering the anterior chamber with the canula forceps, (Pl. I., Fig. 3), and separating a portion of the iris from its ciliary attachment. A better pupil may generally be obtained by first incising the cornea as in iridectomy, and then with the iris forceps or hook gently separating a small portion of the iris from its insertion, which is afterwards drawn out of the wound and cut off.

(*f.*) *Corelysis.*—The object sought to be accomplished by this operation is the detachment of adhesions between the edge of the pupil and the anterior capsule of the lens, *(posterior*

synechiæ). The latest and best method of operating is that devised by Passavant, which consists in introducing a pair of blunt-pointed iridectomy forceps through an incision in the cornea, *(See Iridectomy)*, seizing the iris between the senechia and the corneal opening, and gently drawing it towards the latter far enough to detach the adhesion. The operation should be repeated every two or three days until the entire pupillary margin is relieved.

AFTER TREATMENT.—For several days after an operation for artificial pupil, the patient should be kept in bed, or reclining quietly on a sofa, in a darkened room. All noise and excitement of every kind should be suppressed, and the patient kept in a state of complete mental and bodily repose. A pressure bandage should be immediately applied to both eyes, and drawn sufficiently tight to guard against intra-ocular hemorrhage. In a few hours the bandage may be loosened, but it should not be entirely removed for several days. After the operation of corelysis a strong solution of Atropine should be immediately applied, and the instillation repeated from hour to hour until the pupil is well dilated, after which the protective bandage should be applied, and so adjusted as to exercise just enough pressure to prevent winking. The diet for the first few days should be such as to require little or no mastication, consisting of such articles as milk, soft-boiled eggs, soups, etc. If much inflammation or ciliary irritation should set in, the treatment previously recommended should be rigidly enforced.

ART. VI.—CYCLITIS.

Inflammation of the ciliary body is seldom idiopathic. It is generally associated with its forerunner, iritis, constituting *irido-cyclitis*, or with iritis and choroiditis, forming *irido-choroiditis*. Sometimes the inflammation is transmitted to the ciliary body and iris from the choroid, and then we have what is called *choroido-cyclitis* or *choroido-iritis*. These combinations

are readily understood, when we consider the similarity of structure and close anatomical relations of the parts involved, the iris, corpus ciliare and choroid constituting one continuous tissue, or tract, namely the *uveal.* Hence, inflammation beginning in one of these parts, is very apt to extend to the others, and *vice versa.*. The disease presents two principal forms, or varieties, namely: (1) the *serous*, and (2) the *purulent.*

1.—SEROUS CYCLITIS.

SYMPTOMS.—Serous cyclitis is chiefly characterized by tenderness to the touch in the ciliary region, and by more or less intra-ocular tension, and impairment of vision. It is generally combined with serious iritis, the leading symptoms of which are: episcleral injection, ciliary irritation and neuralgia, increased tension, exudation of lymph upon the posterior surface of the iris, the veins of which are dilated and tortuous, enlargement of the pupil, and a greater or less degree of hypersecretion and cloudiness of the aqueous humor. In addition to these symptoms, irido-cyclitis is distinguished by an actual shallowness of the anterior chamber, due to a bulging forward of the floating portion of the iris, combined with an appearance of unusual depth, arising from a retraction of its ciliary margin, which is fastened by lymph to the ciliary body; and the ophthalmoscope reveals large opaque spots scattered through it. Vision is always much impaired, and the field limited. The power of accommodation is also more or less affected. If the disease continues unchecked, it soon spreads to the choroid; the aqueous humor, which at first was in excess, diminishes and becomes less than normal; the tension also diminishes, so that the globe becomes soft; and finally a condition of general atrophy ensues.

The etiology, prognosis and treatment will be given under the head of

2.—PURULENT CYCLITIS.

SYMPTOMS.—The chief characteristic symptoms of purulent or suppurative cyclitis are: intense episcleral injection, severe ciliary neuralgia, photophobia and lachrymation, associated with pain and tenderness in the ciliary region; occasionally, also, there is more or less œdema of the conjunctiva and lids. The iris is generally discolored, its ciliary margin retracted, and its veins dilated and varicose. Abscesses form in the ciliary body, and sooner or later purulent exudations take place from them into the anterior chamber, sometimes forming an hypopyon of very great size.

ETIOLOGY.—The causes of cyclitis are: extension of inflammation from the neighboring tissues; traumatic injuries of the ciliary body, especially those arising from operations on the eye, as in cataract; and irritation resulting from adhesions of the pupillary margin to the anterior capsule. It also occurs in the form of "sympathetic ophthalmia," (which see.)

PROGNOSIS.—Inflammation of the ciliary body, whether acute or chronic is always a very serious affection, especially the purulent form of it. Few cases, except the most recent, fully recover; the tendency being to suppuration, atrophy, or chronic degeneration.

TREATMENT.— The indications being the same, irido-cyclitis calls for similar treatment to that already given under the head of iritis. If used early, hot fomentations, faithfully applied, will often give great relief, especially when the symptoms are acute; but to be effective they must be used early and assiduously, and even then they will sometimes fail in arresting the disorder. As soon as the fomentations have produced sufficient relaxation, Atropine should be instilled, with the view of producing immediate dilatation. If, however, there is closure of the pupil, and especially if the deeper structures of the eye have become involved, no time should be lost in making an extensive iridectomy, provided there is no purulent exudation,

but it will not do to resort to this measure if there are any indications of suppuration.

So far as internal treatment is concerned, the chief reliance must be on Merc. and Kali iod., with such other remedies as special symptoms may from time to time indicate. See *Sympathetic Ophthalmia*, *Iritis*, and *Choroiditis*.

ART. VII.—IRIDO-CHOROIDITIS.

The preliminary remarks made under the head of cyclitis, apply with equal force to irido-choroiditis, to-wit, that inflammation of any portion of the uveal tract may originate in the same, or in any other portion of it, and gradually spread through contiguous parts until the whole tract becomes involved. The same is likewise true respecting the various forms of inflammation to which each particular part is subject; but we shall confine our attention at present to the consideration of the two principal varieties commonly met with in practice, namely: (1) *simple* or *serous*, and (2) *pseudo-membranous irido-choroiditis*.

1.—SIMPLE IRIDO-CHOROIDITIS.

SYMPTOMS.—This form of irido-choroiditis generally sets in with the usual symptoms of simple iritis, such as ciliary irritation and episcleral injection, abnormal appearance and discoloration of the iris, distension and varicose condition of its veins, sluggishness of the pupil, etc., to which is added, unless prevented by treatment, complete adhesion of the pupillary margin to the anterior capsule, (*annular synechia*), thus cutting off all communication between the anterior and posterior chambers of the aqueous humor. This closure of the posterior chamber necessarily destroys the balance of intra-ocular tension before and behind the iris, causing the latter to be pressed forward into the anterior chamber, either in the form of a circular cushion, or, as is more frequently the case, in the shape

of irregular knobs or protuberances, due to the unequal resistance offered by different portions of its tissue. These knob-like projections are sometimes so extensive as to reach the posterior surface of the cornea, from which the pupillary margin of the iris suddenly recedes, giving to the central portion of the membrane a cup-like appearance, while the outer portion slopes gradually towards the circumference. If, now, an artificial communication be made between the two chambers, a yellowish watery fluid will flow out from behind the iris, the pressure upon the two surfaces will be equalized, the knob-like projections will recede, and the membrane again resume its normal position. And since this will occur in whatever portion of the iris the iridectomy is done, it is plain that the irregularities are not due to plastic exudations on the posterior surface of the iris, but to an unequal distension of portions of its tissue, in consequence of an increase of intra-ocular pressure behind it arising from exclusion of the pupil. This exclusion, it will be remembered, may exist either with or without an open pupil, the only essential condition necessary to constitute it being an adhesion of the entire circumference of the pupil to the posterior capsule, so as to shut off all communication between the two chambers. (See *Iritis*.)

The tension of the globe varies greatly at different periods. At first it is generally normal, or nearly so; then it is more or less increased; afterwards, as the disease progresses and the inner structures become atrophied, the tension diminishes, until finally the globe becomes quite soft.

If the pupil is in a condition to admit of an ophthalmoscopic view of the interior of the eye, the vitreous humor will generally be found to exhibit more or less cloudiness, mostly of a diffuse character, but here and there interspersed with flocculent tufts, and delicate leaf-like or moss-like opacities. Sometimes the cloudiness is most marked in the vicinity of the ciliary body, especially when there is extreme tenderness in the ciliary region

but usually the opacity is general, showing that the inflammation has extended to both the ciliary body and choroid.

The vision always becomes greatly impaired, even when the pupil remains unobstructed. At first there is a mere haziness, which gradually deepens until the patient appears to be looking through a dense cloud. As the disease progresses, objects are seen with more and more difficulty, until finally the patient may be wholly unable to recognize them.

The etiology, prognosis and treatment will be considered in connection with

2.—PSEUDO-MEMBRANOUS IRIDO-CHOROIDITIS.

SYMPTOMS.—This form of irido-choroiditis is characterized by the development of thick, tough masses of false membrane and plastic lymph upon the posterior wall of the iris and the anterior capsule, to the latter of which they adhere. The communication between the two chambers being thus cut off, the iris, and with it the lens to which it is attached, yielding to the intra-ocular pressure, is pushed forward into the anterior chamber, rendering it more and more shallow, until the pupil, which in these cases is not retracted, appears just behind the cornea. The iris is generally very much discolored, its fibrillæ obscured, its tissue stretched, and its surface covered with large tortuous vessels, due to venous engorgment, the latter arising from obstruction of the circulation caused by inflammation of the ciliary body and choroid.

The course of the disease varies according as the inflammation begins in the iris or choroid. In the former case, the symptoms of iritis predominate. The episcleral injection of the corneal zone is generally well developed, and there is also more or less ciliary irritation and pain. The ocular conjunctiva frequently participates in the congestion, which is mostly of a venous character; and, as in other cases of acute iritis, the palpebral conjunctiva and lids are apt to be more or less

swollen and inflamed. The iris is generally somewhat discolored, the pupil sluggish or immovable, and the aqueous humor sometimes cloudy or turbid. At a later period, the ciliary region becomes sensitive, and the vitreous humor more or less opaque, showing that the inflammation has reached the ciliary body. On the other hand, when the inflammation begins in the choroid, the first and most marked symptom is, a sudden and often very great loss of the power of vision, arising chiefly from diffuse opacity of the vitreous humor. Pain if present is not usually very great, nor is there generally much photophobia. The vascular injection of the superficial tissues is also very slight, and occasionally it is entirely absent. The retina generally becomes detached, in consequence of which the field of vision is more or less contracted. As the disease progresses, the posterior portion of the lens frequently loses its transparency, and the ciliary region becomes sensitive and painful. Subsequently, as a general rule, the iris becomes discolored, and its veins tortuous and enlarged; the pupil contracted, adherent, and more or less obstructed; the aqueous humor cloudy and perhaps flocculent; the anterior chamber greatly diminished by the bulging forward of the iris; and the ciliary injection and neuralgia frequently augmented. The tension of the globe, which at first was somewhat increased, now begins to diminish, and unless the disease is speedily arrested, symptoms of atrophy and degeneration set in, the globe ultimately becoming soft, and vision extinct. These changes, though progressive, are often interrupted and irregular, being sometimes acute and rapid, at others slow, insidious and variable.

ETIOLOGY.—The causes of irido-choroiditis are in many cases the same as those of iritis, the extension of the inflammation to the ciliary body and choroid depending, in most instances, upon the location, extent, severity and duration of the irritation or injury; and especially upon the presence of extensive posterior synechiæ, which, when complete or nearly

so, lead to the frequent renewal of iritis, and to a gradual extension of the inflammation to the other portion of the uveal tract. Sympathetic irritation may also give rise to it, as we shall find when we come to treat of "sympathetic ophthalmia."

PROGNOSIS.—The prognosis differs very much, according to the character and extent of the pathological changes. It is only in recent and uncomplicated cases that we may reasonably expect to effect a satisfactory cure, or even to restore the vision to anything like a normal standard. On the other hand, if the disease is already of some standing, if there is complete adhesion of the pupillary margin to the anterior capsule, if large masses of false membrane exist between the iris and lens, and especially if extensive lesions of the choroid, opacity of the lens, or detachment of the retina has occurred, the prospect of cure is so slight as to render the prognosis very unfavorable. Some of these conditions, however, may be relieved; and so long as the field of vision is good, and the sight but little impaired, the case cannot be considered altogether hopeless, even though a certain amount of atrophy has already taken place.

TREATMENT.—Recent cases require no other treatment than that given under the heads of iritis, cyclitis and choroiditis, (which see). Those of longer standing will require that the operation of iridectomy shall be performed, perhaps repeatedly, both for the purpose of relieving intra-ocular tension, and of breaking up adhesions between the iris and anterior capsule. In pseudo-membranous irido-choroiditis this is extremely difficult to accomplish, partly in consequence of the shallowness of the anterior chamber and the rotten condition of the iris, but chiefly on account of the extent and firmness of the adhesions, which generally require the sacrifice of the lens. This, however, is of but little consequence in these cases, as both the lens and capsule are generally opaque. Von Graefe, in order to facilitate the operation, recommends the previous

extraction of the lens; while Bowman performs what he calls "excision of the pupil," by cutting out with scissors a square portion of the iris, including the pupil, and afterwards removing it, along with the attached membrane, with forceps. If the lens is opaque, or if it is dislocated or wounded in the operation, it should be removed at the same time. These operations are very apt to excite fresh attacks of inflammation; but nevertheless it is necessary, in order to relieve the undue tension and prevent subsequent attacks of recurrent iritis, to re-establish communication between the two chambers at the earliest practicable moment. When this is satisfactorily accomplished, the vision often clears up in a remarkable manner, and even atropic symptoms, when not too far confirmed, are sometimes arrested; the eye frequently regaining to some extent its normal condition and fullness.

ART. VIII.—OPHTHALMIA POST-FEBRILIS.

A peculiar form of irido-choroiditis, occurring in connection with the so-called recurrent typhoid fever, and which has been referred to mal-nutrition and starvation, has been described by Mackenzie and other writers. We shall notice it briefly under the head of

POST-FEBRILE OPHTHALMIA.

SYMPTOMS.—This form of ophthalmia, which is generally confined to one eye, is characterized by inflammation of the iris and opacities of the vitreous humor. The disease does not usually manifest itself until several weeks after the last attack of fever has been subdued. The iritis is not generally very severe, seldom resulting in entire closure of the pupil, though frequently giving rise to scattered posterior synechiæ, and sometimes to hypopium. The adhesions are limited to the pupillary margin, and are generally easily overcome by the

energetic use of Atropine ; but the disturbances of vision, which in the latter stages are chiefly due to purulent and flocculent opacities of the vitreous, frequently remain long after the more acute symptoms have been subdued. The disease, however, generally pursues a comparatively mild course; and, after lasting ten or twelve weeks, usually ends in entire recovery. It seldom attacks children under ten years of age ; but when it does, it is said to run a shorter, and in most cases a milder course, than when the patient is more mature.

ETIOLOGY.—The chief cause is supposed to be an impoverished state of the blood, resulting from mal-nutrition ; but the true nature of its connection with recurrent fever is not known. Some authorities attribute it to leucocythæmia, or an excess of white cells in the blood ; but, as Stellwag observes, this assumption is rendered very doubtful by the fact that the ophthalmia usually makes its appearance long after the last febrile attack, and, therefore, after the quality of the blood has become essentially improved.

PROGNOSIS.—As already stated, the disease is seldom followed by any very serious consequences to vision, as the opacities are generally soon absorbed, and the synechiæ can commonly be broken up. Cases complicated with hypopium are, however, more serious, and sometimes terminate in atrophy of the globe.

TREATMENT.—We have already treated so fully of the remedial measures required in this disease, that to give them here would only be to repeat what we have said as to the therapeutic indications and local treatment of iritis, (which see).

ART. IX.—OPHTHALMIA SYMPATHETICA.

It has long been known that when one eye has become diseased, or has been severely injured, the other eye is liable to become sympathetically affected, especially if the causes or circumstances which first give rise to the disorder are continued ;

but it has only been within a few years that sympathetic inflammation of the eye has attracted the attention which its importance demands. This form of inflammation is peculiar, since it does not follow operations for cataract or iridectomy, nor the loss of an eye from suppurative inflammation. The liability to the sympathetic affection appears to be greatest in cases in which the injured eye remains irritable and sensitive after recovery from the immediate effects of the accident; as when a foreign body penetrates the eye, and, by remaining within it, keeps up a constant irritation, and finally excites sympathetic inflammation in the other eye. The affection thus excited is denominated

SYMPATHETIC OPHTHALMIA.

By "sympathetic ophthalmia" is understood a peculiar form of inflammation set up in a previously sound eye by an injury inflicted upon the other eye. It generally assumes the character of an insidious but malignant irido-cyclitis. In some cases the symptoms supervene within a short time of the infliction of the injury; but in others the wounded eye appears to recover from the inflammation caused by the accident, and may continue in this condition for months without exciting any apprehensions of approaching danger, when fresh symptoms unexpectedly arise, the injured eye again becomes injected and painful, and soon the sound eye becomes sympathetically affected. This is especially apt to occur where the injury is caused by a bit of steel, or other metal, which, by remaining in the eye, afterwards sets up the usual suppurative process of elimination about the offending substance. In other instances, again, the wounded eye, especially if the injury happens to be in the ciliary region, instead of becoming quiescent, never fully recovers, but remains in a state of low inflammation, which greatly impairs the safety of the other eye.

SYMPTOMS.—The symptoms vary considerably in different

cases. The most constant are: temporary disturbances of vision, accompanied with a gradual diminution of sight in the sound eye; discoloration of the iris; effusion of lymph upon its posterior surface and in the pupillary area; adhesion of the iris to the anterior capsule; exclusion of the pupil; increased intra-ocular tension; and, if not arrested, partial atrophy followed by softening of the globe. These symptoms are generally accompanied by more or less ciliary neuralgia, photophobia and lachrymation; but in some cases there is neither orbital nor circum-orbital pain sufficient to attract attention, though the ciliary region is almost always sensitive to pressure. Occasionally, the disease manifests itself chiefly by amblyopic symptoms, either with or without photophobia; and Von Graefe describes a rare form of the affection in which the retina is implicated. In these cases there is little or no pain; the vision is greatly impaired, and the power of accommodation is almost wholly lost. The ophthalmoscope reveals congestion of the optic nerve; the retinal veins are sometimes found to be dilated and tortuous; and, in cases connected with increased hardness of the globe, especially such as occur in advanced life, there is frequently exhibited a glaucomatous excavation of the optic disc.

ETIOLOGY.—The most frequent causes of sympathetic ophthalmia are: penetrating wounds in the ciliary region, especially such as are accompanied with loss of vitreous or wounding of the lens; severe laceration or bruising of the eye, followed by ciliary irritation and unattended with general suppuration; foreign bodies, such as chips of metal, glass, stone, etc., lodged within the eye; intra-ocular hemorrhages; contraction, degeneration, or calcification of extensive fibrous deposits within the eye, especially when implicating the ciliary body; and, when the stump remains irritable, the wearing of artificial eyes. In short, any injury which is capable of exciting prolonged irritation of the ciliary nerves, may give rise to

sympathetic irritation or inflammation of the other eye; and, as stated by Wells, this is frequently found to occur at a spot of the ciliary region which corresponds symmetrically to that at which the injured eye was hurt, or at which the ciliary region still retains its sensibility to the touch.

PROGNOSIS.—This is so unfavorable as to afford very little ground for hope after the disease has become fully established. It therefore becomes the imperative duty of the surgeon to warn the patient in time of the very serious nature of his complaint, impressing upon him the fact that, nothwithstanding the long period which may have elapsed since the original injury was received, and the apparently trivial character of his present symptoms, their presence constitutes an insidious source of mischief to the other eye, and that unless he speedily avails himself of the only effective treatment known to the profession, even that will prove unavailing, and vision will be surely and irretrievably lost.

TREATMENT.—The most efficient, and, in the vast majority of cases, the only efficient treatment, either preventive or curative, consists in the early removal of the injured eye. Not that every considerable injury, even when involving the ciliary region, requires the loss of the injured eye in order to insure the safety of its fellow, for the observance of such a rule would cause many an eye to be needlessly sacrificed. But since no case of sympathetic ophthalmia is known to have originated after the injured eye has been removed, and since its removal generally arrests the disease in the other eye, when the operation is performed immediately after the latter becomes affected, it follows that if the power of vision is lost in the injured eye, and there is no prospect of its restoration, there can be no question as to the propriety of immediately enucleating it. But the case is different if the sight continues tolerably good in the injured eye, or even if only a limited degree of it remains, especially if the sympathetic disease has already

made considerable progress, since the chances are that in these cases the injured eye will finally prove more serviceable to the patient than the other. Again, it may be regarded as an established fact, that the performance of any operation upon the affected eye during the height of the sympathetic disease not only fails in arresting its progress, but actually tends to increase it. No benefit, therefore, can be expected from iridectomy, unless it be performed at the very outset of the disease, before active inflammatory symptoms have set in, or is postponed until by treatment or otherwise they shall have measurably subsided. In the latter case, the operative measures indicated will consist in the performance of an extensive iridectomy, together with the removal of the lens, capsule, and adherent masses of exudation. Such an extensive operation will necessarily be attended with considerable danger, not only by directly increasing the inflammatory process, but by giving rise, in many cases, to profuse intra-ocular hemorrhage. The weight of authority, therefore, especially in this country, is in favor of immediate enucleation, in preference to iridectomy or any other operative procedure, in all cases in which there is any doubt of a favorable termination.

ENUCLEATION OF THE EYE-BALL.

The removal of the eye-ball, which before the introduction of anæsthetics was regarded, even by the profession, as an operation of the most formidable character, has since been divested of all its terrors, and, under the improved method of doing it, will hereafter be considered as one of the most simple and trivial nature.

The patient having been fully anæsthetized, the eyelids widely separated by the stop-speculum, (Pl. II. Fig. 33), and the globe steadied with a pair of fixing forceps, (Figs. 36, 37), the surgeon divides the conjunctival and sub-conjunctival tissues close to the edge of the cornea. He then introduces a strabismus hook (Pl. I. Fig. 17) beneath the recti-muscles, one after the other, and divides them close to their insertion; after

which he carries a pair of curved scissors behind the globe and severs the optic nerve as far back as possible. The eye now springs forward from beneath the lids, and may be easily seized with the fingers and lifted from the socket, when the remaining muscles and conjunctival attachments are to be cut away, and the operation is finished.

The hemorrhage, which ensues when the optic nerve and ophthalmic artery are divided, is generally soon arrested by injections of cold water; if not, it may be readily controlled by placing a piece of sponge in the orbital cavity and applying a compress and bandage. In the course of twenty-four hours, or sooner if the dressings are very painful, the sponge should be removed, and the orbit cleansed with a little tepid water, after which cold wet compresses should be applied for a few days, or until the discharges cease. The extremities of the severed muscles and optic nerve soon become covered over with a cicatrix composed of the contracted edges of the conjunctiva, and the stump thus formed is found to be well adapted for the adjustment of an artificial eye, the insertion of which need not generally be delayed more than two or three weeks after the performance of the operation.

ART. X.—GLAUCOMATOUS IRIDO-CHOROIDITIS.

The terms *glaucoma* and *glaucomatous*, signifying of a sea-green color, have been in use ever since the days of Hippocrates, by whom they were used to designate every form of deep-seated opacity. Afterwards they were limited to vitreous opacities and cataracts, which, occurring for the most part in advanced life, present a greyish or greenish appearance. Still later, the terms were applied to a particular form of ophthalmia, which, as it occurs chiefly in gouty subjects, is sometimes denominated arthritic. But since the invention of the ophthalmoscope, in 1851, our knowledge of the internal diseases of the eye has been greatly advanced, the various pathological changes occuring in the choroid, vitreous, retina and optic nerve disc have been carefully studied and described, and as a consequence, the above terms are now used with much greater precision than ever before. By glaucoma, therefore, we no longer mean simply that condition of the globe which is marked by stony hardness with its associated symptoms, but also the previous abnormal conditions or diseases which give rise to it. We shall here treat only of the primary forms; the secondary will be considered in connection with the diseases with which they are associated.

1.—ACUTE INFLAMMATORY GLAUCOMA.

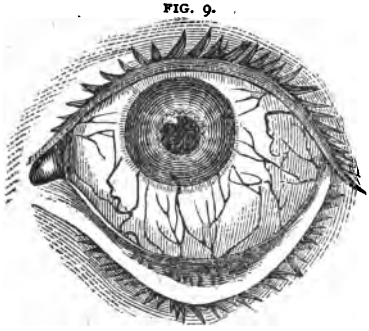
ARTHRITIC OR VENOUS OPHTHALMIA.

SYMPTOMS.—*Premonitory Stage.*—In by far the larger number of cases, the disease is preceded by certain premonitory symptoms, such as repeated attacks of cephalalgia; neuralgic pains in the forehead and temples; more or less venous congestion, which, however, is always slight during the premonitory stage; indistinctness of vision, arising chiefly from disturbances in the circulation, and coming on periodically; the appearance of a colored halo, like a rainbow around a flame, due probably to congestion; dilatation and sluggishness of the pupil; more or less cloudiness of the aqueous and vitreous humors; and, occasionally, a slight variation in the field of vision. But the chief characteristic symptom, and that on which most of the above-mentioned signs depend, is a gradual increase in the tension of the globe, which, however, never becomes very considerable during this stage, and is sometimes said to be entirely wanting. But this symptom is of such high importance, that whenever observed it should always excite our suspicions, especially if any of the before-mentioned signs co-exist. At the same time we should be on our guard against mistaking the *subjective* sense of tension or fullness within the eye for the *objective* sense of hardness, which may and often does exist without any real increase of tension.

At first, and during the premonitory stage, these symptoms are more or less periodic, that is, they occur at intervals of longer or shorter duration, with a period of complete intermission between them; but sooner or later the intermissions cease, or are superceded by remissions only, certain symptoms belonging to the disease remaining permanently, and constituting what is called

CONFIRMED GLAUCOMA.—*Glaucoma Evolutum or Confirmatum.*—After a longer or shorter duration of the premonitory stage—which in some cases lasts for years, although it generally extends over only a few months, and may even be limited to the first two or three attacks—the glaucoma breaks out suddenly, with symptoms of high inflammation; the patient is seized with an intense headache and excruciating ciliary neuralgia, the pain shooting from the orbital and sub-orbital regions to the forehead, temple, face and occiput. The pain is always more or less remittent in its character, becoming greatly intensified on the approach of night, and is frequently accompanied with photopsy, or flashes of light. It is also frequently associated with cold or icy sensations, attended with a feeling of numbness, or anæsthesia, in and around the affected eye, and in the corresponding side of the head. At the same time there is generally more or less febrile excitement, accompanied in some cases with nausea and vomiting. The eyelids are often red and swollen, the superficial tissues infiltrated and injected, and the veins greatly engorged. The vascularity bears a general resemblance to that of simple irido-choroiditis, but differs from it in the following particulars. The corneal zone, while it has a similar disposition about the cornea, is composed of vessels exhibiting more numerous anastomoses, a deeper and more livid hue, and a sort of varicose enlargement; but that which chiefly distinguishes the episcleral injection is a whitish or bluish-white ring, frequently more or less incomplete, and about the fourth of a line in breadth, which separates the vascular zone from the edge of the cornea, and called the *venous circle.* Sometimes the chemosis is so great as to completely hide the episcleral vascularity quite up to the circumference of the cornea. The conjunctival injection consists of large vessels,

FIG. 9.



ACUTE GLAUCOMA.

tortuous and more or less varicose, their trunks turned towards the great fold of the palpebral conjunctiva, and their branches ramifying by bifurcation; those on the border of the cornea anastomosing here and there with branches from the other vascular trunks. (*See Fig. 9*). There is generally considerable photophobia and lachrymation, but not much mucus discharge. The latter presents some peculiar features. In consequence of the frequent motion of the lids, the mucus collects on their edges, or in the angles and folds of the conjunctiva, in the form of white froth or foam; this is the "arthritic foam" of the old authors.

To complete the picture, the cornea becomes nebulous on its posterior surface; the anterior chamber shallow, so that the iris is nearly or quite in contact with the membrane of Descemet; the aqueous humor cloudy; the iris more or less discolored; the pupil dilated, irregular and sluggish; the vitreous humor hazy and opaque; and the globe abnormally hard. Vision is either entirely lost or greatly impaired; in the latter case the field is generally contracted. As the inflammatory symptoms subside the blindness may continue, but this is not the general rule; the sight may be fully restored. This, however, is only temporary. The acute inflammatory attacks continue to recur, the visual field becomes more and more contracted, and finally the sight is entirely lost. At the same time the globe becomes more and more tense, until finally it reaches a state of stony hardness. In other cases the inflammatory symptoms subside permanently, but still the eye does not recover its normal condition. The inflammation continues in a low form and becomes chronic; the glaucomatous

degeneration increases more and more; and finally all perception of light, even quantitative, is lost. This state, called by way of distinction *glaucoma absolutum* or *consummatum*, is sometimes, but very rarely, reached within a few hours, and sometimes even within a few minutes, of the setting in of the attack. This last variety, known as *fulminating glaucoma*, is distinguished from the ordinary acute form by the rapid development of glaucomatous symptoms, especially by the sudden and complete destruction of vision, followed by atrophy and degeneration of the deep-seated tissues of the globe.

The ophthalmoscopic symptoms, as well as the etiology, prognosis and treatment, will be given after the other forms of glaucoma have been described.

2.—CHRONIC INFLAMMATORY GLAUCOMA.

In our description of acute glaucoma we alluded to the fact, that after the subsidence of the acute attack, the disease frequently passed over into the chronic form. It may, however, be developed insidiously from the prodromal or premonitory stage.

SYMPTOMS.—Chronic inflammatory glaucoma, when developed from the acute, generally assumes at first a sub-acute form, at which degree it continues, with more or less decided exacerbations and remissions, for a few weeks, after which the inflammatory symptoms become less and less conspicuous, while the glaucomatous process itself continues slowly to advance. Thus, the globe gradually becomes harder and harder, until at last it reaches the highest point of tension. (Tn. 3). The cornea becomes hazy, less convex, and more and more anæsthetic, until finally, in some cases, it loses all sensibility. The sclera becomes atrophied and more or less translucent, assuming at last a peculiar waxy or porcelain tint. The episcleral veins are engorged and tortuous, the anterior chamber is narrowed by the pushing forward of the iris until the

latter almost rests upon the cornea, the aqueous humor is rendered cloudy or turbid, the pupil is dilated and either sluggish or immovable, and the iris loses its brilliancy, becoming more or less maculated and discolored. The diminution of sight generally keeps pace with these changes, and at the same time the field of vision becomes more and more contracted. At last the sight is entirely destroyed, not even a trace of sensitiveness to light remaining. This state is generally characterized by a pale, greenish opacity of the lens, constituting the so-called glaucomatous cataract. This symptom is not due, as is generally supposed, to degeneration of the lens, but to the combined effect of the mixing of the yellow color of the lens, peculiar to elderly people, with the bluish-grey color of the aqueous humor, which the latter assumes after it has become cloudy and turbid. The effect of this green reflex is somewhat heightened by the greyish opacity of the vitreous and the dilated state of the pupil. While glaucomatous cataract is generally due to changes developed in the course of the disease, it is not, as was formerly considered, an essential, and consequently not a pathognomonic, symptom of glaucoma.

Although absolute glaucoma may exist for a long period without any very striking changes in the symptoms, the above result is not generally reached without the recurrence, at longer or shorter intervals, of inflammatory attacks and exacerbations; but these are usually of a low and insidious character, and are seldom attended, as in the acute form, with any very great amount of pain or suffering. Occasionally, however, acute inflammatory exacerbations occur, attended with headache, ciliary neuralgia, photopsy, etc.; and these may recur from time to time, either spontaneously, or as the result of external causes. At a later period the stage of atropic degeneration sets in; the iris becomes greatly narrowed, and is reduced to a mere streak, the cornea is softened and rendered opaque,

hemorrhagic effusions take place in various portions of the globe, the choroid and retina degenerate, sclerotic staphyloma are produced, followed, it may be, by suppurative inflammation and general atrophy.

3.—CHRONIC NON-INFLAMMATORY GLAUCOMA.

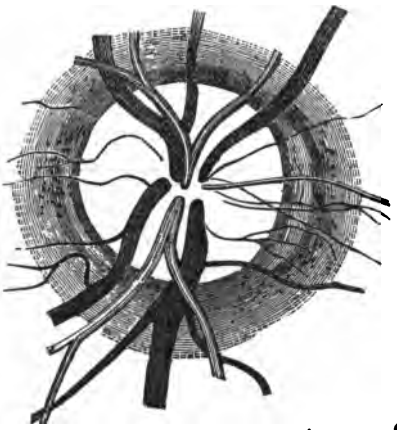
GLAUCOMA SIMPLEX, OF DONDERS.

SYMPTOMS.—This form of glaucoma is chiefly characterized by the absence during the earlier stages, and sometimes during nearly its entire course, of any appearance of inflammatory symptoms. The only symptom that at first is apt to attract attention, is a gradually increasing weakness of vision; and this, in the absence of other symptoms, is generally attributed to the approach of old age. The defect is most apparent for near vision, as in reading, writing, etc., though in many cases it is also well marked for distance. Owing to the absence of premonitory symptoms, the approach of the disease is generally very insidious; and so quietly does it advance, that the patient is often unaware of his danger until after it has made considerable progress. Careful examination, however, will generally detect an increase of tension in the weaker eye, accompanied with rapidly increasing presbyopia and more or less hypermetropia. As the disease advances the tension of the globe increases, the cornea loses its sensibility, the ciliary veins become congested, the pupil is sluggish and more or less dilated, the anterior chamber becomes shallower, the field of vision is progressively narrowed, and the sight more and more diminished, until finally all perception of light is extinguished. The disease seldom runs its course, however, without the accession of inflammatory symptoms, which may be more or less violent according to the type of the inflammation. When acute, the symptoms of acute glaucoma will be superadded to those above-mentioned; and in all cases there will be more or less ciliary neuralgia, cloudiness of the aqueous and vitreous

humors, increase of intra-ocular tension, etc. These symptoms, however, may be so slight and transitory as scarcely to attract attention, and in some cases will be likely to escape detection unless particular attention be paid to the objective symptoms, such, for example, as a slight discoloration of the iris, or some cloudiness of the aqueous humor.

OPHTHALMOSCOPIC SYMPTOMS.—These are: (1) a characteristic "cupping" of the optic nerve disc; and (2) pulsation of the retinal arteries. The glaucomatous, or "pressure" excavation, as the cupping of the optic papilla is sometimes called, is easily distinguished from the other two forms; namely, from what is known as the congenital or physiological excavation, and also from that which characterizes simple atrophy of the optic nerve, by not being partial or limited to the central portion of the optic disc, as in the former, nor by a gradual sloping from its edges, towards the centre, as in the latter; but the cup extends quite up to the edge of the disc, from which the lamina cribrosa suddenly retreats, as if pushed directly backward by the increased intra-ocular pressure. Indeed, so abrupt and precipitous are its edges, that the latter may even over-hang the cup, as though the margin were undermined. The cupping of the papilla is made apparent by the course of the retinal vessels as they pass over the edge of the excavation. Instead of passing straight over the margin of the disc, as in the normal eye, (Fig. 10), we find that as they descend into the excavation they make a more or less abrupt curve; and if the edges of the excavation are undermined, the veins, as they curl over them, appear to be so much displaced, that when they reappear on the optic disc they no longer

FIG. 10.



OPTIC PAPILLA, NORMAL. *

*After ZANDER.

seem to be the same vessels. This is especially the case if the excavation is deep, the displacement sometimes equaling, or even exceeding, the diameter of the vessel.

Spontaneous pulsation of the retinal veins is a common occurrence in healthy eyes; but spontaneous arterial pulsation is known to occur only in cases where there is insufficiency of the aortic valves, or where the intra-ocular tension is considerably increased. The pulsation is generally limited to the optic disc, and is of a rapid and somewhat jerky character.

ETIOLOGY.—Many theories have been advanced to account for the glaucomatous process; of these not more than three appear to be of sufficient importance to claim our attention. The first attributes the increased eye tension, and excavation of the optic disc, to hypersecretion of the fluids of the eye, the result of some abnormal irritation of the secretory nerves, which irritation is regarded as a reflex from the sympathetic. The second attributes the glaucomatous symptoms, primarily, to inflammation of the uveal tract; the other structures of the eye becoming secondarily involved. According to this theory, the irido-choroiditis first gives rise to hypersecretion of the vitreous humor, and this causes an increase of the intra-ocular tension, which latter, by its interference with the circulation, occasions the glaucomatous symptoms. The third and last theory which we shall notice, attributes the disease to a want of elasticity in the sclerotica. The fact that glaucoma is pre-eminently a disease of advanced life, and generally attacks only those whose age exceeds forty or fifty years, in whom the sclerotica appears comparatively rigid and unyielding, is regarded by the advocates of this theory as furnishing conclusive evidence that the disease is due to congestion in the internal circulation caused by a rigid and unyielding capsule. We have not room to examine these theories in detail, but are inclined to regard the inflammatory theory as the most tenable, notwithstanding the fact that some cases

of glaucoma simplex seem to run their course without any, or at least with but very little, appearance of inflammatory symptoms. It should be remembered, however, (1), that the absence of any external, or of any subjective signs of external inflammation, is no proof of its non-existence, the contrary having been frequently established by ophthalmoscopic evidence; and (2) that, in the vast majority of cases, inflammatory symptoms of greater or less severity do show themselves at some period of the disease. On the other hand, there can be but little doubt that rigidity of the sclerotica has more or less to do with the origin and progress of glaucoma. For, as Wells very appropriately observes, we find that in youthful individuals, in whom the sclerotica is more elastic and yielding, an increase of the intra-ocular tension, dependent upon some inflammation of the uveal tract, may exist for some time without exerting any deleterious effect upon the optic nerve or retina.

PROGNOSIS.—Previous to the year 1856, when Von Graefe discovered the value of iridectomy in this disease, glaucoma was justly regarded as incurable; for the disease is of such a progressive and destructive character, that if left to itself, or if treated exclusively by other remedies, it leads, sooner or later, to atrophy and permanent blindness. On the other hand, so effective has the operation of iridectomy proven in relieving intra-ocular tension, and in arresting the progress of the disease, that in those cases in which irreparable damage to the structures of the eye has not yet taken place, the glaucomatous symptoms have been greatly benefited, and in most cases have entirely disappeared. Much, however, depends upon the kind as well as the stage of the disease. Glaucoma fulminans, from the rapidity with which it runs its course, is extremely dangerous. Secondary glaucoma, especially that which supervenes upon hemorrhagic effusions, is equally dangerous, the operation either proving inefficient, or else complicating the

disease by increasing the hemorrhagic effusion. The prognosis in the latter stages of acute glaucoma, as well as in the chronic inflammatory form, must be guarded; since in the first case there may already be such a deterioration of the retina, and cupping of the optic nerve, as to render any improvement from the operation temporary and imperfect; and in the latter, the progress of the disease is so insidious, that serious structural changes of the retina and optic nerve, and especially atrophy of the latter, may occur before treatment is instituted.

TREATMENT.—As already indicated, operative measures stand at the head of remedial agencies in this affection; and of these iridectomy is incomparably the most efficient. When we take into consideration the fact that in the early stages of glaucoma, iridectomy is almost a certain cure for it, it is evident that to postpone the operation a single day after the disease fully declares itself, is to incur a great and unnecessary risk. It is true the operation sometimes cures even in the later stages, and in nearly all cases it proves palliative, but in order to insure the greatest benefit from it, the sooner it is performed the better. The operation is similar to that already described, (*see Iritis*), except that the incision is made in the sclerotica, near its junction with the cornea, instead of being made in the cornea itself, in order that by extending the incision quite up to the ciliary border, a larger section of the iris may be secured; for the same reason, also, the opening is made as large as the keratome will allow. In no other way can the intra-ocular tension be so effectually and permanently relieved. Neither myotomy, or division of the ciliary muscle, nor paracentesis, nor the more recent operation of sclerotomy, can compare in effectiveness with a large iridectomy. Even a smaller iridectomy, such as is made through the cornea for artificial pupil, is not likely to be followed by permanent and satisfactory results.

But while there can be no question as to the propriety of

operating as soon as possible after the disease has fully declared itself, or after the congestive and inflammatory symptoms have ceased to intermit and have become remittent, the case is different during the purely premonitory stage. During this period we may reasonably expect to benefit the patient by the careful administration of well-selected constitutional remedies. This will be obvious when we take into consideration the fact that, in the great majority of instances, there co-exist various constitutional disturbances, such as rheumatism, gout, derangements of the menstrual function, hemorrhoids, etc., all of which are amenable to treatment, and which exercise more or less influence upon the disease. But in order to prove curative they must be administered during the period of intermission: if used later than this they must possess the quality of reducing intra-ocular tension, otherwise they will prove to be of little or no benefit. We have as yet discovered no remedy which will surely and permanently produce this effect, although there are several medicines that are capable of causing the subjective symptom of tension within the eye. As before observed, we should be careful not to confound this symptom with the objective sense of hardness; but as the latter is probably due, at least secondarily, to hypersecretion of the ocular fluids, it is not at all unlikely that we may yet find remedies which are capable of reducing or limiting it, by causing, perhaps, a retrograde metamorphosis to take place within the affected tissues. However this may be, we should endeavor, with the light we now have, to equalize the circulation and remedy constitutional derangements, especially during the premonitory period.

THERAPEUTIC INDICATIONS.

Arsenicum.—Deep-seated throbbing pain in the eyeball, especially at night; photopsy; obscuration of sight, amounting at times to almost complete blindness; periodic burning

pains in and around the eye, worse at night or after midnight. Especially indicated in cases where there is an increase of the aqueous humor.

Belladonna.—Obscuration of sight, with dilatation of the pupils; rapidly increasing presbyopia; hypermetropia; rainbow colors around flames, especially when the red predominates; aching pressure within the eye; also burning pains in and around the eye, especially when accompanied with congestion to the head and face. The best results are obtained by using the remedy tolerably high, say the 200th, never less than the 30th.

Bryonia.—This remedy is indicated when there is soreness to the touch in the ciliary region, accompanied with sharp shooting pains in the eyes, extending to the head and face; also when there is a sense of fullness and pressure, as though the eyes were being forced out of the sockets; aggravation of the pains by moving the eyes, or by any exertion of them in reading or writing, especially at night.

Cedron.—Severe ciliary neuralgia, especially when the pains are distinctly periodical; dilatation of the pupils, with dimness of vision; eyes injected and sore to the touch. This remedy is most useful in relieving ciliary irritation and neuralgia, especially when the pains appear to follow the course of the supra-orbital nerve.

Cimicifuga.—This is one of our most reliable remedies for ciliary neurosis, especially when there is a sense of enlargement of the globes, the eyes feeling as though they would be pressed out of the sockets; also when there are amblyopic symptoms, with dilated pupils; or congestive headache, with aching in the eyes and lachrymation.

Conium.—Dilatation of the pupils, with dimness of sight, especially when accompanied with protrusion; feeling of pressure in the eyes, especially when reading, writing, or doing any fine work; also for photophobia and photopsy, particularly in scrofulous subjects.

Gelseminum.—Amaurotic symptoms, with dilatation of the pupils; disturbances of the power of accomodation; pain in the eyes, either with or without lachrymation. Especially indicated in choroidal and venous congestions, either with or without serous effusion.

Hamamelis.—This remedy is indicated in all venous congestions of the eye associated with hemorrhoids, especially if there is much conjunctival vascularity, ciliary neuralgia, photophobia and lachrymation.

Kali iod.—Amaurotic symptoms, with dilatation of the pupils; burning in the eyes; lachrymation, and a dull, discolored state of the iris. This remedy, which is of undoubted value in every form of choroidal congestion and inflammation, has appeared to give relief in many cases of incipient glaucoma, especially when occurring in syphilitic constitutions.

Phosphorus.—This remedy has been found useful in glaucoma, especially when accompanied with determination of blood to the eyes, photopsy, photophobia, cromopsia, or play of colors around flames, and lachrymation; also when attended with a sensation of pressure in the eyes, dimness of vision, and dull orbital and circum-orbital pains.

Phytolacca.—Dimness of vision, with hypermetropia or rapidly increasing presbyopia; dull, aching pain in the eyeballs, worse from motion, light, or exercise. Especially suited to rheumatic and syphilitic cases.

Rhododendron.—Incipient glaucoma, accompanied with violent attacks of pain in the orbit and head, always worse on the approach of rough weather, or of a thunder storm, and ameliorated when the storm sets in. The pains are of a burning, shooting character, and distinctly periodical. The remedy is best adapted to rheumatic subjects.

Spigelia.—Sharp stabbing pains through the eye and corresponding side of the head, worse at night and on motion. The remedy is particularly indicated if, along with dimness of vision, there is presbyopia, strabismus, or photopsy.

Sulphur.—This medicine is generally most useful as an intercurrent remedy, especially in scrofulous cases. The special indications are; gradual diminution of the power of vision; illusions of sight, photopsy and photophobia; sharp, sticking or stabbing pains in the eyes, worse on motion and at night.

In addition to the above remedies, the following have also been recommended: Arn., Cham., Cocc., Colch., Collin., Colocynth, Crot. tig., Hepar, Merc., Nux v., Prunus spin., Val. zc.

DIET AND REGIMEN.—The diet should be liberal, nutritious, and easily digestible, especially for scrofulous constitutions and elderly patients. Stimulants should be avoided by all except those addicted to their use, and then used only in a feeble state of the system, the object being in all cases to keep the health in the best possible condition. Bright light should always be avoided, or the eyes protected by amber or smoke-colored glasses. The eyes should enjoy perfect rest during the attacks, or when the latter follow each other in quick succession; and in no case should they be used for near objects, or when exercise causes pain or provokes an attack.

ART. XI.—CHOROIDITIS.

We have already considered anterior, or partial choroiditis, under the head of irido-choroiditis; and one of the most important and complicated forms of general choroiditis has been described under the head of glaucoma. It remains to consider (1) simple serous choroiditis; (2) disseminated or exudative choroiditis; (3) suppurative choroiditis; and (4) sclerotico-choroiditis posterior, or posterior staphyloma.

1.—SIMPLE SEROUS CHOROIDITIS.

SYMPTOMS.—This form of choroiditis is chiefly characterized by diffuse cloudiness of the vitreous humor and consequent diminution of vision. The disease is frequently complicated, sooner or later, with serous iritis, the iris becoming more or less discolored, the pupil dilated, or adherent to the anterior capsule, the aqueous humor hazy and more or less turbid from particles of floating lymph, and the posterior surface of the cornea clouded with similar deposits, (*Keratitis punctata*). The diffuse turbidness of the vitreous is rendered more opaque by fixed or floating opacities, of a filiform and membranous character, which, according to Graefe, affect the structure of the vitreous humor, leading to the destruction of its septa, and even to the dissolution of the zonule of Zinn. The relaxation and softening thereby produced frequently give rise to displacement of the lens. In other cases the intra-ocular tension increases, the aqueous humor is secreted in greater quantity, the vision becomes more and more impaired, and finally symptoms of glaucoma appear. These complications, however, rarely take place in simple serous choroiditis, the opacities of the aqueous and vitreous humors generally disappearing altogether, or leaving only a slight amount of cloudiness in the ciliary region.

TREATMENT.—Little more is generally required in the way of treatment, than to keep the eyes in a state of perfect rest, to protect them against bright lights, cold, dampness, etc., to keep the pupil dilated with Atropine, and to hasten the absorption of the vitreous opacities by the internal administration of Kali iod. In those cases in which the intra-ocular tension is increased, the operation of paracentesis may be tried; but if this fails to relieve, and secondary glaucoma sets in, it will probably be necessary to perform the operation of iridectomy, (which see). Aurum, Bryonia, Colocynth, Gelseminum, Ipecacuanha, Phosphorus, Psorinum, and Sulphur, have been employed in these cases with favorable results. (See *Glaucoma*).

2.—DISSEMINATED CHOROIDITIS.

SYPHILITIC OR EXUDATIVE CHOROIDITIS.

SYMPTOMS.—The subjective symptoms of this affection are often so light during the early stages, that its existence is frequently not suspected until after the disease has made considerable progress. There is generally little or no pain, photophobia, lachrymation, or vascular injection; the iris is but slightly implicated; and the only symptom of which the patient is apt to complain, is a peculiar impairment of sight, in which the vision is more or less obstructed and distorted by dark, fixed, cloud-like opacities appearing before it. These *scotomata*, as they are called, are supposed to be due to the dissemination or exudation of matter from the choroid upon the under surface of the retina, the pressure of which upon the latter impairs its function by injuring or destroying some of its elements. The injury to vision is, of course, greatest when the exudations are situated in the region of the yellow spot, and least when confined to the anterior portion of the fundus. The vitreous humor sooner or later becomes diffusely clouded, and frequently exhibits fixed or floating opacities, of a filimentous or membranous appearance. These vitreous opacities sometimes make their appearance previous to that of the choroidal exudations before mentioned. The latter, which are far the most important, vary in size from a millet seed to large circular patches. They occur both in the stroma and upon the retinal surface of the choroid. At first they are of a dull, yellowish color; but at a later period the exudative masses are absorbed, leaving the corresponding parts of the choroid so much thinned as to be more or less transparent, so that the subjacent sclera shines through the patches, giving them a somewhat pearly, glistening appearance. The patches are more or less irregular in shape, and are rendered very conspicuous by proliferation of epithelium pigment cells upon

their borders, the blackness of which contrasts strongly with the whiteness of the more central portions.

The exudation may commence either at the periphery or at the posterior pole of the eye, from which parts it becomes gradually disseminated over the fundus. In the latter case, the patches sometimes exhibit pale-red areolæ round them, which are thought by some to indicate a syphilitic origin. Notwithstanding, however, this is probably the most common form of specific disseminated choroiditis, it is far from being the only one, as we find that almost every variety of the disease is sometimes due to syphilis.

DIAGNOSIS.—The only certain diagnostic signs of the disease are the ophthalmoscopic symptoms; but these are so peculiar as to render it almost impossible to mistake disseminated choroiditis for any other form of the affection, so long as the vitreous remains sufficiently transparent to allow the details of the fundus to be made out. As to the precise seat of the exudations, we may readily satisfy ourselves that it is in the choroid, by observing that the retinal vessels can be traced directly over the patches, and are not obstructed in their course, or rendered the least indistinct by them; moreover, the retinal veins retain their normal calibre and straightness, and the retina its usual appearance and transparency. At a later period, the retina generally becomes thinned and atrophied by the pressure of the exudations; and not unfrequently the optic nerve, also, shows signs of atrophy, the blood-vessels becoming more or less indistinct, and in some cases obliterated.

ETIOLOGY.—Disseminated choroiditis is found to be most frequently associated with syphilis; but the insidious form complicated with serous iritis sometimes occurs in lymphatic, scrofulous, and consumptive patients.

PROGNOSIS.—The prognosis should always be guarded, especially if the exudations are extensive, or are seated in the region of the yellow spot. The most favorable cases, com-

paratively, are those of a distinctly syphilitic origin, in which the spots are surrounded by reddish areolæ. In these and other favorable cases, the exudations are sometimes absorbed, leaving but slight traces of their former existence behind them. In most instances, however, the choroid, retina and optic nerve all suffer to some extent, becoming more or less atrophied and disorganized.

TREATMENT.—Disseminated choroiditis has been treated most satisfactorily, in its early stages, with Merc. cor. and Kali iod. These two remedies are not only indicated in all cases dependent upon a syphilitic basis, but they are also serviceable in every other form of choroidal inflammation, especially when complicated with iritis. Nux. v. and Phos. ac. are found to be the most useful remedies after the vision becomes impaired in consequence of atropic changes in the retina and optic nerve. Of the other remedies which have proven curative, or which have been found useful in this affection, the following are especially worthy of attention: Ars., Bell., Cact., Con., Phos., Rut., Sil., Sol. n., Spig. and Sulph. The selection should be governed, to a great extent, by the condition of the digestive, assimilative, and uterine organs.

DIET AND REGIMEN.—The diet should be plain, unstimulating, nutritious, and easily digestible. The patient should be careful to abstain from all use of the eyes in reading, writing, etc., and to protect them against bright lights by wearing colored glasses. Moderate exercise in the open air, and whatever tends to invigorate the constitution, will be likely to prove beneficial.

3.—SUPPURATIVE CHOROIDITIS.

PANOPHTHALMITIS.

SYMPTOMS.—As the name denotes, this form of choroiditis is characterized by the formation of pus in the choroidal tissues. It generally assumes from the first the character of a

very acute and severe inflammation, in which sooner or later the choroid, iris, conjunctiva, and all other vascular tissues of the eye participate; hence it is frequently termed *pan*-ophthalmitis. The eyelids also become red, hot, and tender, or swollen and œdematous, especially the upper lid, which often overlaps the lower in large puffy rolls. Both the palpebral and ocular conjunctivæ are injected and swollen, the chemosis being so great as to cover the cornea, or to surround it in the form of a tense, livid, circular fold or ring. In these cases the conjunctiva appears dry, and more or less encrusted with exudative matter; but when the inflammation is milder, the secretion is not arrested, but oozes out from between the lids in the form of muco-pus. If the chemosis is not too great, and the cornea is clear, we generally find the iris bulged forward, discolored, and its stroma infiltrated with pus; and if the pupil is dilated, it also is frequently of a yellowish tint, owing to a purulent infiltration of the vitreous. Sometimes, however, the pupil is contracted, its area occluded with lymph, and its margin adherent, perhaps, to the anterior capsule. The anterior chamber is rendered shallow by the bulging of the iris, the aqueous humor is clouded, and not unfrequently we discover below the pupil a considerable hypopyon. In other cases the cornea is opaque from becoming infiltrated with pus, and either breaks down into a mass of purulent matter, or shrinks into a thin, yellowish, rudimentary membrane. The eye is extremely sensitive and painful, and, owing to inflammatory swelling of the orbital tissues, protrudes more or less from its socket; it is also greatly limited in its motions, and even rendered immovable by the surrounding swelling. The intra-ocular tension is increased, and the globe more or less enlarged. These symptoms are generally accompanied by intense pain, mostly of a paroxysmal character, which radiates from the eye to the orbit, head, and corresponding side of the face. The disease is also attended with fever proportionate to the local disorder, which is some-

times accompanied with considerable gastric disturbance. Vision is soon lost, but the patient remains troubled by the subjective symptoms of photopsia, or flashes of light, and chromopsia, or the appearance of colored spectra before the eyes. Sooner or later perforation occurs, either through the cornea or between the recti-muscles, and then the suffering is greatly mitigated. In some cases the pain and other inflammatory symptoms are much less severe, while at the same time the suppurative process is equally as extensive and disastrous. Even the retina undergoes suppurative changes, and also becomes more or less detached from the choroid, in consequence of serous or hemorrhagic effusions from that membrane.

ETIOLOGY.—The most frequent causes of suppurative choroiditis are traumatic injuries, both accidental and surgical, especially those involving the ciliary region. Chemical injuries, blows, concussions, and other like causes, may also give rise to it; but it is much more apt to follow penetrating wounds and surgical operations, such as are connected with the removal of the lens in cataract operations, or the lodgment of bits of metal or other irritating substances within the eye; in short, whatever is capable of giving rise to sympathetic ophthalmia, or of exciting suppurative inflammation in the cornea or iris, is liable to be followed by panophthalmitis, especially in cases complicated with typhus, cerebro-spinal meningitis, puerperal fever, and other low states of the system.

PROGNOSIS.—This is so unfavorable, that unless the disease is seen in its very incipiency, there will be very little chance of arresting it before it has destroyed the vision, or even before it has led to disorganization and collapse of the globe. In most cases it runs a very rapid course, and terminates in perforation and atrophy of the eyeball. The worst results are generally met with in metastatic cases, such as occur in cerebro-spinal meningitis or pyemia, since, both eyes being involved, if the patient does not die of the primary disease,

which is usually the case, he will most probably be left totally blind. The suppurative process is, however, sometimes, though very rarely, limited to a very small portion of the globe, and if under these circumstances the pus escapes, either by perforation or otherwise, a certain and sometimes very useful degree of vision may be preserved; but in the vast majority of cases perforation does not take place until the eye is irreparably injured and the sight destroyed. The globe now generally becomes more or less atrophied, shrivelling up into a small nodular stump, not larger perhaps than a pea, or it may retain for a longer or shorter period a certain degree of fullness and sensibility, subject to repeated attacks of inflammatory action, especially if the opening becomes temporarily closed. In these cases, if there is much ciliary irritation, and especially if it is kept up by the presence of a foreign body within the eye, the other eye may become sympathetically involved, as stated under the head of sympathetic ophthalmia. At last, however, all inflammatory action subsides, and then the suppurative process ceases, the perforation becomes permanently closed, and the globe dwindles away until it becomes completely atrophied.

TREATMENT.—Whenever suppurative choroiditis is threatened, its occurrence should if possible be prevented, by directing the treatment against any exciting cause that may be discovered. Thus, if a bit of metal or other foreign body has entered the eye, it should be carefully and speedily removed, especially if it has penetrated the ciliary body. If it has injured the lens, or if the latter is swollen and cataractous, the lens should be extracted by the flap operation, removing at the same time a portion of the iris. If there is a large hypopyon, and especially if it is complicated with corneal abscess, paracentesis or iridectomy should be performed. If the eye is badly bruised or lacerated, and the vision hopelessly destroyed, and especially if a foreign body also remains in the eye, the

latter should be removed at once, in order to prevent the occurrence of both suppurative choroiditis and sympathetic ophthalmia, for it is not always safe to enucleate the eye after the suppurative process begins. After suppuration once sets in, there will of course be little if any chance of saving the eye, but the suffering may be greatly relieved, and for this purpose the remedies best calculated to allay ciliary irritation and subdue inflammation will be the most efficacious. If the inflammation is very severe, and especially if the case is seen early, ice-water compresses will be indicated; but if the latter are not well borne, or if suppuration has begun, and there is intense ciliary irritation and neuralgia, warm applications will be the most soothing as well as the most beneficial. If the intraocular tension is increased and the pain is very severe, paracentesis, repeated several times if necessary, or an iridectomy, will give great relief; but if the sclerotica is distended with purulent matter, or we have reason to believe that there is any considerable accumulation of pus in the interior of the eye, it will be advisable to open the abscess at once by making a deep and free incision into it. Finally, if the suppurative process is so protracted as to undermine the health, and especially if its continuance threatens the life of the patient, the eye should be enucleated without hesitation, notwithstanding the danger thereby incurred of the disease extending itself to the meninges of the brain.

THERAPEUTIC INDICATIONS.

Aconite is a useful remedy whenever there is high fever, especially in the first stages of the disease, or when the lids are red, hot, dry and swollen.

Apis is recommended when the lids are œdematous and the conjunctiva chemosed, with stinging pains through the globe.

Arnica is indicated during the first stage when the disease

is of traumatic origin, if the lids are swollen and echymosed, and the globe protruded, tense and painful.

Arsenicum is sometimes useful in cases attended with restlessness, thirst, œdematous swelling of the lids and conjunctiva, and deep-seated throbbing and burning pains, especially if there is much prostration of the system.

Belladonna is indicated when there is intense ciliary neuralgia, with burning dryness in the eyes, pain in the orbits, and a severe aching pressure within the globe.

Hepar sulph. is indicated after suppuration has commenced. The eye is protruded and externally tender to the touch; the lids are highly inflamed and swollen, especially the upper; and the pains are deep, throbbing, and ameliorated by warmth.

Mercurius is useful in the first stage, when there is much burning in the eyes, with ciliary injection and more or less redness and swelling of the lids.

Rhus tox. is said to be useful in every stage of the disease, especially the first. The indications are: œdematous swelling of the lids; chemosis of the ocular conjunctiva; severe orbital and circum-orbital pains, aggravated at night and during rainy and rough weather.

Bryonia, Phytolacca, Silicea, Sulphur, and a few other remedies have been recommended, and may occasionally be found useful, not so much by virtue of any direct influence they may have upon the diseased organ, as by contributing to the general physical and mental well-being of the patient.

DIET AND REGIMEN.—As in other suppurative diseases, the strength will need to be sustained by a free allowance of the most nourishing diet; and in some cases it may be advisable to administer stimulants, especially if the patient is very much prostrated, or is old and feeble.

4.—SCLERO-CHOROIDITIS POSTERIOR.

SCLERECTASIA POSTERIOR—STAPHYLOMA POSTICUM.

SYMPTOMS.—Sclero-choroiditis posterior is chiefly characterized by an intra-ocular inflammation involving the fundus of the globe, and accompanied with a greater or less degree of myopia. The inflammation and accompanying myopia may exist either with or without a posterior staphyloma of the sclera; and in like manner the bulging of the sclera may occur without giving rise to any appearance of inflammation in the fundus; hence, although these conditions are often associated together, there is no necessary connection between them, and therefore the old notion that staphyloma posticum results from inflammation is, as a rule, erroneous. Nevertheless, when the staphylomatous process advances rapidly, and in nearly every case in which there is a considerable degree of myopia, an inflammatory condition of the fundus sooner or later supervenes, and gives rise to sclero-choroiditis.

The characteristic ophthalmoscopic symptom of staphyloma posticum is a bright, yellowish or bluish-white line or crescent at the edge of the optic disc. It may be limited to one side, generally the outer, or it may extend quite around the disc, the broadest part being in the direction of the yellow spot. Although its general form is that of a single or double crescent, its shape may be quite irregular, assuming in some cases a more or less pointed, in others a zigzag, and in others, still, a wavy outline, which may be sharply defined, or may gradually fade away into the neighboring tissues. The crescent is often spotted or marbled over with small patches of dark pigment, especially on its edges, where the pigment cells of the choroid are not yet entirely destroyed by the advancing atrophy. It is owing to this thinning of the stroma of the choroid, that the sclera, shining through the former, gives to the crescent its usual glistening-white appearance.

Amblyopic symptoms, due chiefly to disturbances in the intra-ocular tension, frequently manifest themselves. As a general rule, the more rapid the development of the staphyloma, the greater will be the disturbance of vision. This arises partly from the hyperæmic condition of the venous system of the eye, and partly from irritability of the retina. The latter is generally most pronounced when, along with the amblyopia and disturbance of vision, the patient is troubled with photopsies, such as flashes of light, dazzling points, colored corruscations, etc., or when exposure to the light causes a sense of pain and tension in the eye.

As in other forms of choroiditis, the inflammation frequently gives rise to cloudiness or opacity of the vitreous humor, especially in its posterior part, which is sometimes detached from the retina by a thin, serous-like transudation. These opacities, which are both movable and fixed, are especially annoying to the patient, whose short-sightedness renders them unusually distinct. The most serious form of vitreous opacity is that which generally precedes detachment of the retina, and is supposed to be due to a separation of the vitreous. The following is Iwanoff's explanation:—The vitreous humor does not expand in proportion as the posterior chamber of the eye is increased in volume by the staphyloma, but the vitreous recedes from the retina, and the space thus formed between them is filled with a serous exudation, which detaches the vitreous more and more from the limiting membrane, and not unfrequently separates the latter from the subjacent retina.

Secondary glaucoma, in the form of serous irido-choroiditis, frequently supervenes in the course of sclero-choroiditis posterior, accompanied with periodic cloudiness of the aqueous humor, effusions into the vitreous, and glaucomatous excavation of the optic nerve. The latter varies greatly in different cases, being in some instances extremely steep and abrupt; in others it is quite shallow, or confined, apparently,

only to the margin of the disc; and in other cases the disc or its margin is not only cupped, but the latter is surrounded by a second excavation, which is situated in the sclerotic near the edge of the disc. In these cases vision is relatively far less affected than in similar conditions in primary glaucoma, in consequence, no doubt, of the relief afforded to the intra-ocular tension by the staphylomatous enlargement. Nevertheless, iridectomy should be performed as early as possible in all cases where the contraction of the field does not already encroach closely on the centre, in which latter class of cases, according to Graefe, the operation sometimes proves injurious.

ETIOLOGY.—Staphyloma posticum is generally hereditary. Although denied by some, it has been satisfactorily shown by Jaeger and others, that it is by far the most common in the children of myopic parents. Its subsequent development is no doubt chiefly due to a hyperæmic condition of the fundus, caused by the severe and long-continued straining of the accommodation of the eyes for near objects. The main reason that the elongation of the eye takes place at the posterior pole, is because the latter receives no support from either the capsule or the muscles of the globe; but the enlargement is also favored by the conjoint effects of the relaxation caused by the intra-ocular congestion, and the extension resulting from the increased pressure of the fluids. This extension gives rise to atrophy of the choroid, which is still farther increased by the consecutive inflammation that sooner or later supervenes.

PROGNOSIS.—The prognosis should always be guarded, since, although no further development of the ectasia may take place for many years, yet it is liable to occur at any time, and to progress with great rapidity. This is especially to be feared if there is already a co-existing choroiditis, particularly if the visual field is much clouded by it, or if there exist diffuse opacities of the vitreous threatening the retina.

TREATMENT.—The first and most important point to be

observed in treatment is, to see that the patient gives his eyes sufficient rest, and that when in use he does nothing that will be likely to overtax their accommodative power. He should therefore be specially warned against using his eyes for any considerable length of time on near and fine objects, even with suitable glasses, as these require extreme convergence of the visual axes, and thus overtax the power of accommodation; it also tends to increase the hyperæmic condition of the fundus, and to enlarge the posterior staphyloma, by causing undue pressure of the external muscles. Care should also be taken not to expose the eyes to the direct glare of the light, nor to continue using them after a sense of fatigue sets in, especially for near objects; neither should they be used in a stooping posture, as this favors congestion. If the light is too dazzling, and especially if it causes headache and ciliary neuralgia, it should be tempered by wearing blue or smoke-colored glasses, which always give marked relief. If the eye is very irritable, and especially if there is a hyperæmic state of the optic disc, all use of the organ for such purposes as reading, writing, sewing, etc., should be abandoned, and the eye should be allowed perfect rest until all the symptoms of irritation and conjestion have subsided, and even for a considerable period afterwards. In those cases in which the conjunctiva is more or less injected, benefit will generally be derived from the employment of a weak collyrium, consisting of a grain of the sulphate of zinc or copper, two or three grains of the acetate of zinc, or eight or ten grains of borax, each, to the ounce of distilled water.

THERAPEUTIC INDICATIONS.

Aconite is generally useful in all cases in which there is much heat and congestion of the external tunics.

Belladonna is indicated whenever there is much ciliary irritation and neuralgia, especially if there is a hyperæmic condition of the optic disc and retina.

Congestive headache with flushed face, sensitiveness to light, and photopsia, is an additional indication.

Cactus is also a good remedy in these cases, especially if there is a congested state of the optic nerve and fundus.

Cimicifuga is an excellent remedy in most cases of sclero-choroiditis with marked internal and external hpyeræmia, especially if the eye is sore to the touch, or if there is much ciliary neuralgia and irritation.

Crocus is said to be useful in cases where the pain extends from the eye to the top of the head, or from the left eye to the right.

Merc. cor.—This is one of our most reliable remedies in all cases where the choroid exhibits marked inflammatory changes, and its use in such cases should not be hastily abandoned.

Phosphorus.—Hyperæmia of the retina with congestion to the head, indicated by severe headache, flashes of light, colored rings before the eyes, etc.

Spigelia.—Severe pain in and around the eyes, especially on moving them; great ciliary nervous irritation and congestion.

Zinc. phos.—Congestion of the fundus, with fiery balls and other luminous spectra before the eyes.

The following additional remedies have also been recommended:—Atropine, (locally), Gels., Glon., Lyco., Kali iod., Nux v. Physostig., Sulph. and Zinc.

ART. XII.—HYALITIS.

Inflammation of the vitreous humor is usually associated with some other disease of the fundus, such as choroiditis, retinitis, etc., but it may also occur idiopathically; at least such is the opinion of most ophthalmologists, although Pagenstecher, who made numerous experiments on the eyes of rabbits, came to the conclusion that the disease never occurs as a primary affection, but always depends on changes in the neigh-

boring structures. Indeed, Galezowski goes so far as to assert that the vitreous humor never can become inflamed, since it has no organized structure, but that the inflammation is always confined to the hyaloid membrane. This, however, is now known not to be the case, it having been clearly proven by Virchow, Weber and others, that inflammatory changes frequently occur in the vitreous, and may assume either the simple or the suppurative form.

1.—SIMPLE HYALITIS.

Simple hyalitis is sometimes, though very rarely, idiopathic. It is generally secondary to inflammation of the ciliary body, choroid or retina, and consequently the symptoms are almost always combined with those of an accompanying cyclitis, choroiditis or retinitis.

SYMPTOMS.—The disease is chiefly characterized by diffuse opacities within the vitreous. If the inflammatory process is much advanced, connective-tissue opacities, of various forms and sizes, may sometimes be discerned even by the naked eye, glistening indistinctly in the midst of the diffuse cloudiness; but at the commencement the opacities are generally too thin and indistinct to be recognized, except by the aid of the ophthalmoscope. Viewed through this instrument, the vitreous appears at first more or less clouded, and the optic nerve and retinal vessels have an indistinct or blurred appearance, as though seen through a mist; the observer may also discover, here and there, thicker opacities in the form of dark specks, delicate filaments, etc. As the inflammation increases, the vitreous humor becomes less and less transparent and the cloudiness more evenly diffused, so that the details of the fundus are rendered either very indistinct, or become entirely invisible. In addition to the fixed and floating opacites above-mentioned, neoplastic formations of connective tissue appear in various portions of the vitreous, having a filamentous or

membraneous character, which, variously inter-twined and crossing each other in every direction, divide it into irregular sections which sometimes have the form of separate compartments. These appearances are generally most marked in the vicinity of the ciliary body, and at the posterior pole of the lens, where the opacity is sometimes so great as to be termed posterior polar cataract. In some cases vessels are seen in the vitreous, which divide and sub-divide in the most varied manner. Sometimes *synchesis* of the vitreous occurs, that is, it becomes partly or completely fluid. This generally occurs in proportion to the development of the connective-tissue formation. In this state the movable opacities sometimes disappear from the visual field by sinking to the bottom of the fundus, but re-appear whenever the eye is subjected to any rapid movement. Even when the vitreous is not fluid, the denser opacities are very movable, floating about more or less freely on every quick motion of the eye and head. In some cases where fluidity of the vitreous occurs, owing to the presence of crystals of cholesterine in the fluid, the floating opacities and crystals present the appearance of bright, glittering, star-like bodies, the movement of which seems to the patient like a shower of stars. In other cases, where the proportion of connective tissue in the vitreous becomes very large, the latter detaches itself from the limiting membrane and shrivels up, until in some instances it occupies less than one-fifth of its natural space. In these cases, also, the retina is often extensively detached, either alone or along with the vitreous, the separation finally extending from the ora serrata to the entrance of the optic nerve. These changes, according to Iwanoff, most frequently occur when a foreign body, such as a depressed cataractous lens, becomes encapsuled; they also occur in irido-choroiditis, from a gradual shrinkage of the connective-tissue products developed in the vitreous as a consequence of inflammatory proliferation.

2.—SUPPURATIVE HYALITIS.

Suppurative hyalitis generally occurs in connection with suppurative iritis, cyclitis, or irido-choroiditis. It generally supervenes upon injuries of the eye, cataract operations, etc., and frequently leads to panophthalmitis and destruction or atrophy of the globe.

SYMPTOMS.—Suppuration may commence in any portion of the vitreous, and may either remain confined to the part in which it originates, or it may spread throughout the whole of the vitreous humor. In some cases the purulent matter appears just behind the lens, (*posterior hypopyon*), and is due to pus which has burst through the retina from the ciliary body. In this case the other portions of the vitreous are frequently normal. Generally, however, the entire vitreous becomes involved in the suppurative process, except in the case of foreign bodies, which frequently give rise to circumscribed abscesses.

ETIOLOGY.—It is generally conceded that hyalitis usually depends on inflammation of the neighboring structures. In our study of cyclitis, irido-chorioditis, glaucoma, etc., we have seen how uniformly cloudiness of the vitreous appears amongst the symptoms; but it is especially in the more acute and suppurative forms of those diseases that it is an invariable attendant. It may also be excited by the presence of foreign bodies, by wounds of the vitreous humor, by loss of vitreous after operations for cataract, by extravasations of blood, etc.

PROGNOSIS.—Diffuse opacities of the vitreous, when dependent on inflammation of the investing vascular structures, generally soon disappear in cases where the latter take a favorable turn and undergo resolution; but the contrary occurs if the inflammation is frequently repeated, or if the neighboring tissues are much altered. In short, the prognosis depends chiefly upon the cause of the inflammation, and the extent to which the surrounding tissues are implicated.

TREATMENT.—As the removal of the cause constitutes the first and most important point in treatment, it is evident that whenever the existence of hyalitis depends upon irido-cyclitis, irido-chorioditis, or any other disease of the fundus, the treatment will require to be directed to the removal of the primary affection. (See *cyclitis*, *choroiditis*, *glaucoma*, *retinitis*, etc.) If the inflammation is due to the presence of a foreign body in the vitreous, and its location can be determined, either with the ophthalmoscope or otherwise, it should be immediately cut down upon, and removed with a Daviel's spoon, (Pl. I. Fig. 31), the canular forceps, (Fig. 3), or any other convenient instrument. If this is found to be impracticable, then the best course is to enucleate the eye at once, and thus save the other eye from being destroyed by sympathetic ophthalmia, (which see). Fixed opacities remaining after severe inflammation of the vitreous, have sometimes been torn or cut through with a sickle-shaped needle, (Fig. 8), introduced through the sclera, and the vision thereby considerably improved. What effect, if any, the long-continued administration of such remedies as Baryta, Causticum, Magnesium, Phosphorus, Sepia, Silicea, etc., may have upon them has not yet been satisfactorily determined.

ART. XIII.—RETINITIS.

We are now to consider a class of diseases of the highest importance, which previous to the invention of the ophthalmoscope were very imperfectly understood—so much so, in fact, as to be confounded with an affection of a totally different nature, namely, hyperæsthesia of the retina. The latter is characterized by intense photophobia, lachrymation, ciliary injection and neuralgia, while retinitis, as we shall see, is distinguished by no such symptoms.

1.—SEROUS RETINITIS.

ŒDEMA OF THE RETINA.

SYMPTOMS.—Serous retinitis, or œdema of the retina, is chiefly characterized by a delicate greyish opacity of the fundus of the eye, which shows itself in the form of a bluish-grey veil or mist spread over the surface of the retina, and which hides to a greater or less extent the choroidal vessels. The opacity, which is due to a serous infiltration of the connective tissue of the retina, may be either general or partial, that is, it may affect the whole or only parts of the fundus. In the latter case, the œdematous cloudiness is most marked in the region of the optic nerve entrance, but becomes fainter and fainter as it approaches the macula lutea, or yellow spot, in consequence of the diminished thickness and greater transparency of that portion of the retina. As the œdema increases, the details of the choroid and optic disc are rendered less and less distinct, until, in severe cases, the fundus presents nearly a uniform reddish-grey or bluish-grey appearance. In these cases the optic disc appears somewhat swollen and indistinct, but the opacity is so diffuse and veil-like as to produce but little alteration in the appearance of the arteries; the retinal veins, on the contrary, are dilated and more or less twisted in their course, those in the vicinity of the optic nerve describing comparatively large curves, while the smaller branches are decidedly tortuous. The œdematous character of the affection can generally be made out by carefully observing the varying depths of the vessels in different parts of their course; as in those places where they are the most superficial, they have a distinctness and clearness of outline which is lost or obscured in parts where they dip more deeply into the effusion. Small hemorrhagic extravasations are occasionally to be seen in the vicinity of the retinal veins, but they are not often met with in this form of retinitis.

Externally, the eye appears nearly or quite normal. The pupil is sometimes slightly dilated and sluggish, but this is seldom very noticeable; and as there are no symptoms of irritability present, such as photophobia, lachrymation and ciliary neuralgia, the disease in its first stage is apt to attract but little attention. Soon, however, the visual field becomes more or less darkened and contracted, and it is this which generally leads the patient to apply for treatment. His complaint is that all objects appear as if enveloped in a mist or fog, or as if he was looking through a veil. If the disease is partial, or if the opacity is limited to only a small portion of the fundus, the corresponding part of the visual field will alone be impaired. As the affection progresses, however, both peripheral and central vision deteriorate, the sight grows dimmer and dimmer, and if the disease is not arrested the retina finally becomes atrophied, and vision is permanently destroyed.

ETIOLOGY.—Serous retinitis is chiefly due to a hyperæmic state of the optic nerve and retina, superinduced by long exposure of the eye to bright lights, by mechanical violence, and, in many cases, by certain constitutional affections, such as syphilis, albuminuria, etc. As the causes are similar to those of the exudative variety, the etiology will be given more at length in the next section.

PROGNOSIS.—This should be particularly guarded, for the reason that the affection is liable to become more or less chronic, in which case vision may be lost through atrophy or detachment of the retina, or it may take on the exudative form, and lead perhaps to disease of the choroid and vitreous.

TREATMENT.—The patient should be strictly enjoined not to exercise his eyes in reading, writing, etc. He should also be careful to protect them from the irritating effects of bright light by wearing blue or smoke-colored glasses.

The internal remedies which have proven most beneficial in this form of retinitis are:—Apis, Ars., Bell., Bry., Cact.,

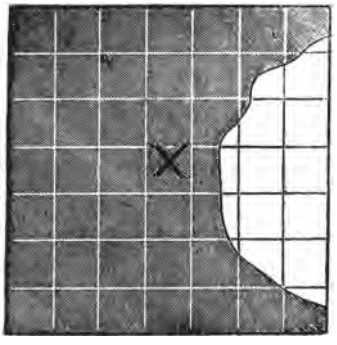
Digit., Gels., Merc., Phos., and Puls., the latter, more especially when dependent on menstrual irregularities. The following have also been recommended in complicated cases, or as intercurrent remedies: Acon., Cimicif., Collin., Con., Croc., Hepar., Nux v., Kali iod., Lach., Sulph., and Zinc. For special indictions see previous sections.

As illustrative of the character and treatment of a somewhat complicated traumatic form of this affection, we subjoin an interesting and instructive case from the N. Y. Ophthalmic Hospital Rec., 1876, kindly furnished us by F. H. Boynton, M. D., Asst. Surg. to the Institution.

Chas. Birch, aet. 54, Leominster, Mass. Three weeks before application for treatment, (March 4th, 1876), while bending suddenly forward, the eye came in contact with the post of a rocking chair; the blow was received in the inner angle of the right eye; lids soon became ecchymosed, slight discoloration still remaining. V=Perception of light. Field of vision of right eye according to diagram:

Fig. 11.

NO VISION.



PERCEPTION OF OBJECTS.

Ophthalmoscope shows in right eye diffuse haziness of vitreous, serous inflammation of choroid and retina, with effusion under and detachment of latter, as represented by diagram. Optic nerve of left eye very hyperæmic, V. only $\frac{20}{200}$, owing to macula, remnant of small pox.

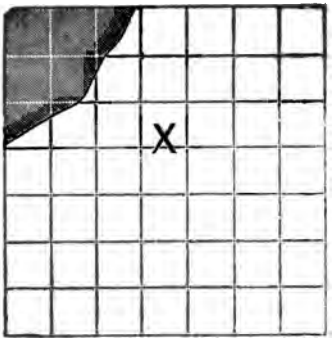
May 5th. Has consented to come into the hospital for treatment.

He has been carefully examined by Drs. Allen, Wanstall and myself, but no indicative symptoms could be found. On account of the success of Gelsemium in several cases of serous choroiditis (non-traumatic) in the hands of Dr. Norton, Gels. 30th was prescribed, dose every three hours. Patient was put to bed, both eyes being carefully padded with lint, and compress bandage applied; bandage to be reapplied three times in twenty-four hours. Sol-Atropine instilled to insure complete rest to the accommodation. Low diet.

14th. Since last date has been constantly in bed. Optic nerve very slightly hyperæmic; few opacities in vitreous; detachment as per diagram and sharply defined.

Fig. 12.

NO VISION.



THIS PART OF FIELD CLEAR.

Vessels of normal size. Rv.= $\frac{14}{200}$; Lv=$\frac{20}{200}$.

Heretofore both eyes have been constantly bandaged; now, yielding to supplication of patient, allow left eye to be free.

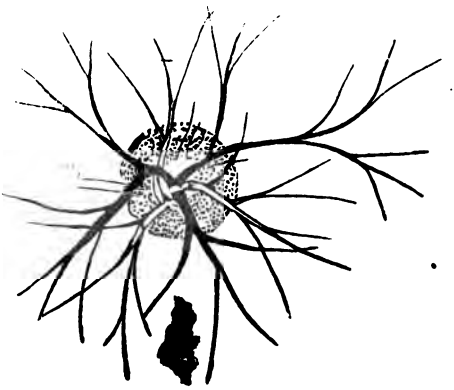
25th. Field the same; vitreous becomes quite hazy after moving the eye; vision not quite as good; condition has slightly retrograded since allowing one eye free. Now bandage both eyes and confine in bed, except one-half hour each day for exercise. Gelsem. 30th.

April 5th. Ophthalmoscope shows slight opacities in vitreous. Field of vision *perfect.*

Rv. (floating). V.= $\frac{20}{200}$; with + 36, $\frac{20}{70}$ nearly.

On the former site of detachment is an exudative choroiditis, quite circumscribed (see Fig. 13). Macula lutea, cloudy; nerve, slightly hyperæmic.

Fig. 13.



THE ABOVE CUT REPRESENTS THE PATCH OF EXUDATION REMAINING.

8th. Continued and remarkable improvement, very slight haziness of fundus; no flocculi; nerve still slightly hyperæmic. V=$\frac{20}{70}$ without glasses. During the last few days of treatment, I experienced much difficulty in retaining the patient in the hospital. On the evening of the 8th he surreptitiously took his departure.

May 19th. I am in receipt of a letter from the gentleman, dated May 17th, saying that since he left the hospital, there has been gradual improvement. For the first three weeks he kept the bed most of of the time; since which time he has been working at his trade (joiner); experiences some difficulty in doing fine work.

In recording this most satisfactory result, I experience much embarrassment in deciding how much, if any, credit to give Gelsemium as an agent in attaining the desired end; undoubtedly the recent invasion, bandaging and complete rest, were active factors. I would suggest its use in serous inflammations of the iris, choroid, and retina, in those cases not requiring other interference, and its effects noted, that there may be no doubt as to its efficacy.

2.—EXUDATIVE OR PARENCHYMATOUS RETINITIS.

SYMPTOMS.—This form of retinitis is characterized by inflammatory changes in the parenchyma of the retina, whereby the membrane undergoes cell proliferation, hypertrophy, fatty

or colloid degeneration, and sclerosis. The optic disc is generally of a greyish-red or pink color, and its boundaries are so indistinct that in many cases its position can only be recognized by the course of the central vessels, as they emerge from the hollow in which they are imbedded in the centre of the disc. In these cases the retina loses to a great extent its transparency, and becomes dull and dirty looking, with perhaps some appearance of striæ, or of dark and light spots, which give it more or less of a marbled appearance. As a general rule, however, it presents a somewhat uniform, but very fine granular appearance, in which the natural tint of the subjacent choroid is entirely hidden, and the vessels more or less deeply veiled. Extravasations of blood, in the form of points or small spots, frequently occur, either lying superficially on the veins, or situated more deeply, in which case they have a somewhat indistinct or blurred appearance. When the hemorrhagic extravasations are large or very numerous, they constitute a distinct form of the disease known as *Retinitis apoplectica*, (which see).

The pathological changes above sketched vary considerably in different cases, according to their nature, seat and extent. Thus, if the exudation is seated in the more external or choroidal layers of the retina, the vessels will not present the indistinct and interrupted appearance that they will when it occupies the inner layers, since in the latter case they are necessarily more or less hidden by the exudation. We also find that, when thus situated, the exudations generally present the appearance of light cream-colored or greyish-white non-striated spots or patches, over which the retinal vessels are seen to pass without interruption. In these cases the inflammatory process frequently originates in the choroid instead of in the retina, to which it subsequently extends by cell proliferation, giving rise to fatty or colloid degeneration of the external layer, with sclerosis of the external

limiting membrane. When, on the other hand, the exudations are seated in the inner portions of the retina, they are generally somewhat striated, and the vessels instead of passing straight over them are more or less interrupted, or concealed from view. At first the inflammatory changes consist, chiefly, of hypertrophy of the stroma and connective tissue fibres, the latter of which may increase so rapidly as to compress, and thereby cause more or less atrophy of the nerve fibres. At the same time, the optic nerve fibres and ganglion cells increase by proliferation, giving rise to sclerosis, and afterwards, perhaps, undergoing fatty degeneration. The internal limiting membrane also becomes hypertrophied and uneven, occasionally exhibiting upon its inner surface minute elevations, caused by under-lying points of exudation. This variety of retinitis frequently originates in inflammation of the ciliary body and choroid, and is then associated with irido-cyclitis or irido-choroiditis.

Uncomplicated cases are attended with little or no irritation, the chief subjective symptoms being a greater or less obscuration of the visual field, corresponding to the points of exudation. If these occupy the centre of the field, the injury to vision will, of course, be much greater than when the centre is clear, especially for small or near objects; the obscurity diminishing in proportion as the spots are removed from the centre*. Where the exudative form is combined with the diffuse, or where the entire retina becomes affected, the obscurity is often general, and vision is sometimes reduced to a mere perception of light. As a general rule, however, the periphery of the retina escapes, and then, if the vitreous also remains clear, the patient may be able to so adjust the optic axis as to obtain a fair degree of eccentric vision. Moreover, the exudations and hemorrhagic effusions may be absorbed,

*Micropsia, in which all objects appear smaller to the patient than they really are, is sometimes observed in these cases. If, for example, the patient is told to draw a certain figure, such as a circle, he will invariably draw it too small.

the intra-ocular congestion be relieved, the œdema subside, and then, if the choroid, retina and optic nerve are not too much injured, the vision may decidedly and permanently improve. (See Dr. Boynton's case, page 151). But such favorable results do not always occur, especially in complicated cases. Months and even years may elapse before the disease makes any considerable progress, and then new points of exudation may suddenly appear, accompanied perhaps by marked symptoms of inflammation; or the accompanying irido-cyclitis, choroiditis, etc., may subside only to burst out again with increased violence; and this may occur again and again, each fresh attack or exacerbation developing new points of exudation, until finally the inflammation has run its course. In these cases the integrity of the retina is never entirely restored. The portions of membrane corresponding to the points of exudation are frequently transformed into connective tissue, and although the process of degeneration by which the transformation is effected is generally very slow, it continues until the affected portion of the retina loses all sensibility to light, in consequence, probably, of atrophy of the nerve elements. In other cases the entire retina as well as the choroid and optic nerve undergo atropic changes, and vision is hopelessly lost.

ETIOLOGY.—The causes of exudative retinitis are probably the same as those which give rise to the diffuse form; indeed, the latter is generally developed along with the former. In most cases it is due to some constitutional affection, such as syphilis, diabetes, albuminuria, etc. It may also be caused by some other disease of the eye, such as irido-cyclitis or choroiditis; or it may depend upon disturbances in the circulation, such as occur in uterine or heart affections. Among other probable causes, we may also mention, long exposure of the eyes to intense light, tuberculosis, retinal hemorrhages, cerebral diseases, and even sympathetic influences.

PROGNOSIS.—This we have already sufficiently indicated. During the progress of the disease, so long as the region of the macula lutea remains clear, the sight may be sufficiently good for the patient to recognize very small objects, and even to read the finest print. At the same time it will be difficult for him to distinguish large or distant objects, in consequence of the field of vision being more or less interrupted and diminished. But sight is not generally entirely lost until the optic nerve elements have become atrophied. Nor is the injury to vision always proportionate to the changes observed in the fundus. Tolerable, and even excellent, vision may frequently be obtained after serous and hemorrhagic effusions have taken place, and even after fatty degeneration has occured, as these products are all capable of being absorbed. The affected portions of the retina, however, rarely if ever become perfectly normal. Permanent changes in both the choroid and retina occur under the most favorable circumstances, and some impairment of vision is always to be expected.

TREATMENT.—The treatment for exudative retinitis is almost identical with that for œdema retinæ, (which see). So long as improvement can result from increased absorption, benefit may be expected from the administration of Mercurius, especially the *corrosivus*. This remedy has frequently been found very effectual in promoting the absorption of patches of exudation, and in clearing up the visual field, the results being especially favorable when the disease is of syphilitic origin. (See *Retinitis syphilitica*). Hemorrhagic effusions are often quickly absorbed under the use of Belladonna, Crotalus and Lachesis, especially the latter. (See *Retinitis apoplectica*). Other remedies will be found under the nephritic variety, (which see). When the disease has existed a long time, and the choroid and retina are already much atrophied, of course but little improvement can be expected. In this case, it is generally advisable to confine our treatment chiefly to the employ-

ment of such measures as are best calculated to preserve the existing vision; and for this purpose especial attention should be paid to the patient's health, and to the observance of suitable hygienic rules. Great care should also be taken to guard against a renewal of the inflammation, by avoiding any of the known causes, such as exposure of the eyes to bright light, etc. Should relapses occur, they will require to be treated according to specific indications, having reference more especially to the particular forms they may be found to assume—as, for example, the inflammatory or hemorrhagic—and to the causes which may be supposed to give rise to them.

3.—SYPHILITIC RETINITIS.

This is a peculiar form of diffuse retinitis, occurring in persons whose constitutions have become tainted with secondary syphilis. Authorities differ as to the diagnostic value of its symptoms, Wells asserting that it is occasionally possible to diagnose the nature of the malady from the ophthalmoscopic appearances alone, while Stellwag claims that the disease has no peculiar symptoms, but that its syphilitic nature is indicated solely by the presence or previous existence of the symptoms of constitutional syphilis. We shall find that while the former statement is substantially true, it will frequently be impossible to clear up the diagnosis until we have obtained a knowledge of the history and constitutional condition of the patient.

SYMPTOMS.—At first there are no characteristic symptoms. There is generally more or less venous hyperæmia, but this is sometimes only partial. As in simple serous retinitis, the optic disc is slightly swollen and its margin rendered somewhat indistinct by the serous infiltration, which gives to the disc and surrounding retina the appearance of being covered with a delicate bluish-grey veil or mist. The opacity, which

is often extremely faint, is most pronounced along the course of the vessels and in the vicinity of the optic disc, where it is distinctly striated. Small, glistening white points generally occur in the region of the macula lutea, which frequently disappear and reappear every few days, accompanied with corresponding changes in the vision. In this region, also, we sometimes find the peculiar reddish-brown tint, or copper color, so characteristic of syphilis. Occasionally we meet with white spots or patches, either isolated or in the form of irregular stripes, which, being seated in the innermost retinal layers, may so compress some of the vessels as to give them the appearance of white tendonous lines, or bands. Neither the white spots, nor the punctated appearance in the region of the macula lutea, are pathognomonic symptoms, as they both occur in nephritic retinitis; but in the latter affection, in addition to other peculiarities, they are readily distinguished by being of a brighter and more glistening aspect. (See *Retinitis albuminurica*).

Syphilitic retinitis is frequently complicated with choroiditis, and sometimes with irido-choroiditis and keratitis punctata, or with syphilitic iritis. Not unfrequently it follows one or more attacks of iritis. According to Stellwag, it is peculiarly apt to occur if, during convalescence from specific iritis, or before entire removal of the disease, the eye is exposed to functional sources of injury.

Hemorrhagic effusions sometimes occur, but they are usually small and insignificant; occasionally, however, they are both numerous and extensive. They may be seated in any of the layers of the retina, or upon its external surface, between it and the choroid. The latter membrane frequently undergoes extensive changes, consisting chiefly in atrophy of the epitheliel layer and aggregation of the pigment cells, in the form of small black spots interspersed with little grey points; or the atrophic changes may extend still deeper, and

involve the stroma of the choroid, giving rise to large grey patches, bordered with pigment, through which the choroidal vessels may be seen.

Vision is often greatly impaired; and so rapidly does the sight diminish, that the course of only two or three weeks we have known the patient to be unable to read No. "L," Snellen. As a matter of course, the disturbance of vision is greatest when the region of the macula lutea is affected; and, as already stated, the fluctuation frequently corresponds with changes which occur in the punctiform opacities of that region. The visual field is only slightly diminished, but photopsies, and that peculiar symptom, micropsia, are of frequent occurrence. (See Exudative Retinitis.—*Note*).

PROGNOSIS.—Although, as a rule, the disease progresses very slowly, and is subject to frequent relapses, the nerve elements of the retina are not apt to be affected, and hence the prognosis is generally favorable. In case, however, there should be much hypertrophy of the connective-tissue element, the latter may so press upon the nervous structure of the retina as to give rise to more or less atrophy and permanent impairment of vision. Moreover, the functional condition of the retina is liable to be greatly injured by the frequent relapses to which the disease is subject.

TREATMENT.—The remedies which have proven eminently curative in this affection, are *Mercurius corrosivus* and *Kali hydriodicum*. They may be used either singly or in alternation, as may best suit the particular indications; and if the patient is brought under their influence at an early period of the attack, the disease will generally be found to yield in the most satisfactory manner. But if the inflammation has already given rise to extensive tissue changes, but little good can be expected of any internal treatment, especially if the nerve elements are implicated. We notice, however, that Asafœtida, Arum, Cinnabaris, Petroleum, Thuya, and a few other remedies,

have been recommended for this form of retinitis, and they may prove serviceable in some cases, provided the specific indications correspond with the constitutional as well as the local symptoms; for we confess that we have but little faith in any but specific constitutional remedies in this affection.

4.—NEPHRITIC RETINITIS.

RETINITIS ALBUMINURICA, IN BRIGHT'S DISEASE.

This form of diffuse retinitis derives its name from the fact that it occurs in connection with Bright's disease of the kidney, and that its ophthalmoscopic symptoms are, in many cases, so peculiar and constant, as to enable us, from the retinal appearances alone, to determine with certainty the coexistence of the kidney affection. Having in the preceding sections described the common characters of diffuse retinitis with sufficient fullness, we shall give but a brief sketch of the remaining varieties of retinitis, confining our remarks chiefly to the more important and characteristic.

SYMPTOMS.—The symptoms of nephritic retinitis are, for the most part, similar to those of the syphilitic variety; the chief difference being that they are generally much more strongly defined. Thus, the optic disc is more swollen, and its margin rendered more indistinct, by the serous infiltration, which, extending for some distance beyond the disc, presents the appearance of a bluish-grey or reddish-grey veil spread over the fundus, and conceals to a greater or less extent the details of the underlying choroid. The disc and surrounding retina generally exhibit a distinctly striated appearance, which is chiefly due to hypertrophy and sclerosis of the connective tissue element. The retinal veins are enlarged, dark, and somewhat tortuous; but the arteries are normal, or slightly contracted. Dark and light spots frequently appear in the course of the vessels, in consequence of the varying depths of

the infiltration. The latter is sometimes so great, especially in the vicinity of the optic nerve, as to render the optic disc quite swollen and prominent, and conceal more or less completely the retinal vessels. Hemorrhagic effusions also take place in different portions of the retina, and these are frequently numerous and extensive. This is, no doubt, partly due to disease of the vascular coats, but chiefly to disturbances in the general circulation arising from hypertrophy of the left ventricle, which is generally present in Bright's disease, and to congestion of the retinal circulation caused by the swelling of the optic nerve.

But the most characteristic symptoms of nephritic retinitis are met with at a more advanced state of the affection. We then notice in the region of the macula lutea small, white, glistening spots, presenting more or less of a stellate figure, the characteristic appearance of which may afterwards be lost in consequence of their becoming merged in the general exudation. We also observe a broad, glistening white band around the optic entrance, but separated from it by a zone of greyish-brown infiltration, the outer border of which is very irregular, and broken up into circumscribed patches of exudation, or extended along the retinal vessels towards the periphery, especially on the inner side of the retina. At an earlier period, or in less characteristic cases, these symptoms are less prominent, the retina in the vicinity of the optic disc appearing almost normal, and the peculiar white exudation, instead of forming a broad, white ring about the optic disc, lying in scattered patches, or extending along the course of the vessels. Even in these cases, however, the exudation in the region of the yellow spot has more or less of a stellate or streaky appearance, characteristic of the renal affection.

The pathological changes just noticed are found to be due to fatty degeneration of the cellular and connective tissue elements of the retina, especially the latter, which, in the region of the

macula lutea, are so arranged as to converge towards the centre of the yellow spot, and hence the peculiar stellate appearance at that point. The striated appearances are due, on the other hand, to sclerosis of the optic nerve fibres, and, though much less conspicuous, are of far greater importance than those arising from fatty degeneration, which, unlike the former, are capable of being absorbed. Similar changes take place in the coats of the retinal vessels, and also in the chorio-capillaris, in consequence of which the diameter of both the choroidal and retinal vessels is more or less diminished.

The sight is usually very much impaired, central vision being the most, and peripheral the least, deteriorated. The field of vision is but slightly if at all contracted, but it generally contains extensive gaps corresponding to the pathological changes above noted. Sudden attacks of amaurosis sometimes occur from uræmic poisoning, but these are easily distinguished from the loss of vision arising from inflammatory changes in the retina, which is gradually progressive, besides being accompanied by other symptoms of uræmia, such as headache, vertigo, sickness, convulsions, loss of consciousness, paralysis, etc. Although frequently attended with symptoms of derangement of the digestive functions, such as anorexia, nausea, sickness, etc., the impairment of vision is often the first symptom that attracts the attention of the patient; and it is not perhaps until an opthalmoscopic examination reveals the true nature of the complaint that the disease of the kidney is suspected. As a general rule, however, nephritic retinitis does not appear, or is not recognized, until the kidney disease is fully developed, and is most frequently met with in the later stages of the chronic affection, after amyloid degeneration has set in.

ETIOLOGY.—The nature of the connection between nephritic retinitis and Bright's disease of the kidney, is not known. By some, the disease of the retina is supposed to be due to the congestion arising from hypertrophy and dilatation of the

left ventricle, which is a common accompaniment of nephritic retinitis. This view would seem to be supported by the fact that hemorrhagic extravasations are not only of constant occurrence in this form of the affection, but appear at the very commencement of the disease. Others, again, refer the disease to mal-nutrition of the retina caused by the presence of urea in the blood. The retinitis and albuminuria are both observed in the later months of pregnancy, the kidney affection being dependent, no doubt, as suggested by Virchow, on mechanical obstruction of the renal circulation. They also occur after scarlatina, cholera, pyæmia, typhoid fever, etc., and then the retinitis is referable to the coexisting albuminuria.

PROGNOSIS.—Nephritic retinitis very rarely results in complete blindness, and, on the other hand, normal vision is seldom regained after extensive pathological changes have taken place in the substance of the retina. When these changes are due simply to fatty degeneration of the connective tissue elements, the patches may be absorbed and vision restored; but when atrophy of the optic nerve, or sclerosis of the optic nerve fibres, ensue, vision is permanently impaired. Those cases, on the contrary, that are secondary to the exanthemata, or that occur in advanced pregnancy, or after the excessive use of spirituous liquors, etc., admit of the sight being fully restored.

TREATMENT.—This should, of course, be chiefly addressed to the kidneys. For this reason we have more confidence in Phos. ac., and Plumb., in these cases, than in any other remedies, but the following have also been recommended:

In acute nephritis: Canth., Chelid., Kali acet., Terebinth.
In chronic nephritis: Ars., Hepar, Phos. ac., Sulph.
In fatty degeneration: Ars., Canth., Phos.
In granular degeneration: Ars., Colch., Plumb.
In amyloid degeneration: Ars., Phos. ac., Sulph.
For uræmic symptoms: Ferr., Opi.
From alcoholic drinks: Ars., Nux v.
In pregnancy: Apis, Colch., Gels., Kal., Merc. cor.
In scarlatina: Apis, Ars., Apoc., Hell., Merc.

5.—LEUCÆMIC RETINITIS.

Comparatively little is known concerning this somewhat rare form of retinitis. It was first described and figured by Liebreich, in 1861, but its chief characteristics were first pointed out by Becker and Leber, in 1869.

SYMPTOMS.—The chief characteristic symptoms of leucæmic retinitis are: a pale orange-yellow hue of the fundus, due to an excess of the white blood corpuscles, and a pale pinkish color of the retinal vessels, especially the veins, which are often dilated and tortuous. The optic nerve entrance is also pale from the same cause, and its margin is obscured by a serous infiltration which extends a considerable distance from the disc, in the vicinity of which the retina presents the usual striated appearance. Small extravasations of blood likewise occur in different parts of the fundus, but they, also, are of a pale reddish color; whilst along the course of some of the blood-vessels, and in the region of the macula lutea, are seen white stripes and spots, due to an extravasation of the colorless blood corpuscles, as first shown by Leber. The latter, in his dissections, was unable to verify the observation of Recklinghausen relative to a varicose and hypertrophied condition of the optic nerve fibres, but he satisfied himself that there was not a trace of fatty degeneration of the retina, as in retinitis albuminurica. In some cases, more or less atrophy of the retina has been observed, the result of pressure arising from previous intra-ocular hemorrhages.

TREATMENT.—This, to be of benefit, should be addressed to the coexisting leucocythæmia. In the absence of any experience, we would suggest a trial of the following remedies: Ars., Calc., Chin., Ferr., Nat. m., Ol. jec., Phos. ac.

6.—RETINITIS APOPLECTICA.

Hemorrhagic effusions are not, as we have seen, peculiar to this form of retinitis, comparatively small extravasations taking place occasionally in nearly every variety of the affection; but hemorrhagic retinitis, so-called by way of eminence, is distinguished chiefly by an extreme tendency to hemorrhagic effusions into the different layers of the retina.

SYMPTOMS.—In retinitis apoplectica there is more or less serous infiltration of the optic nerve and retina, but no exudative or degenerative changes, such as are common to other forms of retinitis. Nor is the œdema generally very marked, but only sufficient, in most cases, to render the disc slightly indistinct, and its margin somewhat irregular and obscure. The veins, on the other hand, are dark, tortuous, and very much enlarged; while here and there are seen numerous extravasations of blood, which, by overlying the retinal vessels, frequently interrupt their continuity. The arteries are more normal in their appearance, but more or less contracted, and in some cases, particularly in the vicinity of the optic disc, are changed into narrow, tendon-like bands.

The hemorrhagic effusions may occur in any portion or layer of the retina, and even in the optic disc itself; but, for obvious reasons, they occur most frequently along the course of the blood-vessels, between the inner and outer layers of the retina, often pushing aside the elements of the latter, and making their way to the more superficial layers, especially the choroidal, towards which they are prone to extend. In these cases, the patches of effusion will often be found to be situated beneath the retinal vessels, and to have a more distinctly circumscribed appearance than when seated in the internal portions of the retina, where they are generally larger and darker, and often hide a portion of the vessels from view. In some cases, they break through the internal limiting membrane into the

vitreous, and give rise to dense opacities. The patches undergo very little change in their appearance for a long time, but finally the process of absorption sets in, and they gradually become lighter and lighter, assuming at last a peculiar greyish tint. In some cases, however, instead of undergoing absorption, they degenerate into dark, friable masses, giving rise to black patches of pigment, often of considerable size.

Vision is, of course, more or less impaired; but, unless the hemorrhage takes place in the vicinity of the macula lutea, the sight is not usually so much injured as the ophthalmoscopic appearances would indicate. Sometimes, however, the attack is very sudden, and the patient, after experiencing a sensation of sickness and vertigo, may become nearly or quite blind within a very few moments. The field of vision is generally somewhat narrowed, and exhibits, here and there, spots or spaces corresponding to the patches of effusion; or in some cases, it may be, to their *shadows*, as first suggested by Heymann.

ETIOLOGY.—The disease is frequently caused by disturbances of the general circulation, such as are met with in cardiac, hepatic and uterine affections, especially those arising from hypertrophy of the left ventricle, disease of the aortic valves, and menstrual suppression. It may also arise from tumors, or any other impediment to the return of venous blood from the eye, situated within the orbit or cranium. A more frequent cause, however, especially in elderly people, is atheromatous or fatty degeneration of the coats of the retinal vessels, in which case, as Wells observes, the cerebral vessels would be likely to be similarly affected.

PROGNOSIS.—This should be particularly guarded, owing to the great tendency of the disease to relapses, which, if frequently repeated, greatly impair the function of the retina, and lead, sooner or later, to atrophic changes in the retina and optic nerve.

TREATMENT.—The above enumeration of causes shows

that the treatment should be addressed to them, and to the general condition of the patient, rather than to the pathological state of the retina, over which remedies can exert but little direct influence. Thus, if the heart is at fault, Cactus, Gelseminum, and other cardiac remedies, will be indicated; portal obstruction will call for Mercurius, Nux v., Podophyllum, etc.; and menstrual suppression will require such remedies as Aconite, Belladonna, Senecio, Sepia, etc. Phosphorus has been recommended for the hemorrhagic diathesis, and Arnica, Crotalus and Lachesis to promote absorption of the extravasations.

7.—RETINITIS PIGMENTOSA.

PIGMENT DEGENERATION OF THE RETINA.

Although much diversity of opinion exists regarding the pathology of this affection, some regarding it as a peculiar form of choroiditis, some referring it to chronic perivasculitis of the retinal vessels, and some to chronic inflammation of the retina itself, we shall find it most convenient to describe it as retinitis pigmentosa, the name by which it is generally known.

SYMPTOMS.—The disease is chiefly characterized by the appearance of numerous spots of black pigment in the inner layers of the retina. These spots are of various forms and sizes, most of them having a branched or stellate appearance, which has led to their being compared, not inaptly, to bone corpuscles. The deposits first make their appearance at the periphery of the fundus, generally on the inner or nasal side of the retina, and thence gradually extend in opposite directions, forming a more or less broad band in the middle zone, leaving the central, and perhaps the temporal, portion of the retina unaffected; ultimately, however, the remaining portions of the membrane, including the region of the macula lutea, may become involved in the degenerative changes. The retinal ves-

sels are often greatly contracted, and their walls thickened, the smaller branches being obliterated, or changed into narrow tendon-like bands. In many cases, however, the vessels, in some parts of their course, instead of being bright and transparent, look like fine, black lines, owing to the presence of pigment in their walls. This circumstance, in connection with the fact that the pigment is generally deposited along the course of the vessels, has led many ophthalmologists to refer the disease to degenerative changes in their coats—an opinion which seems to be confirmed by a case of Schweigger's, in which, as stated by Wells, he found, on microscopical examination, that the pigmentation was confined to the retinal vessels, the coats of which were thickened and the smaller branches obliterated, these changes extending beyond the pigmentation. But the choroid, retina, and optic papilla also become degenerated, the former being more or less deprived of its pigment epithelium, so that its vessels are rendered visible, and the retina undergoing atrophy of its nerve elements and hyperplasia of its connective tissue elements. To complete the picture, the external limiting membrane of the retina becomes destroyed, and the granular layer, being no longer confined, becomes more or less mixed with the pigment cells of the epitheliel layer of the choroid; and as these find their way more freely into the retina in some places than in others, they become heaped up, here and there, into little black masses of pigment, which give to the retina its peculiar tessellated or mottled appearance.

The subjective symptoms in this affection are no less striking than the objective, the disease being characterized from its commencement by hemeralopia, or night-blindness, and by a marked circular contraction of the field of vision. The former is due to a torpid condition of the retina, resulting from an insufficient supply of blood, in consequence of the diminished number and calibre of its vessels; and the latter arises, in all probability, from pigmentation of the retina. As a conse-

quence of these changes, the patient may be able to see well enough in a direct line during the day, or in a bright light; but as soon as night approaches, or the field of vision is less strongly illuminated, the sight becomes very much impaired. When the visual field becomes greatly contracted, the manner of the patient is rendered somewhat awkward and uneasy, in consequence of his being obliged to roll his eyes about in every direction in order to direct the visual axis upon each individual object. As long as the region of the macula lutea is unaffected, the sight may remain good for central vision; but as soon as this region is invaded, which generally occurs between the ages of 35 and 50, the sight deteriorates, the retina and optic nerve gradually become atrophied, and, sooner or later, the disease leads to complete blindness. The affection generally occurs in both eyes, and is frequently both hereditary and congenital. Although the pigment degeneration may not appear until after puberty, the disturbances of vision generally occur at a much earlier period, and in all cases the disease dates from infancy or early childhood.

ETIOLOGY.—It is evident, from the above, that the etiology of this affection is not well understood. As already stated, the disease is generally hereditary. It is found to be frequently associated with deaf-mutism, and other congenital malformations, and is especially liable to occur from the intermarriage of relatives.

PROGNOSIS.—This is very unfavorable, the disease, as already stated, ending, sooner or later, in complete blindness.

TREATMENT.—This can, of course, only be palliative; but, if proper attention is paid to the general health, and the eyes guarded against all injurious influences, undue exertion, etc., the course of the disease, which is always very slow, may be such as not to produce blindness for many years. Kali hydriodicum, Mercurius corrosivus, and a few other remedies, have been recommended, and may, in some cases, prove temporarily beneficial; but care should be taken not to push them beyond the point of healthful reaction, as their continued use has sometimes led to rapid deterioration of the central vision.

ART. XIV.—NEURITIS OPTICA.

Inflammation of the optic nerve, according to Stellwag, may be either partial or general; may be limited to a few bundles, or embrace its entire thickness; may be confined to the orbital or cranial portion of the nerve; may embrace the entire nerve of one or both eyes; may extend from the retina along one or both nervous tracts to the corpora geniculata (*neuritis ascendens*); or it may originate within the cranium and descend to the optic papilla (*neuritis descendens*); in short, it may assume a great variety of forms and degrees, depending chiefly upon its anatomical relations. A certain degree of optic-neuritis is generally associated with different forms of retinitis, and has already been described. We shall here treat only of the idiopathic affection, of which there are two principal forms, namely, (1) *ascending*, and (2) *descending* optic-neuritis.

1.—ASCENDING OPTIC-NEURITIS.

ENGORGED PAPILLA, ISCHÆMIA OF THE DISC.

SYMPTOMS.—This form of optic-neuritis begins at the optic disc and extends upwards along the course of the nerve, but generally stops short at the lamina cribrosa. It is chiefly characterized by great œdema and swelling of the papilla—which, however, may be only partial—by numerous and extensive extravasations of blood within and around the disc, and by great enlargement and tortuosity of the retinal veins, which are dark and engorged with blood, while the arteries, on the other hand, are very much contracted, and sometimes almost entirely empty.

ETIOLOGY.—The engorgement of the papilla is generally due to an obstruction in the central vessels of the retina, caused

by tumors, or other diseases, within the orbit or cranium. This obstruction soon gives rise to œdema and swelling of the optic nerve, hypertrophy of the connective tissue elements, and, finally, to more or less inflammation of the optic nerve fibres.

The researches of Schwalbe, Schmidt, and other recent observers, have thrown new light upon the etiology of this affection, and have so far disproved the old notion that the engorged papilla is generally due to certain cerebral conditions, which impede the venous circulation of the optic nerve by an increase of intra-cranial tension, or by direct pressure upon the cavernous sinus, as to render it highly probable that the engorgement is due rather to a veritable dropsy of the optic nerve sheath, caused by the passage of the arachnoidal fluid between the external and internal sheaths of the optic nerve to the lamina cribrosa and papilla, where it is arrested, and gives rise to more or less strangulation and swelling. The congestion and consequent œdema are, of course, still further increased by the unyielding scleral ring surrounding the swollen papilla. Manz thinks that dropsy of the sheath, and consequent engorgement of the papilla, may occur, not only in cerebral affections, accompanied by serous effusions, but by any cause, such as an intra-cranial tumor, capable of displacing the normally existing arachnoidal fluid, and forcing a portion of it into the sheath of the optic nerve.

Mixed forms of optic-neuritis frequently occur, in which the symptoms of engorged papilla are not so pronounced and characteristic as above represented, but which shade off, as it were, into those of

2.—DESCENDING OPTIC-NEURITIS.

NEURO-RETINITIS, NEURITIS DESCENDENS.

SYMPTOMS.—This form of optic-neuritis, as its name indicates, commences extra-ocularly, the inflammation extending downwards to the optic papilla. The swelling and hyperæmia of the disc are much less than in the engorged papilla, and the veins are less dilated and tortuous; the arteries, on the other hand, especially those of the retina, are generally very much contracted. The optic disc is reddish and swollen, its outline indistinct and more or less obscured by hemorrhagic effusions having a striated appearance, some of which are only apparent, consisting of newly-developed and closely arranged microscopic blood vessels. The optic disc and retina are diffusely clouded, the latter somewhat extensively, constituting what is called *neuro-retinitis*. White spots sometimes appear in the region of the macula lutea, which renders the disease liable to be mistaken for nephritic retinitis; but, as pointed out by Von Graefe, the arrangement of the spots in neuro-retinitis is different, being situated much nearer to the optic disc; moreover, the œdema of the retina in the vicinity of the disc is greater, the swelling of the optic nerve is also greater, and the veins are larger and more tortuous. (See *Nephritic Retinitis*).

The sight is often much impaired, but the diminution of vision does not always correspond to the extent of the morbid changes, being in some well-marked cases of optic neuritis perfectly normal. Occasionally, however, the sight diminishes very rapidly, so that in the course of a few hours or days the patient may be unable to distinguish light from darkness. In most cases, the field of vision is more or less contracted; and this condition is generally associated with a sluggish and dilated state of the pupil.

A great variety of subjective symptoms are met with in different cases, such as headache, vertigo, loss of memory, vomiting, impairment of the special senses, epileptic attacks, paralysis, etc. These symptoms generally point to a cerebral origin of the neuritis, and are often the occasion of much suffering; the headache, especially, is often very severe and protracted, and generally extends over the whole head. The patient is also frequently annoyed with photopsies and chromopsies, due chiefly, no doubt, to disturbances in the circulation.

ETIOLOGY.—Optic-neuritis frequently originates in cerebral meningitis, the inflammation extending to the optic nerve, and giving rise to descending neuritis. It has also ocurred in connection with cerebro-spinal meningitis, with intra-cranial tumors, abscesses, syphilitic deposits, hydatid cysts, blood-clots, etc. According to Jackson, optic-neuritis should be looked for in every form of cerebral disease, especially those that give rise to cerebral fever. In some cases the disease appears to be hereditary. The disease also occurs in young and delicate females, and is then generally traceable to some menstrual disturbance, or disorder of the central nervous system, such as spinal irritation, chorea, etc.

PROGNOSIS.—This is generally unfavorable, most cases of optic-neuritis resulting sooner or later in atrophy of the nerve and loss of vision. The prognosis is said to be more favorable in the case of children than in adults; also, that acute and rapidly progressing cases afford, as a rule, a more favorable prognosis than the chronic and gradual. So far as the general prognosis is concerned, those are especially favorable in which the affection is due to some temporary and removable cause, such as menstrual irregularities, spinal irritation, etc. But when the brain is affected, the question of vision is merged in the more important one of saving the patient's life, and then the case belongs to the domain of general practice.

TREATMENT.—More good will generally be accomplished

by suitable hygienic measures, and by attention to the general health, than by any specific treatment of the eye symptoms. Whenever practicable, the removal of the cause, whether it be an inflammation or tumor in the orbit, or functional disturbances of the circulation, such as arise from menstrual irregularities, will generally give the most prompt and lasting relief. In the great majority of cases, however, the treatment will of necessity be merely palliative, and will require to be mainly directed to the relief of the patient's sufferings.

In the absence of any precise indications, the following list of remedies is suggested, the selection to depend upon the general action of the remedy and the exigencies of each particular case:—Apis, Ars., Aur., Bell., Bry., Cact., Cim., Collin., Con., Croc., Gels., Kali iod., Lach., Lept., Merc., Nux v. Phos., Puls., Spig., Sulph., Zinc.

ART. XV.—INFLAMMATION OF THE ORBITAL TISSUES.

Under this head we shall describe, very briefly, (1) inflammation of the capsule of Tennon (Bonnet's capsule); (2) inflammation of the cellular tissue of the orbit; and (3) periostitis of the orbit.

1.—CAPSULITIS TENNONII.

INFLAMMATION OF THE CAPSULE OF TENNON.

The ocular capsule, known as the capsule of Tennon or Bonnet, is sometimes subject to inflammation.

SYMPTOMS.—There is, generally, considerable pain in and around the eye, and in some cases it is severe, extending to the face and corresponding side of the head. The globe is somewhat protruded and its motions impaired, but the most marked symptom is a greater or less degree of chemosis, the ocular conjunctiva being red and swollen, and accompanied with con-

siderable episcleral injection. The eyelids, also, are somewhat swollen and inflamed, but the conjunctival secretion is but little if any increased. At the same time, the cornea, iris and other tissues of the eye remain unaffected. Choroiditis and hyalitis are said in some cases to attend or precede the affection, but as a general rule vision continues unimpaired throughout the progress of the case. The disease usually runs a slow but safe course, the effusion between the capsule and sclera being absorbed.

ETIOLOGY.—Cold and erysipelas are said to be the chief causes, especially the former. It may also be of traumatic origin, as in irido-choroiditis following cataract operations, or the inflammation sometimes excited by the operation for strabismus.

TREATMENT.—When the disease is of catarrhal or rheumatic origin, warm fomentations will be appropriate, and will generally give great relief. If on the other hand the disease is due to trauma, cold applications will be required. If the inflammation is very severe, Aconite and Belladonna, either singly or in alternation, may be employed, aided, if necessary, by a Belladonna lotion or ointment.

2.—CELLULITIS ORBITÆ.

INFLAMMATION OF THE CELLULAR TISSUE OF THE ORBIT.

SYMPTOMS.—Inflammation of the orbital cellular tissue is generally of a very acute character, and, as in other forms of cellulitis, soon terminates in suppuration and abscess. Owing to the unyielding nature of the cavity in which the parts are lodged, the inflammatory swelling, which is always very great, and especially so after suppuration has set in, gives rise to the most intense and agonizing suffering within the orbit, the pain extending to the surrounding parts and often

to the whole head. The eyelids are red, hot, and very much swollen, the conjunctivæ much injected, and accompanied in most cases with great chemosis, in the centre of which the cornea is deeply imbedded. The swelling of the orbital tissues causes more or less protrusion of the globe, and although this is not at first very perceptible, it gradually increases, until at last the palpebræ are unable to cover the organ, and the latter stands out, more or less, from between them. Pressure upon the globe, or any attempt to move it, excites intense pain, and therefore the patient keeps the eye perfectly still. As suppuration occurs the pain slightly abates, becomes intermittent and throbbing, and is attended with manifest rigors. These symptoms are generally accompanied with considerable fever, especially at night; and if the inflammation extends to the brain, delirium, vomiting, and other cerebral symptoms, ensue. If the suppuration is extensive, the pus ultimately makes its way to the surface, either presenting at the orbital margin, or under the conjunctiva where it passes from the lid to the globe. In some cases the inflammation spreads to the globe, and then the symptoms of panophthalmitis are added to those already described. (See *Suppurative Choroiditis*. Even when the suppuration is confined to the orbital tissues, the vision is often greatly impaired, either by the stretching of the optic nerve or by the pressure upon it, and the field of vision is also more or less contracted. The retinal veins are frequently dilated and tortuous, the retina and optic disc more or less infiltrated with serum, and when the disease is protracted it sometimes gives rise to optic-neuritis.

But inflammation of the orbital cellular tissue is sometimes far less acute, and may even be of a chronic character. In these cases the symptoms are proportionably less severe. Matter forms and makes its way to the surface more slowly, the eye gradually protrudes from between the lids, which become somewhat red and swollen, and finally perforation occurs and the pus is evacuated.

ETIOLOGY.—Orbital cellulitis may be induced by sudden atmospheric changes, by exposure to cold and wet, or by other physical causes. It may also arise from the extension of inflammation from neighboring parts, as in purulent conjunctivitis, panophthalmitis, erysipelas of the head and face, etc. Occasionally the inflammation supervenes upon severe constitutional diseases, such as typhus fever, purperal fever, pyæmia, etc. But the most frequent causes are of a traumatic character, such as penetrating, contused, or incised wounds of the orbital tissues, injuries received from the lodgement of foreign bodies in the orbit, operations upon the lachrymal sac, eyelids, eye, etc.

PROGNOSIS.—This varies according to the nature and extent of the complications. If, as is not unfrequently the case, the cellulitis becomes complicated with periostitis of the orbit, it may result in caries or necrosis of the latter, in which case the pus may find its way into the antrum Highmorianum, or into the cranium; or the inflammation may extend backward along the periosteum directly to the membranes of the brain, and give rise to cerebral inflammation or abscess. Life, as well as vision, may also be jeopardized by inflammation and suppuration of the globe, or by such an impairment of the general health as to preclude recovery.

TREATMENT.—During the first stage, or before suppuration sets in, cold compresses should be employed, the latter being conjoined with the internal use of Aconite, unless the symptoms call for some other remedy, such as Apis, Bell., Bry., Rhus, etc. But if suppuration has already set in, warm applications, such as fomentations and poultices, will be required. The latter will generally be found to be the most convenient, not only for the purpose of promoting suppuration, but to facilitate the discharge of pus, which should always be evacuated at the earliest possible period, either through the conjunctiva, or if this is impracticable, then through the lid

itself. The internal remedies best adapted to this stage are: Ars., Hep., Lach., Merc., Sil., Sulph.

If there should be any doubt as to the presence of pus in the orbital cavity, the upper lid may be retracted, and a small exploratory incision made, by passing a narrow-bladed knife (Pl. I. Fig. 13) through the conjunctiva, above the upper surface of the globe, into the orbit, and if pus oozes out, the opening should be enlarged so as to permit of its free evacuation. In order to avoid injuring the globe, care should be taken to direct the edge of the instrument slightly upward in making the incision. A warm emollient poultice should then be applied, and if this fails to keep the opening patulous, the lips of the wound should be carefully separated with a probe, or, if necessary, a small tent may be inserted, being careful to remove it at least once a day. If the sinus is a long one, and especially if it seems indisposed to heal, a mild astringent lotion should be injected every time it is dressed. A careful examination should also be made from time to time, in order to discover the condition of the bone, and if necrosis is found to exist, the sequestræ should be removed as fast as they may become detached.

DIET AND REGIMEN.—The general health of the patient should receive careful attention, and the diet should be of the most nutritious and liberal character. Long-continued suppuration may demand the use of malt liquors, especially if the patient's health has been already undermined by serious illness.

3.—PERIOSTITIS OF THE ORBIT.

Orbital periostitis may be either acute or chronic. The former is generally attended by high inflammatory

SYMPTOMS.—The symptoms of acute orbital periostitis are similar to those of orbital cellulitis, except that they are generally somewhat less severe, and the protrusion of the globe is more or less oblique, as respects the antero-posterior diameter of the ball, instead of being direct. Moreover, the movements of the globe are less restricted in some directions than in others, owing to the periostitis being confined to a particular part of the orbit. Where the sensations of the patient and the obliquity of the globe are not sufficient to determine the seat of the disease, it may frequently be detected by gently pressing the globe back into the orbital cavity in different directions, the pain and swelling corresponding to the seat of the inflammation. The cellular tissue, as well as the bone itself, also become more or less inflamed, the former sometimes to a great extent, in which case pus is formed in considerable quantity, causing marked protrusion of the eye, and a corresponding limitation of its movements.

In chronic periostitis, the symptoms are the same as in the acute form, but much less severe. Thus, the orbital and circumorbital pain, the redness and swelling of the lids, the chemosis, the conjunctival and episcleral injection, and the ocular protrusion, are generally less pronounced, while the course of the disease is more insidious and protracted. The pain, which is usually most severe at night, is always increased when pressure is made on the globe in the direction of the swelling, which may often be detected in this manner. More or less suppuration generally occurs, the matter sometimes accumulating beneath the periosteum and separating it from the bone, in which case the latter is apt to become necrosed. If this should occur, the inflammation or the pus may extend into the frontal sinus, or into the cavity of the cranium, giving rise to either menin-

gitis or abscess of the brain. In other cases, the periosteum swells and forms nodes, or tumors, which, after the inflammation has run its course, generally disappear, leaving, perhaps, only a little thickening of the periosteum ; sometimes, however, the tumors ossify and become permanent.

ETIOLOGY.—Acute periostitis is frequently due to the same causes that give rise to orbital cellulitis, and is often associated with it. Operations on the lachrymal sac are especially apt to give rise to it. So, also, are concussions and injuries of the orbit, whether made by blows, by cutting instruments, or by the lodgement of foreign bodies within the orbital cavity. Sometimes the disease is secondary, the inflammation extending from the frontal sinus, or other neighboring cavities. The chronic form, on the contrary, is frequently due to syphilis. Many cases occur, also, among scrofulous and badly-nourished children.

PROGNOSIS.—Orbital periostitis generally ends in recovery, though in some cases, especially when the roof of the orbit becomes carious, the inflammation may travel to the brain and cause death. In most cases, however, the caries and necrosis are limited to the margin of the orbit, resulting, when healed, in contraction of the integuments, and, in many cases, causing more or less ectropium. But the worst results, so far as the integrity of the eye is concerned, are experienced when the posterior portion of the orbit becomes carious, for this always gives rise to extensive suppuration of the orbital tissues, and not unfrequently affects the optic nerve, destroying its function by inflammation, or so compressing it as to lead to atrophy.

TREATMENT.—Simple periostitis requires similar treatment to that recommended for inflammation of the cellular tissue of the orbit (which see). It is especially important that all collections of matter should be evacuated as soon as possible after they are detected, and that care should afterwards be taken to favor the escape of pus and other morbid products. When the disease can be traced to some dyscrasia of the system, anti-scrofulous or anti-syphilitic remedies will generally be indicated, such as Cist. c., Kali iod., Kali brom., Merc. protoiod., Nit. ac., Ol. jec,, Sulph., etc.

ART. XVI.—INFLAMMATION OF THE LACHRYMAL APPARATUS.

Diseases of the lachrymal organs are frequently met with, but inflammation of these parts is comparatively rare. Erysipelatous inflammation frequently occurs at the internal angle of the eye, and the attendant swelling, being situated over the lachrymal sac, may give rise to symptoms resembling, in some respects, those of inflammation of the sac itself; but it generally subsides without involving these parts to a degree sufficient to cause suppuration, or any other unpleasant consequences. We shall embrace what we have to say concerning inflammatory affections of the lachrymal organs under the two heads of (1) Dacryo-adenitis, and (2) Dacryo-cystitis.

1.—DACRYO-ADENITIS.

INFLAMMATION OF THE LACHRYMAL GLAND.

SYMPTOMS.—Acute inflammation of the lachrymal gland is seldom an idiopathic affection. It is characterized by great heat, redness and swelling, such as accompanies the formation of acute abscess in other parts. Sometimes the inflammatory products are absorbed, and the swelling subsides; but, in most cases, suppuration occurs, and generally continues long after the opening of the abscess. The suppurating cavity is comparatively deep, and usually opens and closes several times before it becomes permanently healed. In some cases, however, the opening remains patulous, and a small fistulous sinus is formed, through which the lachrymal secretion continues to ooze. But dacryo-adenitis is most frequently of a chronic character, and runs a very slow and tedious course. It usually manifests itself by the appearance and gradual development of

an irregular, more or less hard, and immovable swelling at the outer and upper portion of the orbit. When the tumor is large, it pushes the globe downwards and inwards, and sometimes impedes its movements, especially in the opposite direction. The tumor is not generally painful, nor sensitive to the touch; but, if the swelling is of considerable size, or if the inflammation is at all acute, it may be both painful and tender, especially on pressure. In some cases the upper lid is red and œdematous, the palpebral conjunctiva injected and somewhat swollen, and the ocular conjunctiva, perhaps, chemotic. Occasionally, both glands become inflamed at the same time, and then the deformity is symmetrical.

ETIOLOGY.—In most cases, dacryo-adenitis is the result of a blow, or fall; but it may also be due to cold, or it may spring from chronic inflammation of neighboring parts.

TREATMENT.—In the acute form, Aconite, Belladonna and Baryta internally, in connection with cold or ice-water compresses externally, will favor resolution of the inflammation; but if suppuration threatens it should be encouraged by the use of hot fomentations and poultices, and as soon as pus forms it should be let out by making a free incision into the abscess. Hepar, Merc. and Silex are the internal remedies most frequently indicated after suppuration sets in. In the chronic form, Bar. iod., Kal. iod., and Phytolacca should be tried; but, if the swelling remains, and especially if it impairs the mobility of the eye-ball, or causes its displacement, the tumor should be extirpated.

2.—DACRYO-CYSTITIS.

INFLAMMATION OF THE LACHRYMAL SAC.

SYMPTOMS.—Acute inflammation of the lachrymal sac is, when fully developed, a very painful affection—much more so than the limited extent of membrane involved would lead us to expect; moreover, there is generally much constitutional disturbance, or feverishness, attending the disorder—peculiarities which are chiefly due, no doubt, to the vascularity of the affected membrane, and the unyielding character of the bony canal in which the latter is inclosed. A dull, shooting pain is first felt in the region of the lachrymal sac, at the inner angle of the eye, at which point there appears a small, hard, circumscribed swelling, which afterwards becomes hot, red and tense, and so sensitive that the patient cannot bear to have it touched. The neighboring parts also frequently become red and swollen, the œdema extending to the eyelids and face, and even to the temple. The conjunctiva is more or less injected and swollen, especially the large fold of that membrane, and there may also be some chemosis. The nose generally appears dry and stopped up, in consequence of the closure of the nasal duct, which prevents the passage of fluids into the nostrils. At this time, the appearances are such that the disease is liable to be mistaken for erysipelas of the face. This is especially true of the lids, which are extensively infiltrated with serum, and are red and glistening. But a close examination of the parts will reveal a marked prominence and redness in the region of the sac, the circumscribed enlargement of which is also apparent to the touch.

After a time, varying from a few days to as many weeks, according to the violence of the inflammation, suppuration of the sac occurs; the swelling becomes still more prominent, and if left to itself often bursts and gives exit to pus, or pus mingled with tears and mucus, though the latter do not generally begin to be discharged until after the inflammation has

somewhat receded. After perforation occurs, the pain, swelling, and other inflammatory symptoms, rapidly subside; and in the course of a few weeks more, if circumstances favor, the opening may heal up, and complete recovery take place. Usually, however, the persistent flow of muco-purulent matter and tears wholly prevent the closure of the opening, or if not, the closure is but temporary, as the inflammation soon relapses, and leads again to perforation, and so the process is continued, until what is called a *fistula lachrymalis*, or more properly a *fistula of the lachrymal sac*, is established. Sometimes, especially in chronic cases, more than one external opening is formed, in consequence of the cellular tissue in the vicinity of the sac breaking down into small abscesses, which finally open in the usual manner by perforation.

More frequently, however, the inflammation does not advance to suppuration and the formation of fistulæ. The natural secretion, so to speak, of the mucous membrane, becomes so altered by the inflammatory process as to resemble pus, and in this state either escapes spontaneously through the puncta lachrymalia, or is forced out whenever pressure is made on the distended sac. The relief thus obtained causes the inflammation to recede; the secretion gradually becomes thinner and more natural, and at last changes into clear mucus. As the congestion and tumefaction abate, the sac and duct again become pervious, the lachrymal secretion takes its natural course into the nose, and the disease is at an end.

ETIOLOGY.—Dacryocystitis is generally a secondary affection, being due to an extension of the inflammatory process from the conjunctival or nasal mucous membrane, as in granular conjunctivitis, nasal catarrh, periostitis and caries of the nasal bones, etc. It is especially apt to occur under these circumstances in scrofulous and syphilitic patients. It is frequently associated with erysipelas, but whether as cause or effect is uncertain. It also frequently follows blennorrhœa of the sac. When idiopathic, it is generally of catarrhal origin.

TREATMENT.—If seen at the commencement, we should endeavor to prevent the formation of an abscess, by the local use of cold or ice-water compresses, and the internal administration of such remedies as Aconite, Belladonna, Baryta, etc.; but as soon as pus appears in the lachrymal sac, we should try to avert perforation, and secure a ready exit for the discharge, by slitting the upper canaliculus with Weber's knife, (Pl. II, Fig. 38), and then, if the opening into the sac is contracted, passing the knife into the latter, and dividing its neck. Gentle pressure upon the walls of the sac will then cause the free escape of its contents, the pus continuing to ooze out of the opening, and welling up freely whenever the slightest pressure is made upon the swelling. A probe should now be used to dilate the nasal duct, so as to restore the passage into the nose. But if suppuration has already progressed so far as to render perforation inevitable unless otherwise relieved, it is better to lay the sac open, by making a free incision into it, in a downward and outward direction, and thus give exit to the pus. A warm-water dressing, or a poultice, should now be applied, and the wound kept open until the discharge ceases, which will generally occur as soon as the inflammation subsides, and the nasal duct is rendered pervious. If the lachrymal passages remain closed after the inflammation abates, the canaliculus should be divided, and the nasal duct dilated by a probe, as already described. The same operative procedures should be had recourse to, in case perforation has already taken place. If the ulcerated opening fails to heal readily, and becomes fistulous, its edges should be stimulated from time to time with sulphate of copper, when it will soon close. If, after the perforation has healed, the lining membrane of the sac continues to secrete muco-purulent matter, the passage should be syringed out daily with a solution of alum or sulphate of zinc, of the strength of one or two grains to the ounce of distilled water, or a weak preparation of Hamamelis or Muriate of Hydrastia, may be used in the same manner. These injections

will not only clear the sac of irritating secretions, but will diminish the discharge by lessening the inflammatory process. The injections should be made every day, or every other day, as may be found most beneficial; and, if necessary, they should be gradually strengthened as improvement occurs. Any convenient syringe will answer to inject the fluid, but it will generally be necessary to first pass a silver canula, by one of the canaliculi, through the sac into the duct, and to this the nozzle of the syringe should be attached. Or, if preferred, we may introduce Spier's lachrymal catheter (Pl. II, Fig. 39) through the inferior punctum and canaliculus, and inject the sac through the upper canaliculus, by means of an Anel's syringe the injection passing out again through the catheter lying in the inferior canaliculus.* If the parts are tense and hypertrophied, it may be necessary to facilitate the introduction of the tube, by previously dividing the neck of the sac and the internal palpebral ligament. This is most readily effected by first slitting up the canaliculus with Weber's beak-pointed knife, (Pl. II, Fig, 38), and after passing the point of the instrument quite down into the sac, turning its cutting edge forwards and outwards, and incising the ligament from within.

The internal treatment for blennorrhœa of the lachrymal passages may be gathered from the following indications:

Discharge thin and acrid: Alum., Ars., Arum t., Cinnab., Merc.

Discharge thin and bland: Euph., Sil.

Discharge thick and bland: Calc., Puls.

Discharge very profuse: Arg. nit., Euc. g., Hepar, Nat. m., Merc.

Obstinate: Calc., Fluor. ac., Petrol., Sil.

Occasionally useful.—Brom., Calend., (*topically*), Hydras, Kali iod., Lach. Sulph.

* See *Am. Hom. Obs.*, vol. viii, p. 360.

ART. XVII.—ADDITIONAL THERAPEUTIC INDICATIONS.

The remedies mentioned in the preceding pages are those upon which the author has hitherto chiefly relied in the treatment of ophthalmic inflammation; but as the list is in some instances somewhat meagre, we have gleaned from our homœopathic literature the following additional therapeutic hints, which will no doubt be found serviceable in particular cases.

Agaricus.—Spasmodic action of the muscles of the eyelids and globe; twitching of the lids, accompanied with great heaviness; twiching and jerking of the eyeballs, with soreness, aching, and outward pressure. Spasmodic movements generally disappear during sleep, but return on waking. Great weakness of the eyes; vision soon becomes obscured, especially for near objects; everything appears blurred and indistinct.

This remedy has cured muscular asthenopia, with weakness of the internal recti; also anæmia of the choroid, retina and optic nerve.

Ailantus gland.—Conjunctivitis, with aching, burning, smarting and roughness; purulent discharge, with agglutination of the lids in the morning.

This new remedy is said to have cured chronic gonorrhœal ophthalmia.

Alumina.—Burning sensation in the eyes, with or without lachrymation, especially at night; itching and smarting of the lids and canthi; nightly agglutination; weakness of the upper lids, which hang down as if paralyzed; conjunctiva red and inflamed; edges of the lids itch and burn; cilia drop out; photophobia; squinting, and dimness of vision.

In blepharitis ciliaris; trachoma; muscular asthenopia, with weakness of the internal recti; amaurosis.

Amyl nit.—Eyes staring; conjunctiva bloodshot; pupils dilated; vision obscured; chromopsia; veins of the optic disc enlarged, varicose and tortuous.

In exophthalmic goitre, by olfaction.

Asafœtida.—Crampy, drawing and boring pains around the brows; stitching and burning pains in the eyes, with dryness, and sensation as if sand was in the eye; pressure in the eyes; heavy feeling in the eyelids, as if sleepy.

Ciliary neuralgia, keratitis, iritis, irido-choroiditis, and retinitis, are said to have been benefited by this remedy, especially syphilitic cases.

Asarum.—Severe burning in the lids, with or without watering of the eye; conjunctiva deeply injected; violent congestive headache.

Chronic blepharitis and asthenopia, attended with severe headache, are reported as having been cured by this remedy.

Aurum mur.—Vascularity and opacity of the cornea; ciliary injection; photophobia; tearing pains in the globe, especially the left; complete loss of vision.

Several cases of diffuse keratitis, accompanied with the above symptoms, have been reported cured by low attenuations of this remedy; also a case of amaurosis, with great prostration, occurring suddenly after a severe attack of scarlatina.

Baryta iod.—Drs. Liebold and Woodyatt report cases of diffuse and obstinate phlyctenular keratitis, in scrofulous subjects, successfully treated with this remedy; the lymphatic glands "feel like a string of beans between the muscles."

Calcarea iod.—Severe ciliary irritation, pain, photophobia, lachrymation, spasm of the lids.

Reported serviceable in nearly every form of scrofulous inflammation of the eye, particularly chronic blepharitis, phlyctenular and suppurative keratitis, especially when com-

plicated with enlargement of the glands of the neck and throat.

Cedron.—Eyes protruding; pupils fixed and dilated; dimness of vision, especially at night; objects appear red at night and yellow in the day time; pressive and shooting pains in the forehead and temples, worse over the left eye.

Supra-orbital neuralgia, especially when dependent upon iritis, choroiditis, and other intra-ocular troubles, appears to have been frequently relieved by this remedy.

Chelidonium.—Violent pressive and shooting pains in the eyes; neuralgic pains in the brows and lids; feeling of sand in the eyes, especially on movement; redness, burning and swelling of the eyelids, with morning agglutination; yellowness of the sclerotica; dimness of vision, with faintness; flickering and brilliant specs before the eyes.

Intermittent ciliary neuralgia, catarrhal conjunctivitis, and rheumatic amaurosis, are reported as having been cured by this remedy.

Cicuta.—Diplopia; things look black; eyes protrude, with a staring look; pupils first contracted, then considerably dilated; when standing or walking, the sight vanishes, and objects appear to advance, recede, and waver, from vertigo.

Cicuta has cured double vision, vertigo, blepharitis with agglutination of the lids, and photophobia; but its chief value appears to be in spasmodic affections of the eyes and lids.

Clematis.—Smarting pain in the eyes and in the margins of the lids; burning pain in the lids and canthi; stitches and burning in the inner canthus, with weak sight and lachrymation.

Chronic blepharitis and conjunctivitis, keratitis, iritis, and kerato-iritis, occuring in scrofulous subjects, have been cured or greatly benefited by this remedy.

Comocladia.—Aching soreness in the globes, which feel heavy and larger than natural; painful pressing-out sensation,

as if something was pressing on top of the eyeballs; severe pain in the balls, extending to the head; pains increased by warmth.

In ciliary neuralgia associated with asthenopia, and chronic iritis.

Crocus.—Burning in the eyelids; burning and smarting in the eyes, as from smoke; spasmodic twitching of the lids, especially the upper; aching in the eyeballs, with epiphora, worse on reading; upper lids feel heavy; pupils dilated; sight obscured, as by a mist, worse for central vision.

This remedy seems to have relieved a variety of ophthalmic troubles, chiefly menstrual, or occurring in hysterical women; such as nictation, with epiphora; nightly twitching of the lids, with lachrymation; asthenopia, associated with the above symptoms, or when attended with a sensation as if the patient had been weeping; pains in the eye and head, occurring in sclero-choroiditis posterior, etc.

Crotalus.—Yellow, sunken appearance of the eyes; pressure in and above the orbits; oozing of blood from the eyes, which appear ecchymosed; frequent vanishing of sight, especially in damp weather, or when reading.

In ciliary neuralgia and amblyopia, occurring in women, and aggravated at the menstrual period; it also appears to be indicated in retinal hemorrhages, as first pointed out by Dr. Liebold.

Croton tig.—Œdematous swelling and itching of the eyelids; weakness of the eyes, with lachrymation; violent stinging and burning pains in the eye, with inflammatory redness and irritation of the conjunctiva; violent inflammation of the eye occurred on the second day, attended with ulceration of the ocular conjunctiva, irritation of the iris with contraction of the pupil, conjunctival and episcleral injection, profuse lachrymation, photophobia, and violent pains, disturbing the nights rest.

Phlyctenular ophthalmia and keratitis, either with or without ulceration of the cornea, are said to have yielded speedily to this remedy, especially when the characteristic eruption also appeared on the lids and face.

Cyclamen.—Dilatation of the pupils, with obscuration of sight; stupefaction, with sensation of a fog before the eyes.

Amblyopia, diplopia, hemiopia, and convergent strabismus, are said to have been relieved by this remedy.

Fluoric ac..—Violent itching in the canthi; increased lachrymation; sensation as of cold wind blowing in the eyes; vision disturbed by dark, floating opacities.

Lachrymal fistula, of a years duration, and dark spots before the eyes, caused by movable opacities of the vitreous, are reported to have been relieved by this remedy.

Hamamelis.—Painful inflammation of the eyes and lids, with extreme congestion; ecchymosis of the lids; intra-ocular hemorrhage.

This remedy, used locally as well as internally, has been successfully employed in traumatic conjunctivitis, keratitis and iritis, caused by burns, splinters, blows, etc.; also in ulceration of the cornea, and in internal hemorrhages, especially when of traumatic origin.

Kali bich.—Conjunctiva deeply injected, with heat and uneasiness; eyelids inflamed and swollen; papillæ of the palpebral conjunctiva enlarged; cornea ulcerated; photophobia and dimness of vision.

Trachoma, pannus, corneal opacities, and rheumatic iritis, the latter in a syphilitic patient, have been successfully treated by this remedy.

Kalmia.—Sensation of stiffness in the eyelids, and in the muscles around the eyes; itching in the eyes; glimmering before the eyes, exactly in the axis of vision; dimness and loss of vision, especially on looking down, worse in the morning.

Sclero-choroiditis anterior, asthenopia with stiffness of the recti muscles, and retinitis albuminurica, have all been cured, or greatly benefited, by the internal administration of Kalmia.

Lycopus virg.—The chief symptom is a painful pressure in the eyeballs.

Lycopus has relieved protrusion of the eyes, with tumultuous action of the heart, and is even reported to have cured exophthalmic bronchocele.

Phytolacca.—Burning, smarting and itching in the eyes, as if sand were in them, with profuse lachrymation; dull, heavy pain in the eyeballs, worse from motion, light, and reading; an eruption (probably enlarged papillæ) on the conjunctiva; eyelids œdematous and agglutinated.

This remedy is reported to have cured catarrhal ophthalmia, with lachrymation and photophobia; also granular conjunctivitis, with circum-orbital pain and soreness; great benefit is also said to have resulted from its internal administration in a case of traumatic suppurative choroiditis, in which the lids were enormously swollen, the conjunctiva chèmosed, and the anterior chamber filled with pus.

Prunus sp.—Lancinating and shooting pains in and around the eye, and in the corresponding side of the head; pain in the eyeball as if it were crushed or wrenched; pain in the globe as if it were pressed asunder; sharp, piercing pains, extending to the eye; aggravation of the pains from motion.

This remedy not only seems to relieve almost every form of ciliary neuralgia, but to be of great value in the treatment of various ophthalmic disorders of which this symptom is a prominent feature, such as irido-cyclitis, choroiditis, chorio-retinitis, etc.

Ruta.—Feeling of heat and sensation as of fire in the eyes, with soreness when reading by candle-light; pressure on the upper wall of the orbits, with tearing pain in the eyeballs; dimness of vision from exerting the eyes too much by reading or fine work.

In asthenopic symptoms arising from over-exertion of the eyes.

Santonine.—Dimness and loss of vision; giddiness; troubled sight, with dilatation of the pupils; convulsive twitchings of the eyes and lids.

This remedy is reported to have been successful in a considerable number of cases of asthenopia, amaurosis, and cataract (?).

Senega.—Swelling, burning and pressure of the eyelids, with burning pain in the margins; eyelashes in the morning full of hard mucus; illusions of sight; extreme sensitiveness of the eyes to light.

Senega appears to act very beneficially in blepharitis and conjunctivitis, attended with the above symptoms; and is said, also, to have promoted absorption of hypopya, and of less fragments after cataract operations.

Staphysagria.—Itchings of the margins of the eyelids; pimples around the inflamed eye; sticking shocks in the eyeball, as if it would burst; illusions of sight; dilation of the pupils; aching and pressure in the eye; lachrymation and photophobia.

This is an old and well-known remedy for blepharitis, styes, and small tarsal tumors; and it is also reported to have cured several cases of the so-called "arthritic ophthalmia."

Sticta.—Burning in the eyelids, with soreness of the ball in closing the lids, or turning the eyes.

In catarrhal conjunctivitis, with profuse but mild discharge.

Zinc phos.—Retinal hyperæmia; extreme sensitiveness of the eyes to light; photopsia, photophobia, and chromopsia.

In hyperæsthesia and hyperæmia of the retina.

TABLE A.

OPHTHALMIC SYMPTOMS.

1. **Agglutination**—BELL., CALC., CARB. V., CAUS., EUPHORB., HEP., KALI, LYC., NAT. M., NUX V., PHOS., PULS., RHUS., RUTA, SEP., SILIC., STAPH., *Bry.*, *Ign.*, *Stann.*, Alum., Croc., Nit. ac., Plumb., Sulph., Thuja.

2. **Burning**—ARS., ARN., BELL., BRY., CALC., CON., CHAM., CROC., DIG., RHOD., RUTA, SPIG., SPONG., THUJA., *Alum.*, *Canth.*, *Ferr.*, *Graph.*, *Ign.*, *Kali*, *Nit. ac.*, *Plumb.*, *Puls.*, *Rhus. Sep.*, *Staph.*, *Sulph.*, Acon., Agar., Aur., Bar., Chin., Dros., Hell., Lyc., Mur. ac., Nux v., Phos., Silic., Stram.

3. **Dryness**—BRY., STAPH., SULPH., VERAT., *Bell.*, *Puls.*, Agar., Bar., Caust., Croc., Euph., Kali, Lyc., Nat. m., Nux v., Phos., Spig.

4. **Lachrymation**—ACON., ARN., BELL., BRY., CALC., CAUST., CHIN., COLOC., DIGIT., EUPH., FERR., GRAPH., HEP., IGN., KALI C., LYC., MERC., NAT. M., NUX V., PHOS., PULS , RHUS, RUTA, SPIG., SPONG., STRAM., SULPH., VERAT. A. *Alum.*, *Ars.*, *Bar.*, *Chelid.*, *Con.*, *Croc.*, *Rhodod.*, *Seneg.*, *Sep.*, *Sil.*, *Stan.*, *Staph.*, Zinc., Agar., Camph., Canth., Carb. v., Cina, Coff., Hell., Lach., Op., Petr., Ph. ac., Plat.

5. **Neuralgia**—ATROP., BELL., CEDR., CHAM., PRUNUS SP., SPIG., *Chin.*, *Cinnab.*, *Sil.*, Asafœt., Bry., Cimicif., Crotal., Ign., Mez., Nat. m., Plat., Sulph., Thuj.

6. **Pupils**, *Dilated*—ACON., BELL., CALC.,CHIN., CINA, CROC., HEP., HYOSC., IGN., IPEC., SEC. C., SPIG., STRAM., VERAT., ZINC. *Agar.*, *Arn.*, *Hell.*, *Nux v.*, *Ph. ac.*, *Puls.*, Ars., Aur., Caust., Con., Cupr., Dig., Mur. ac., Nit. ac., Petr., Plumb., Stann.

Pupils, *Contracted*—ARN., CAMPH., CHAM., CHIN., CIC., HYOSC., IGN., PULS., SULPH., VERAT., *Acon.*, *Agar.*, *Ars.*, *Aur.*, *Bell.*, *Cina*, *Cocc.*, *Dros.*, *Plumb.*, *Sec. c.*, *Stram.*, Calc., Canth., Digt., Hell., Mur. ac., Ph. ac., Stann., Thuj.

7. **Redness**, *Inflammatory*.—ACON., APIS, ARN., ARS., BELL., BRY., CALC., CHAM., CHIN., DIGT., EUPHR., IGN., MERC., NAT. M., NIT. AC., NUX V., PHOS., PH. AC., PULS., RHUS, SEP., SILIC., SPIG., SULPH., VERAT., *Coloc.*, *Cupr.*, *Euphorb.*, *Ipec.*, *Kali*, *Lyc.*, *Staph.*, Bar.,

Camph., Canth., Carb. v., Con., Dulc., Ferr., Graph., Hep., Hyosc., Op., Plumb.

8. **Smarting**—AGAR., CON., MERC., NUX V., RHUS, VAL., *Alum., Canth., Chin., Graph., Sep., Staph.*, Ars., Bell., Bry., Calc., Carb. v., Caust., Croc., Dros., Euphor., Hell., Hep., Kali, Lyc., Mur. ac., Nit. ac., Phos., Ph. ac., Sulph., Thuj.

9. **Swelling**—ARS., RHUS, STRAM., *Bry.*, Carb. v., Hep., Nux, v. Phos., Plumb., Ruta, Sulph.

10. **Ulceration,** *Tarsal*—SPONG., SULPH., *Arn., Calc., Cham., Lyc., Phos., Sil., Staph.*, Alum., Bar., Caust., Kali, Nit. ac., Sep.

11. **Ulceration,** *Corneal.*—ARG. N., ARS., AUR., CALC., GRAPH., HEPAR., KALI BIC., MERC., *Acon., Canth., Cinnab., Nat. m., Silic., Sulph.*, Apis, Arn., Cham., Chin., Cimicif., Con., Crot. tig., Ham., Puls., Rhus.

12. **Vision, A.**—*Amblyopia:* BELL., PHOS., ZINC., *Gels., Merc., Sant.*, Acon., Alum., Arn., Ars., Aur., Bar., Bov., Calc., Chel., Chin., Crot., Cyclam., Ign., Kali, Lyc., Nat. m., Puls., Ruta., Sep., Sil., Sulph., Thuj.

B.—*Chromopsia.*—BELL., CON., *Croc., Digit., Kali*, Alum., Ars., Calc., Cann., Canth., Hep., Hyos., Merc., Ph. ac., Phos., Sep., Spig., Stram., Zinc.

C.—*Diplopia.*—BELL., DIGIT, EUPHORB., HYOSC., PULS., SEC. C., SULPH., VERAT., *Aur., Cic., Stram.*, Agar., Graph., Nit. ac., Merc., Petr.

D.—*Hemiopia.*—AUR., LITH. C., LYC., MUR. AC., NAT. M., SEP., *Bov., Cyclam., Digt.*, Calc., Chin., Lob., Viola od.

E.—*Hemeralopia.*—HYOS., RANUN., VERAT., *Arg. nit., Digt., Sulph.*, Bell., Chin., Lyc., Merc., Puls., Stram.

F.—*Photophobia.*—ACON., ARN., ARS., BELL., BRY., CHAM., CHIN., CON., EUPHR., GRAPH., HEP., IGN., MERC., NUX V., PULS., SEP., SULPH., *Cic., Cin., Croc., Sant.*, Alum., Camph., Coff., Hell., Kali, Lyc., Mur. ac., Nit. ac., Ph. ac., Sil.

G.—*Photopsia.*—BELL., BRY., SPIG., *Bar., Caust., Kali, Sil., Verat.*, Ars., Aur., Calc., Coloc., Croc., Digt., Dulc., Nat. m. Nux v., Op., Petr., Ph. ac., Staph., Stram.

H.—*Vitreous Opacities.*—KALI IOD., SIL., SULPH., *Calc., Nat. m. Nit. ac., Phos., Sep.*, Arn., Bell., Carb. v., Caust., Ham., Kal., Lach., Lyc., Merc., Petr., Prunus, Sol. n.

TABLE B.

OPHTHALMIC INFLAMMATION.

1. **Conjunctivitis**—APIS, ARG. NIT., BELL., EUPHR., MERC., PULS., RHUS, SEP., SULPH., *Arn.*, *Ars.*, *Calc.*, *Cham.*, *Cinnab.*, *Graph.*, *Hepar.*, *Ign.*, *Nux. v.*, *Sang.*, *Spig.*, *Zinc.*, Alum , Chelid., Croc., Cupr., Euphor., Kali bic., Nat. m., Sen., Thuj.

2. **Blepharitis**—ACON., ALUM , APIS, ARG. NIT., ARS., CALC., CAUST., CINNAB., EUPHR., GRAPH., HEPAR, MERC., NAT. M., PETR., PULS., SEP., SILIC., *Aur.*, *Cham.*, *Crot. tig.*, *Merc.*, *Nux v.*, *Psor.*, *Rhus*, *Staph.*, *Tellur.*, Bell., Clem., Colch., Kali, Lyc., Phos. ac., Sang., Seneg., Viola tric.

3. **Keratitis**—ACON., APIS, ARG. NIT., ARN., ARS., AUR., CALC., CANTH., CHAM., CHIN., CIMICIF., CON., CROT. TIG., EUPHR., GRAPH., HAM., HEPAR., KALI BIC., MERC., NAT. M., NUX V. PULS., RHUS, SEC. C., SIL., SULPH., *Aur. m.*, *Bar.*, *Sep.*, *Thuj.*, *Vaccin.*, Alum., Bell., Caust., Chin., Kreos., Nit. ac., Seneg.

4. **Episcleritis.**—ACON., KAL., MERC., SILIC., THUJ., *Puls.*, Cocc., Spig., Sulph.

5. **Iritis.**—ACON., ARN., ARS., AUR., BELL., BRY., CALEND., CEDR., CHIN., CLEM., CON., EUPHR., GELS., HAM., HEPAR., KALI IOD., MERC., NIT. AC., NUX V., PETR., RHUS, SILIC., SPIG., SULPH., TEREBINTH., THUJ. *Arg. nit.*, *Asafœt.*, *Cinnab.*, *Nat. m.*, *Puls.*, Cocc., Crot. tig., Hyos., Led., Plumb., Stilling., Zinc.

6. **Cyclitis**—KALI IOD., MERC., *Bell.*, *Bry.*, *Rhus*, *Silic.*, Apis., Ars., Aur., Prunus sp., Thuj.

7. **Choroiditis**—AUR., BELL., BRY., GELS., KALI IOD., MERC., NUX V., PHOS., PRUNUS SP., PULS , SULPH., *Apis*, *Ars.*, *Hepr.*, *Phyt.*, *Rhus t.*, Acon., Coloc , Ipec., Psor., Ruta, Sil., Sol. nig.

8. **Glaucoma.**—BELL., BRY., CEDR., COLOC., PHOS., PRU. SP., RHODODEN., SPIG., *Kali iod.*, *Merc.*, *Phyto.*, Arn., Ars., Aur., Cham., Cocc., Collin., Con., Crot. tig., Gels, Ham.. Nux v., Sulph.

9. **Retinitis**—BELL., BRY., CACT., CON., MERC , NUX V., PHOS., PULS., *Apis*, *Asafœt.*, *Ars.*. *Aur.*, *Gels.*, *Kalm.*, *Kali iod.*, Acon., Collin., Croc., Lach., Leptan., Spig., Sulph., Zinc.

10. **Orbital Cellulitis.**—ACON., APIS, HEPAR., LACH., MERC., RHUS., *Calc.*, *Kali iod.*, Caust., Sil., Sulph.

11. **Dacryocystitis**—ACON., HEPAR, MERC., PULS., SIL.,*Arum t.*, *Arg. nit.*, *Euphr.*, *Petr.*, Cinnab., Hydras., Nat. m., Sang., Stilling., Sulph.

12. **Fistula Lachrymalis**—ARG. NIT., BROM., FLUOR. AC., *Calc.*, *Lach.*, *Petr.*, Nat. m., Silic., Sulph.

DIV. II.

RESULTS OF OPHTHALMIC INFLAMMATION.

Many of the consequences of ophthalmic inflammation have already received the attention at our hand which their relative importance, and the general object we have had in view, has seemed to demand. Others, however, have been but briefly noticed, or only incidentally referred to, and will therefore require to be separately considered. But as we have already devoted as much space to the subject of inflammation as we can well spare for that purpose, we shall aim in what follows to be as brief and practical as possible.

1.—SYMBLEPHARON.

This term denotes a more or less extensive adhesion of the mucous membrane of the lids to that of the globe. The adhesions may be direct and close, so as to cause very great limitation of the movements of the ball; or they may consist of narrow bridges of connection, either slender and chord-like, or thin and membranous. These loose attachments are supposed to be formed by the movements of the globe, and consequent stretching of the original adhesions. The affection may be produced by any cause which gives rise to ulceration of the two opposed conjunctival surfaces, whether it be the accidental introduction of caustic substances, such as lime or mortar, between the lids, or the destruction of the superficial epithelial layers by the knife or caustic, as in careless operations for the removal of trachoma, pterygium, etc.

TREATMENT.—When the adhesions are extensive, it is almost impossible to prevent their ultimate reunion after separation. Surgeons of the highest eminence have recorded their repeated attempts and failures in this direction. The difficulty seems to lie in the contraction of the new formations,

and the consequent difficulty of permanently separating the granulating surfaces. Almost every form of mechanical contrivance has been made use of to prevent the junction of the raw surfaces; and for this purpose shields of metal, glass, ivory, and other substances, have been interposed between the lids and globe; but as contraction takes place during the process of cicatrization, the interposed substance is gradually pushed out, and although the case may seem to do well at first, the operation is almost certain, in the end, to prove a failure. Probably Mr. Wordsworth's glass shell, mentioned by Wells, which has a central opening for the cornea, and resembles an artificial eye, would, as the inventor claims, be successful in many cases, provided it were worn continuously for a sufficient length of time; for it should be remembered that, as in the case of burns, the new formation is imperfectly organized and liable to absorption, and consequently, as pointed out by Walton, contraction continues for some time after the completion of the cicatrix.

Of the many operative procedures that have been devised for symblepharon, the following appear to be the most reliable, and may be adopted in moderate cases with reasonable prospect of success:

1. That of Amussat, which consists in freely dividing all existing adhesions, and then daily carrying the point of a probe, or of a cutting instrument, to the extremity of the division; this is continued until the pyogenic surfaces are cicatrized, and can no longer grow together.

2. Petrequin's ligature process, which consists in carrying a double ligature through the adhesion, one portion of which is tied with great firmness close to the sclerotica, and the other with a less degree of compression near the lid. As the former sloughs away at an earlier period than the latter, the part near the eyeball heals before the other, and the cicatrization becomes too far advanced to admit of its reattachment to the outer part.

3. Arlt's process, which consists in first passing two ligatures through the symblepharon close to the cornea, and after carefully dividing the adhesions as far back as the retro-tarsal fold, doubling down the symblepharon so as to bring its conjunctival surface in apposition with the raw surface of the globe, and then passing the ligatures through the lid close to the orbital border, tying them on the outside. After the orbital wound has healed, if the shrunken remains of the symblepharon prove troublesome to the patient, they may be safely snipped off with a pair of scissors.

4. Teale's method by transplantation. This consists in first separating the adhesions in the usual manner, beginning at the margin of the cornea, and then interposing one or more flaps of conjunctiva previously dissected from neighboring portions of the globe. The flaps are adjusted in their new positions by means of fine silk ligatures, "and their vitality is further provided for by incising the conjunctiva near their base, in any direction in which there seems to be undue tension." He also stitches together the margins of the gap from which the transplanted conjunctiva has been removed. In adjusting the flaps, great care should be taken to prevent the doubling in of their edges, which would be likely to prevent the full success of the operation.

2.—ANCHYLOBLEPHARON.

This term denotes a firm adhesion of the two lids, which may be either complete or partial, congenital or acquired. In the majority of cases the adhesion is partial, and is usually limited to the outer angle. The union is generally of a membranous nature, especially in congenital cases; but when complicated with symblepharon, or when caused by severe mechanical or chemical injuries, it is apt to be thick and tendinous.

TREATMENT.—If the adhesion is membranous, or if it is

limited to one or more points, the lids should be carefully separated upon a director, and readhesion prevented by carefully drying the edges, and then touching the raw surfaces with collodion, as first suggested by Walton; but if the union is large and broad, and especially if it is confined to the palpebral angle, the most appropriate and effective treatment is the operation of *Canthoplasty*, (which see).

3.—ENTROPIUM.

By Entropium is meant a more or less extensive inversion of the lids. It is usually complicated with trichiasis, or turning in of the cilia, which is generally regarded as constituting the first degree of entropium. We recognize two principal forms of the affection; the spasmodic, which usually occurs in elderly people, and hence is frequently called senile entropium; and the chronic, which is generally due to inflammatory and structural changes in the conjunctiva and tarsal cartilages. The former, which is frequently temporary, is generally met with in the lower lid, but it may also occur in the upper. The affection is often accompanied with great irritation from the friction of the cilia against the globe, which frequently gives rise to inflammation, and leads sooner or later to ulceration and opacity of the cornea.

TREATMENT.—The most simple and effective treatment for spasmodic entropium, particularly in senile cases, is the operation of canthoplasty, care being taken to make the incision oblique instead of horizontal, so as to relax the orbicularis muscle to the fullest extent. Generally, the incision should be in a downward direction, because it is usually the lower lid that is affected. If this fails to keep the lid in its natural position, its external surface should be painted with collodion, the contraction of which in drying is sometimes sufficient, even without the operation, to prevent the lid from again becoming inverted.

When the central part of the lid is greatly relaxed, as it usually is in old cases, some surgeons, in order to equalize the tension, instead of extending the edge of the lid, as above recommended, remove a triangular piece of integument from the central, or most relaxed portion. An incision is first made about one and a half lines from the free border of the lid, and parallel with it, extending on either side to within one or two lines of the commissure. Two oblique incisions are then made from points about midway between the centre and the two extremities of the horizontal incision, converging towards the orbital border, so as to include a triangular portion of the integument, which is dissected up and removed. The sides of the wound are then united by two or three fine sutures, the horizontal incision being left to itself. When healed, the cicatrix will be in the form of the letter T. In very bad cases, especially where there is a narrowing of the palpebral fissure, it is best to combine this operation with that of canthoplasty, above described.

In case there is much contraction and incurvation of the tarsal cartilage, it may also be found necessary to remove a portion of the latter, which is best done by turning back the upper angles of the V-shaped incision in the operation just described, as far as the ends of the horizontal incision, and then cutting out a wedge-shaped portion of the cartilage, by making two nearly parallel incisions into it along the palpebral margin nearly down to its inner surface, at the same time sloping them towards each other so as to meet near its posterior surface. The strip to be removed is then seized with a pair of forceps, and detached with a few touches of the scalpel. The extent to which this "grooving process" should be carried, will depend, of course, upon the degree of contraction and dislocation of the cartilage.

If these operative procedures fail to rectify the position of the lids, there remains no other resource than to remove the hair-follicles, as described under Trichiasis, (which see).

4.—ECTROPIUM.

Ectropium is the reverse of entropium; that is, it is a turning out of the eyelid, so that more or less of its conjunctival surface is exposed. It is generally confined to the lower lid, though it may affect both. There are various degrees of the affection, ranging from a slight eversion of the border of the lid, to one in which the entire surfaces are reversed. Of course this malposition of the lids interferes with the proper discharge of the tears, so that the eye is always more or less suffused and watery; and in severe cases, especially of the lower lid, they frequently pour over the side of the cheek, inflaming and excoriating the latter, and even increasing the ectropium, by causing contraction of the integuments. In fact, it is this contraction of the skin near the edges of the lids, during cicatrization from long-continued excoriation, burns, wounds, etc., that most frequently gives rise to ectropium. But severe forms of conjunctivitis, especially the purulent and granular, also produce it, in consequence of the extensive swelling and hypertrophy of the conjunctiva, the eversion being aided by the action of the orbicularis. Other causes are: paralysis of the portio dura, chronic blepharitis, or lippitudo, abscess of the lids, abscess and caries of the orbit, especially of its margin, intra-orbital tumors, cancerous growths, and exophthalmos.

TREATMENT.—If the cause of the displacement can be removed, acute and recent cases will, as a general rule, require no additional treatment, except the simple replacement of the lid, and its retention in the normal position by a compress bandage. But when the eversion is of long-standing, the tarsus becomes more or less elongated, so that the lid will no longer fit the globe, even after it is restored to its natural position. It then becomes necessary to narrow the palpebral

fissure by the operation of *tarsoraphia.* This operation, devised by Walther, may be performed as follows:—The operator ascertains the extent of the surplus tissues, by first reducing the dislocated lid, and then, having put its border slightly on the stretch, pinches up the loose tissues at the outer canthus, until the margins of the two lids fit each other, marking with ink the boundaries thus included. He then inserts a horn or ivory spatula between this portion of the lids, and, beginning at the outer canthus, makes a crescent-shaped incision along the previously-marked boundary, through the skin and cellular tissue, to the point where the two lids should meet. He then shaves off this portion of the lids, including its cilia, as far back as the outer canthus, being careful not to leave any of the hair follicles behind, as these would grow again. The two raw surfaces are then brought together, and secured by three or four interrupted sutures. In order to lessen the strain upon the sutures, adhesive strips may be applied in such a manner as to draw the integuments towards the junction of the lids, which should be that of a straight horizontal line. When there is a marked difference in the length of the tarsal edges, it is generally necessary before completing the operation, in order to prevent a bulging of the fascia and cartilage, under the sutures, to excise a portion of the latter, in shape like an Italic *V;* the edges of the incision should then be included in the suture.

For ectropium resulting from cicatrices near the margin of the lids, and causing their eversion by traction, a great variety of operations has been devised, most of which are simple modifications of the following, which is known as Dieffenbach's:—The cicatrix, or so much of it as may be necessary, is removed by a triangular-shaped incision, the base of which is turned towards the ciliary margin, and the apex to the cheek. The incision which forms the base of the triangle, is then extended on each side at right angles to the sides of the former triangle, and the flaps thus formed are raised a little

from the subjacent parts, brought together so as to fill the triangular space previously occupied by the cicatrix, and the T-shaped wound thus formed united by fine sutures. In case the ciliary margin remains too much relaxed, tarsoraphia may be advantageously united with this operation.

For such exceptional cases of ectropium and lagophthalmos as will not admit of being successfully treated by the above operations, the reader is referred to the larger works on ophthalmology, particularly those of Wells and Stellwag, where he will find a great variety of blepheroplastic operations fully illustrated and described.

5.—TRICHIASIS.

This is a disease in which the eyelashes are inverted, or turned inward toward the globe. The malposition may affect the whole or only a portion of the cilia, which are always more or less degenerated and distorted. Supernumery cilia are not uncommmon in these cases, as many as four or five having been found to spring from the same hair-follicle. These generally have the appearence of new hairs, being for the most part short, fine and colorless. In some cases the cilia appear to be arranged in two distinct rows, and then the disease is called *distichiasis*. The misplaced cilia are generally turned inwards, and by constantly sweeping against the globe excite considerable irritation, which is accompanied, in some cases, by severe lachrymation and photophobia. If the abnormal friction is allowed to continue, vascular keratitis sets in, and this is followed by pannus. It may also cause severe spasm of the lids, which in turn may give rise to some degree of ectropium.

ETIOLOGY.—The most frequent causes of trichiasis are those which give rise to structural changes in the edges of the lids, such as blepharitis ciliaris, purulent and granular ophthalmia, cicatricial contractions, etc.

TREATMENT.—This is either *palliative* or *radical*. The

palliative treatment consists in removing the misdirected cilia, as fast as they grow, with forceps. If this treatment is continued for a sufficient length of time, it may finally result in atrophy of the hair-follicles, and thus prove radical; but as a general rule the cilia continue to grow, and require to be extracted as often as they are reproduced. The radical treatment consists in either giving to the cilia a more natural and harmless direction, or else in extirpating the bulbs of the inverted lashes. The latter is generally the most successful method; but the loss of the cilia is so disfiguring to the patient, especially in the upper lid, that the operation should, if possible, be avoided. Sometimes we can succeed in turning the cilia away from the globe, by merely pinching up a fold of the integument near the ciliary border, and excising it. When this will answer the purpose, it is the best plan to adopt, as it not only preserves the cilia, but the success of the operation is confirmed by the subsequent contraction, and the subsidence of the irritation and swelling. If this fails to meet the indication, we may frequently succeed by first making perpendicular incisions down to the cartilage at the extremities of the trichiasis, and then uniting them at the ciliary margin by carrying an incision along the edge of the lid, between the meibomian ducts and cilia; after which sufficient of the integuments should be excised to evert the cilia, and with them any coexisting entropium. If this procedure, which is a modification of Von Graefe's operation, will not suffice, then the best method, notwithstanding the resulting deformity, is to remove the hair bulbs. This operation is both tedious and painful, especially when a considerable number of the cilia are misplaced, and therefore it is better to perform it when the patient is under the influence of chloroform. A horn or any other suitable spatula is first placed under the lid, and is held there by an assistant, who at the same time raises the lid from the globe, and causes its edge to be somewhat everted. Then the edge of the lid is split, or divided into two layers, to the depth of about two

lines, with a scalpel or other suitable knife, (Pl. I, Fig. 22), being careful not to continue the incision into the lachrymal puncta. The incision should be made close to the surface of the cartilage, so that all the hair-follicles may be included in the anterior layer. The integument is then divided behind the hair-bulbs, by a horizontal incision extending down to the fascia, which, if the trichiasis involves the whole of the lashes, should meet the free border of the lid at an obtuse angle, two lines beyond the commissure. The portion thus included may then be liberated with a few touches of the scalpel; and if any of the hair-bulbs still remain, they should be carefully excised, otherwise some of the cilia will be reproduced. Sutures are not required, but a wet compress should be applied, and in a few days the wound will be healed. Should there have been any coexisting entropium, or rolling in of the edge of the lid, it will be corrected by contraction of the cicatrix.

6.—XEROPHTHALMIA.

This affection, sometimes called xerosis conjunctivæ, consists in a dry or cuticular state of the conjunctiva, which loses its character of a mucous membrane, and no longer secretes. The surface of the membrane becomes rough, scaly, and of a greyish-white color, being sometimes finely granulated, at others resembling cicatricial tissue. The opposed surfaces are so dry, rough and stiff, as greatly to hinder the movements of both the eye and lids; and this is still farther increased by contraction of the conjuctiva, and by a greater or less accumulation of hardened epitheliel scales within the narrowed conjunctival sac. In the great majority of cases, also, there is partial symblepharon, the lids adhering to each other and to the caruncula; the puncta are frequently obliterated; and the upper lid is sometimes so much shortened, that the eye cannot be shut, producing the state of lagophthalmus. When the globe or lids are moved, the ocular conjunctiva is thrown into folds round the cornea. No moisture is perceived on rubbing

the cornea, the surface of which is generally rough, uneven, and greatly deficient in sensibility. The cornea is generally obscure, the opacity being so great, in some cases, that the color of the iris and the state of the pupil cannot be recognized. Not only the cornea, but also the conjunctiva, becomes anæsthetic, dust and dirt accumulating between the lids, and exciting little or no irritation.

ETIOLOGY.—This incurable affection is generally caused by chronic granular conjunctivitis; and is most apt to result from neglected or badly treated cases, especially when deep scarification and too severe caustics are employed. It also follows diphtheritic conjunctivitis, especially when the latter is attended with sloughing. Symblepharon accompanied with severe inflammation, trichiasis, entropium, logophthalmos, and injuries resulting from burns, strong acids, etc., are among the less frequent, but occasional causes.

TREATMENT.—This is merely palliative, the best we can do being to mitigate, or temporarily relieve the dryness of the conjunctiva, by the frequent use of some bland fluid, such as a weak solution of glycerine, milk, artificial serum, etc. These collyria act beneficially by washing away the hardened epithelium from the surface of the cornea, and thus render the latter more transparent.

7.—PTERYGIUM.

This term, which is derived from a Greek word signifying *a wing*, is used to denote an hypertrophied condition of the conjunctival and episcleral tissues. It is usually situated at the inner canthus, and is of a triangular form, the base at the semilunar fold, and the apex near the margin of the cornea, towards the centre of which it gradually advances. It presents more or less of a tendinous or fibrous structure, and is traversed in the direction of its length by numerous nearly parallel bloodvessels. It is divided into two principal forms, according to the greater or less degree of hypertrophy exhibited at

different periods of its growth. While thin, transparent and delicate, it is called pterygium tenue or membranaceum, but when it becomes thick and fleshy, it is termed pterygium crassum or carnosum. It is generally somewhat loosely connected with the subjacent parts, so that it can be easily raised with the forceps; but if the conjunctival portion contains any considerable amount of ligamentous or tendinous tissue in its structure, it is thereby rendered less yielding, and may even impede to some extent the movements of the globe.

Pterygium usually occurs about the middle period of life, and makes its appearance quite insensibly, the disease frequently making considerable progress before the patient is aware of its existence.

Its growth is generally very slow, the pterygium advancing gradually to the margin of the cornea, where its progress is sometimes arrested; in other cases it extends more or less on to the cornea, but it seldom passes beyond the centre. The corneal portion is less vascular and more compact and tendinous than the conjunctival, especially the extreme point of the pterygium, which not unfrequently appears round and bead-like.

ETIOLOGY.—The chief cause of pterygium appears to be some injury which irritates the ocular conjunctiva, such as may result from prolonged exposure to wind, dust, heat, etc. Hence its usual seat at the internal canthus, where the conjunctiva is most exposed to the operation of such agencies. Hence, also, its frequent occurrence among the inhabitants of hot climates, and among sea captains, stone-cutters, masons, etc. Pterygium may also result from phlyctenular keratitis, superficial ulceration of the margin of the cornea, or any other cause capable of giving rise to inflammatory hypertrophy of the conjunctival and episcleral tissue.

TREATMENT.—If the pterygium is small, or thin and vascular, it may yield to Arg. nit., Ars., Calc., Chin., Lach., Nux mos., Psor., Ratan., Spig., Sulph., or Zinc., all of which have proved beneficial in particular cases. But if the occupa-

tion or habits of the patient are such as to favor its growth, it will be necessary to abandon them before any internal treatment will be likely to prove successful. If symptoms of severe irritation exist, they should be allayed by appropriate treatment; and for this purpose much good sometimes results from the use of mild astringent collyria, especially if there is any catarrhal or other form of ophthalmia connected with it.

But if the pterygium is large and thick, and especially if it is composed of true connective tissue, these means are insufficient, and we can only remove it by resorting to operative procedures. But since these are not always perfectly successful—the cicatrix or some portion of hypertrophied tissue remaining, which may even necessitate a further operation—so long as the pterygium does not interfere, nor seem likely to interfere, with vision, or with a free and unrestricted movement of the globe, it should not be operated upon. On the other hand, if the morbid growth has so far encroached on the cornea as to impede vision, or if it should threaten to do so, and especially if its size and character are such as to limit to any considerable degree the movement of the globe, we should remove the pterygium by one of the following methods:

(1). *Excision.*—The patient having been brought under the influence of an anæsthetic, the lids separated by the stop-speculum (Pl. II, Fig, 33), and the globe turned slightly in the direction of the pterygium, and there held by a suitable instrument, (Pl. I, Fig, 16), the operator seizes the growth with a pair of reliable forceps, and raises it sufficiently to pass a pointed narrow-bladed knife (Fig. 13) under it, with which he first excises the corneal, and then the scleral portion, dissecting the latter toward the palpebral fold to a distance of one and a half or two lines from the margin of the cornea, thus far following exactly the edges of the pterygium, and keeping close to the surface of the cornea and sclerotica. From this point the dissection is continued toward the base of the pterygium, not by following the edges of the latter, as before,

which would form a triangular wound, but by two converging incisions, meeting in front of the reflection, so as to give the wound somewhat of a rhomboidal shape. Having removed all hypertrophied tissue, the edges of the wound should be closed by two or three fine sutures. A protective bandage should then be applied, and in three or four days the sutures may be removed.

(2). *Ligation.*—The lids having been separated and the globe fixed as above described, the operator raises the pterygium with a pair of forceps, and passes a fine curved needle, armed with a double silk ligature, beneath it from border to border, first near the margin of the cornea, and afterwards at the base of the pterygium. The thread now forms a double loop on one side of the pterygium, by cutting one thread of which, the ligature, after the removal of the needle, is divided into three portions, an outer, middle, and inner one. The ends of the inner thread are first tied, then those of the outer, and finally the two ends of the middle one, which are both on the same side of the pterygium. At the expiration of four or five days, the ligated portion of the pterygium may be easily detached with the forceps.

(3). *Transplantation.*—This operation, which was first introduced by Desmarres, and afterwards greatly improved by Knapp, is now generally performed in the following manner:—The corneal portion of the pterygium is first dissected off, and excised. Two curved incisions are then made in the direction of the retro-tarsal folds, from the upper and lower borders of the base of the pterygium. The latter is next divided into two equal portions by a horizontal incision extending to its base. After this, two small conjunctival flaps are formed, one on either side of the wound, for the purpose of covering it. The contraction of the flaps causes the two curved incisions to gape sufficiently to receive the corresponding halves of the pterygium, where they are secured by fine sutures. Finally, the conjunctival flaps are brought together over the former seat of the pterygium, and there united.

8.—OPACITIES OF THE CORNEA.

Under the head of *Keratitis* will be found a general description of the nature, situation, and extent of the various forms of corneal opacity. They may be summarized as follows:

(1). *Epithelial or Nebulous Opacities.*—These are thin and superficial, appearing like a mist or cloud upon the surface of the cornea. They are sometimes so fine as to be extremely difficult of detection, unless the cornea is examined with a convex lens or by lateral illumination.

(2.) *Parenchymatous Opacities.*—These thicker and deeper-seated forms of opacity are named, from their color, *leucoma.* When "complete," the entire cornea has a whitish or bluish-white appearance, very much resembling the sclera, the surface frequently retaining its normal lustre. When "partial," the opacity is more or less cloud-like, the border being irregular, and gradually shaded off into the unaffected portions of the cornea. The color varies from a greyish or bluish transparency to a yellowish, or even chalky-white tint.

(3). *Tendinous or Cicatricial Opacities.*—These are more or less superficial, according to the depth of the original ulcer. They generally have a tendinous or glistening-white appearance, especially the central portions. The edges are frequently indistinct, owing to their being surrounded by an epithelial cloudiness, the result of recent inflammatory changes, which in the course of time becomes absorbed.

(4). *Calcarcous Opacities.*—These opacities, consisting of the carbonate and phosphate of lime, are of a brownish tint. They are situated just under the epithelium, and have an irregular and somewhat indistinct outline, shading off more or less gradually into the normal transparent cornea.

PROGNOSIS.—This depends chiefly upon the duration, nature, and extent of the opacity. When recent, and especially

when occurring in young and vigorous patients, they almost always disappear sooner or later without treatment. Tendinous and cicatricial opacities never disappear altogether; but at first they are generally surrounded by a cloudy border, which clears up in the course of time, the remaining opacity being lessened in extent, and its effect on vision greatly diminished.

TREATMENT.—The cure of recent cases of corneal opacity is frequently hastened by the internal use of the following remedies.—Apis, Cannab., Chel., Crotal., Euph., Hep., Merc., Puls. n., Rhus and Sulph. Even old cases of leucoma are reported to have been greatly benefited by the persistent administration of Ac. nit., Aur., Calc., Cup. al., Hep., Kali bic., Kali iod., Merc., Nat. sul., Sil., Spong., and Sulph. Of these, the following have also been employed externally:—Cup. al., Kali bic., Kali iod., Merc., and Nat. sul. There being no characteristic eye symptoms in these cases by which to make the selection, the indications will have to be sought for in other organs; but if there is no derangement of the patient's health to guide us, we may, if all inflammatory symptoms have disappeared, endeavor to promote absorption by the cautious use of irritants, such as Merc. dulc., Nat. sul., etc., a small quantity of which may be daily dusted into the eye. Or we may make use of irritating collyria, beginning with weak solutions of the sulphate of zinc or copper, and either changing or gradually strengthening them as the eye becomes accustomed to their use. For this purpose we have generally found nothing better than a collyrium of Kali iod, (grs. ij—v ad ℥ j). The action of these agents is often increased by the instillation of Atropine, which promotes absorption by diminishing the intra-ocular tension. Calcareous opacities should be carefully scraped off with a scalpel, as recommended by Dixon and Bowman. As this is a very painful operation, and denudes the cornea of epithelium, it

should be done with the greatest care, and only a small quantity removed at a time; a little olive or other bland oil being afterwards applied to the eye.

In old and incurable cases, vision may sometimes be improved by diminishing the intensity of the diffused light by means of stenopaic spectacles. These are so constructed as to permit only the central rays to pass, thus cutting off the irregularly refracted rays from the periphery. These spectacles, while they often answer very well for near objects, as in reading, writing, sewing, etc., are not adapted to general use, the field of vision being too much contracted to permit of freely moving about, as in walking, driving, etc.

If these means fail of restoring serviceable vision, then our only resource is an artificial pupil, made behind a transparent part of the cornea; selecting for this purpose the operation of iridectomy, iriodesis, iridoenkleisis, or corydialysis, according as one or the other may best suit the condition of the cornea and the optical principles involved in the case. See *Operations for Artificial Pupil.*

9.—STAPHYLOMA OF THE CORNEA.

There are three principal forms of corneal staphyloma, namely, (1), kerato-conus, or conical cornea; (2), kerato-globus, or buphthalmos; and, (3), staphyloma of the cornea and iris. The first two forms are chiefly due to a weakening and thinning of the corneal tissue, and the last to ulceration and sloughing of the cornea, followed by prolapse and subsequent adhesion of the iris.

A.—Conical Cornea.

KERATO-CONUS.

This form of staphyloma, if considerable, may be easily distinguished by viewing the eye in profile, when the conical shape

of the cornea will be readily perceived. Slight cases, however, may be either entirely overlooked, or mistaken for amblyopic forms of myopia, unless we make an ophthalmoscopic examination, when the smallest amount of conicity may be detected. In these examinations we use only the mirror, through which, if we view the cone exactly in the line of its axis, all the light will be reflected, and we shall see a bright red space, surrounded by a dark zone, and this again surrounded by another circle, which is red. If viewed obliquely, the part of the cone opposite to the light will be darkened. If we examine the interior of the eye, we can only see a small portion of the fundus; while the retinal vessels and the border of the optic nerve entrance appear distorted and more or less indistinct. The slightest movement of the eye or mirror greatly increases the distortion, the irregular refraction through the cornea frequently giving a curled or twisted appearance to the vessels, and also to the border of the optic disc.

Vision is always more or less impaired, and, in many cases, is insufficient to serve any useful purpose, the distortion and confusion of the retinal images being too great to admit of much improvement by any kind of stenopaic apparatus. Moreover, the apex of the cone seldom remains transparent, but sooner or later becomes hazy or opaque, and, in some cases, even tendinous or cicatricial.

ETIOLOGY.—Inflammation is supposed to be one of the chief causes of kerato-conus; but it cannot be the sole cause, as many cases occur in which no signs of inflammatory action ever appear. Neither is the bulging forward of the cornea due to intra-ocular pressure, for such eyes are almost always abnormally soft. It appears to be due, rather, to a weakening and thinning of the cornea, the latter becoming more and more attenuated as the staphyloma increases.

PROGNOSIS.—The development of conical cornea is generally very slow. It is often interrupted in its course, stop-

ping short at a certain point, then resting, perhaps, for years, and then increasing again without any apparent cause. Or it may cease at any stage of development and become permanently stationary. It is a singular circumstance in these cases that, however thin the apex of the cone may become, it never gives way unless it is accidentally ruptured. The disease is seldom monocular, but generally affects both eyes, either simultaneously or in succession.

TREATMENT.—It is highly probable that the progress of kerato-conus may, in some cases, be checked by the persistent use of proper homœopathic remedies, even in cases in which there is no co-existing inflammation; but, as yet, we are obliged to confess that we know of no internal remedy on which we can place reliance as a curative agent is these cases. It is true that Drs. Allen and Norton, in their work on "Ophthalmic Therapeutics," say that Calc. iod. has seemed to act favorably in their hands, and that "decided benefit has been obtained from its use in checking the progress of both conical cornea and staphyloma." The same remedy is even reported by H. Goullon to have *cured* a case of kerato-conus; but this may well be taken *cum grano salis*, as we cannot conceive of the possibility of materially reducing the conicity of the cornea, except by incision, and this is generally very far from being a successful operation. Some diminution, however, may result from lessening the intra-ocular pressure by means of an iridectomy; and, as we may in this manner possibly arrest the progress of the disease, and at the same time improve the vision, by making a pupil opposite the peripheral portion of the cornea, where it still retains, to a great degree, its normal curvature, it is the operation most frequently performed. The iridectomy should be of only moderate size, and, as suggested by Wells, should be made slightly upwards and inwards, so that a part of the base of the artificial pupil may be covered by the upper lid. When the conicity of the cornea is slight

and almost stationary, some prefer an iridodesis to an iridectomy, with a view of displacing the pupil towards a portion of the cornea which is less abnormally curved, so as to lessen the diffusion and irregular refraction of the rays passing through it. Others, again, make an iridodesis on opposite sides of the pupil, so as to change the latter into a long, narrow slit, with a view to render the aperture stenopaic; but the operation is said to offer no advantages over the ordinary method.

B.—Kerato-Globus.

BUPHTHALMOS.

In this disease the entire cornea, and generally the anterior portion of the sclerotica also, are bulged forward in such a manner as to give a uniform spherical curvature to the cornea, and a greater or less increase in the size of the whole anterior portion of the eyeball. This increase is often so considerable as to present an appearance similar to that of exophthalmos, the front portion of the globe protruding between the lids, and giving to the eye a peculiar staring expression, whence it has derived the name of *buphthalmos*. The effect of the enlargement is to increase the size of the anterior chamber in every direction. Hence the disease was for a long time regarded as a dropsy of the anterior chamber (*hydrophthalmia anterior*). The iris is stretched so as to be proportionally enlarged, the fibres appearing slightly separated, especially towards the ciliary margin. It is frequently somewhat cupped, particularly in a backward direction, and is occasionally tremulous, perhaps from losing the support of the lens, which is sometimes dislocated. The pupil is usually dilated and sluggish, and more or less of its margin is sometimes adherent to the anterior capsule. The cornea may remain entirely transparent; but, in most cases, it is more or less clouded, especially

on the periphery, and, in some instances, it is uniformly and densely opaque. As the disease progresses, glaucomatous symptoms supervene; the tension increases, the optic disc becomes excavated, the lens is rendered opaque, the vitreous separates and becomes fluid, detachment of the retina occurs, and atrophy finally ensues; or else, in consequence of the thinning of the anterior portion of the globe, the ball becomes ruptured. In either case, the disease is almost certain to terminate, sooner or later, in complete blindness.

ETIOLOGY.—The etiology of this disease is somewhat obscure. It does not appear to be due to the increased intra-ocular pressure, since glaucomatous symptoms do not generally give rise to bulging of the cornea. Neither does it arise from an increased secretion of the aqueous humor. It must, therefore, either originate in such an abnormal condition of the cornea as would constitute a predisposition to the disease, or else it must result from a weakening and thinning of the corneal tissue in consequence of some severe inflammation, such as vascular keratitis or pannus. The latter is probably the chief factor in its production in most cases.

TREATMENT.—This is similar to the treatment recommended for Glaucoma (which see).

C.—Staphyloma of the Cornea and Iris.

This form of staphyloma is one whose walls are composed, either wholly or in part, of cicatricial tissue, and is generally the result of ulceration. Partial staphyloma is, in the majority of cases, only an advanced stage of what is called *staphyloma iridis*, or prolapse of the iris. As the latter usually occurs during the inflammatory process, the prolapsed iris soon becomes covered with lymph, which gradually assumes a cicatricial character, and, being weaker or more extensible than

the normal cornea, readily yields to the intra-ocular pressure, and gives rise to "partial" staphyloma. The growth of the staphylomatous protrusion is generally slow and subject to many interruptions; but, if not permanently checked, it may gradually extend until it involves a considerable portion of the cornea; and, if the original perforation was extensive, it may even implicate the whole of the corneal tissue, and thus be transformed into a "total" staphyloma. The walls of the projection may preserve, to a great degree, their former transparency and delicacy, in which case, either through mechanical violence or a sudden contraction of the recti muscles, they frequently burst. But, in most cases, as the staphyloma enlarges the walls increase in thickness, and, when it protrudes between the lids, the external irritation frequently excites more or less inflammatory action, which tends still further to augment the size of the morbid growth.

ETIOLOGY.—As already stated, the most frequent cause of staphyloma of the cornea is ulceration. But it may also be produced by wounds and injuries, or by any operation, such as flap extraction, which becomes complicated with prolapse of the iris. Total staphyloma is frequently caused by ulceration or sloughing of the entire cornea.

TREATMENT.—Internal remedies can have no beneficial effect upon staphyloma of the cornea, unless it be in retarding its development by lessening inflammatory action. In this way some good may possibly result, in particular cases, by the administration of such remedies as the inflammatory complications may specially indicate. The most approved treatment for partial staphyloma, especially if recent, is iridectomy. This operation at once lessens the intra-ocular pressure, and thus not only arrests the bulging of the cornea, but may also cause it to diminish in size. At a later stage of the affection, glaucomatous symptoms may set in, and then, of course, iridectomy should on no account be omitted. Fortunately for

the success of the operation, the place of election in these cases is generally opposite the most transparent portion of the cornea, namely, the periphery. In some cases of partial staphyloma, it is advisable to combine iridectomy with the methodical use of a pressure bandage; but if, for any reason, the latter is not well borne, or if it seems to excite pain or uneasiness within the eye, it had best be dispensed with, and the eye simply shaded.

Total staphyloma does not admit of any restoration of vision, the only object of treatment being to improve the personal appearance of the patient, and relieve him from an annoying and painful disfigurement by removing the projection.

Of the numerous methods of operating in these cases, we shall only mention two, namely, (1) Excision and (2) Borelli's operation.

1. EXCISION.—The lids being widely separated by an assistant, the point of a cataract knife (Pl. I., Fig. 29), with the edge turned downward, is made to penetrate the base of the staphyloma in such a manner that, when pushed forward and made to cut its way out, it shall divide the lower two-thirds of the staphyloma in the plane of its base. The collapsed growth is then seized by forceps, and the remainder divided with scissors; or, if the operator prefers, a flap may be formed from it with which to cover the opening at the base of the staphyloma. A pressure bandage is then to be applied, and the resulting inflammation moderated by rest and the internal administration of Aconite.

2. BORELLI'S OPERATION.—This consists in transfixing the tumor by two needles, in such a manner as to form a cross. A ligature is then passed round the staphyloma, behind the needles or pins, and firmly tied. In the course of three or four days the tumor generally sloughs off, and in a week or so afterwards the wound is healed. If the staphyloma is small or partial, its whole base should be included within the liga-

ture; but if large or total, only a part of it should be embraced, and care should also be taken not to draw the ligature too tight, otherwise it may cut through the walls of the tumor, or suppurative choroiditis may supervene and destroy the eye.

10—ANTERIOR SCLERO-CHOROIDAL STAPHYLOMA.

Sclero-choroidal staphyloma may affect the anterior, lateral, or posterior portion of the sclerotica, but is mostly confined to the anterior and posterior zones. The latter has already been described under the head of "Sclero-Choroiditis Posterior." The former is no more a primary affection than the latter, but is a secondary effect of an inflammation of the anterior part or the whole of the uveal tract; in other words, it may proceed from a partial or total sclero-choroiditis. The increased tension of the globe distends the sclerotica from within, while the resistance of the membrane is probably diminished by its participation in the inflammation. In this way the sclerotica becomes thinned, and raised into prominences of various magnitude. These vary in size from that of a small grain to a filbert; or the whole anterior portion of the sclerotica may be raised into one irregular, mulberry-like tumor round the cornea, and then the disease is called "Annular Staphyloma." As the staphyloma increases, the sclerotica becomes more and more atrophied and discolored, the affected part assuming a dusky, bluish-grey appearance, due to the shining through of the choroid. The growth of the tumor is sometimes very rapid, and is then usually attended with severe pain and other symptoms of acute inflammation; but, as a general rule, the progress of the disease is very slow and gradual, its course corresponding with that of the inflammatory

affection on which it depends. When the latter becomes chronic, the staphyloma generally remains stationary, or slowly progresses; but during periods of exacerbation, the eye becomes painful and the disease makes perceptible progress.

TREATMENT.—During the early stages of the affection, the treatment is the same as that for Choroiditis (which see). But when the staphyloma has existed for some time, and is large, we may have to remove it by an operation. For this purpose we may adopt either of the methods described under the head of "Staphyloma of the Cornea and Iris."

11.—OPACITIES OF THE VITREOUS HUMOR.

Opacities of the vitreous are of two distinct forms, or classes—the diffuse, and the filiform or membranous. The diffuse variety presents itself in the form of a greyish mist or nebulosity, scattered here and there through the vitreous humor, or spread out like a veil over the fundus, and giving a blurred appearance to the vessels of the retina and optic disc. This form developes rapidly, extends quickly through the entire vitreous, and clears up just as quickly, appearing and disappearing from time to time, according to the condition of the vascular envelope of the vitreous, which serves as the developing membrane. When these changes occur very suddenly, there is reason to apprehend the most serious consequences, as they are frequently succeeded by detachment of the retina. If, however, the inflammation on which the opacity depends takes a permanently favorable turn, the vitreous may clear up and return to its normal condition.

Associated with the diffuse form, we frequently meet with various circumscribed opacities, both filiform and membranous, consisting of the debris of cells, or the remains of blood

effusions, floating about in the vitreous, and assuming a great variety of forms. Examined with the ophthalmoscope, they are seen to be dark, fixed or floating bodies, of a filiform, reticulated or membranous character; or they may be so fine and numerous as to give an obscure and hazy appearance to the whole fundus.

TREATMENT.—This to be successful must be directed to the removal of the cause, which, as we have seen, is generally some form of choroiditis, or other inflammatory affection of the deeper structures of the eye. Arn., Gels., Ham., Kali iod., Lach., Merc., and Sulph. have acted very favorably in many cases, and are worthy of special attention. Ars., Bell., Caust., Kal., Lyc., Phos., Prun., Sil., and Sol. n. have also been recommended, and deserve notice. The absorption of opacities arising from extravasation of blood into the vitreous, has been hastened by the application of a compress bandage. Benefit often accrues, also, from attention to the general health, especially when the affection is aggravated by some functional derangement of the system.

12.—DETACHMENT OF THE RETINA.

AMOTIO RETINÆ.

Detachment of the retina occurs whenever serum is effused between it and the choroid. At first it is always partial, and confined to the periphery; but it may afterwards spread in every direction, especially towards the optic disc. It usually takes place in the lower half of the fundus, probably in consequence of the fluid immediately gravitating to that part. The outline of the detachment, as viewed with the ophthalmoscope, is generally somewhat irregular, varying

according to the amount of sub-retinal effusion. When the detachment is large and prominent, it is frequently thrown into folds, which are usually most conspicuous near the circumference of the fundus, on which they sometimes cast a distinct shadow. The color of the detached retina, which chiefly depends upon that of the fluid beneath, is of a yellowish, greenish, or bluish-grey tint, and often exhibits a marked contrast with the usual bright red reflex of the normal retina. These features of the disease are generally sufficiently distinctive for the ready recognition of advanced cases; but in very slight degrees of detachment, a much closer inspection is required to clear up the diagnosis. We notice, first, that the vessels are darker than those on the normal retina; that they bend more or less abruptly over the border of the detachment, and pursue a crooked and tortuous course on the folds, between which they frequently disappear; that they quiver with every movement of the undulating membrane; and that they are somewhat closer to the observer than those on the normal retina. We notice also that those appearances are generally more conspicuous the nearer we approach the circumference of the fundus.

Vision is impaired in proportion to the degree of detachment. The patient first notices a faint cloud waving before him, at a point in the field of vision corresponding to the sub-retinal effusion. Hence, if the detachment occurs in the lower half of the fundus, the obscurity will be in the upper half of the visual field, and *vice versa*. Objects generally seem more or less distorted, exhibit slight wave-like or undulatory movements, and appear bordered with a colored ring. The sight is likewise disturbed with photopsies, arising from retinal irritation; and also by movable opacities of the vitreous, which appear as black specks and spots, of various sizes and shapes, floating about in the field of vision.

ETIOLOGY.—The causes which give rise to detachment of the retina are not always manifest. Sometimes it can be traced directly to a blow or fall. In other cases it is found to arise from intra-ocular hemorrhage, occurring in the course of some inflammatory affection of the choroid or retina. Thus, we have seen it to occur very frequently in the course of sclero-choroiditis posterior, in consequence chiefly of the elongation of the optic axis, which, by causing a separation of the vitreous, favors the detachment of the retina. It is also frequently associated with retinitis, especially the exudative variety.

PROGNOSIS.—This is mostly unfavorable. Occasionally, slight detachments may remain stationary, or may even disappear, the sub-retinal fluid becoming absorbed, and the affected membrane regaining its functions. But such favorable results are not to be expected. In the vast majority of cases the disease is progressive, the detachment slowly extending, accompanied by frequent inflammatory attacks and exacerbations, until finally it terminates in total blindness. When the detachment is the result of accident, the disease is generally limited to one eye, and is much more favorable;* but when associated with myopia, or when it depends upon sclero-choroiditis posterior, each eye is usually affected, the same cause operating in both.

TREATMENT.—If seen shortly after the detachment occurs, the patient should be confined to his room, and if possible, to his bed. The eyes should also be carefully bandaged, as this not only serves to exclude the light, but hastens absorption. Atropine should be immediately instilled, chiefly with the view of preventing accommodation; but its use should not be pushed too far, as the sudden reduction of the intra-ocular pressure is liable to excite temporary hyperæmia

*See Dr. Boynton's Case, p. 151, *et. seq.*

of the vessels of the choroid and retina, and by causing an effusion of blood, increase the detachment.

Gelseminum is one of our most promising internal remedies for this affection, rapidly promoting absorption in recent cases, both traumatic and inflammatory. Much benefit has also been derived from the administration, in suitable cases, of Apis, Ars., Aur., Bry., Dig., Hep., Kali iod., Merc. and Rhus.

Temporary improvement has been obtained by puncturing the sac by means of a sickle-shaped needle, and permitting the fluid to escape from beneath the retina. The needle is passed perpendicularly through the sclerotica behind the lens, and having penetrated seven or eight lines into the vitreous, its point is turned towards the detachment, which is then divided as the instrument is withdrawn. Especial care must be taken not to cause intra-ocular hemorrhage by wounding the choroid. The operation, though unattended with any immediate danger, is not always successful; and as it appears in many cases to have "hastened the atrophy of the eye by inciting a degenerative irido-choroiditis," its usefulness as a remedial measure is, to say the least, very questionable.

DIV. III.—OPHTHALMIC TUMORS.

In the technical sense of the word, a "tumor" is "a circumscribed substance produced by disease, and different in its nature from the surrounding parts." In a broader and more general sense, however, the term may be used to denote any morbid enlargement of a part, whether different in its nature from the neighboring tissues, or not; and it is in this less-restricted sense that we shall make use of it.

1.—HORDEOLUM, OR STYE.

This miniature boil is too familiar to need particular description. It is not, as was formerly supposed, an inflammation of a Meibomian gland, but of the connective tissue of the edge of the lids. As a general rule, only one boil occurs at a time, but in some cases there are several; and it is no uncommon thing for one to follow another in regular succession, thus prolonging the disease for several months. The inflammation is generally confined to the immediate vicinity of the stye, but if highly acute it may extend to the entire lid, which becomes very red and œdematous; and even the ocular conjunctiva may become inflamed and chemosed. In such severe cases there is apt to be considerable feverishness and constitutional disturbance. But generally the disease runs a less acute, and in some cases a chronic course; and although the swelling is extremely sensitive to the touch, it soon terminates, either in resolution, or, which is more common, in suppuration, the purulent matter being discharged from the apex of the stye, mixed with small masses of disintegrated connective tissue.

Hordeolum is generally regarded, and justly so, as an indication of an unhealthy state of the constitution. It is most

commonly met with in scrofulous and enfeebled subjects, or in those whose health is broken down, especially individuals whose constitutions are undermined by dissipation, or in whom there co-exists some derangement of the digestive or uterine organs.

TREATMENT.—If seen sufficiently early, we may bring about resolution by the use of cold compresses and Aconite; but in most cases it is advisable to hasten the suppurative process by warm applications, giving at the same time Hepar or Pulsatilla internally, and subsequently, Graph., Staph., Sulph., or Thuja. The following remedies are also useful in preventing the recurrence of styes:—Alum., Ambr., Caust., Con., Ferr., Lyc., Merc., Nat. m., Phos. ac., Rhus, Seneg., Sep., Sil., and Stann.

2.—CHALAZION.

This is a small tumor, or cyst, originating in the tarsus, and due to inflammatory or other changes of the Meibomian apparatus. Its usual appearance is that of a small, rounded, isolated tumor, about the size of a pea, situated just beneath the conjunctiva or skin, and at a little distance from the edge of the lid. It occurs most frequently in the upper lid, but sometimes in the lower one, and more rarely in both. It occasionally becomes inflamed and traversed by enlarged vessels; and if the inflammation is very acute, it may give rise to suppuration and the formation of a small cystic abscess. In most cases, however, the inflammation is of a chronic character; and the contents of the cyst, instead of being purulent, are sometimes glairy or gelatinous, sometimes curdy, and sometimes fatty or sebaceous.

Debility seems to favor its development, as it is of frequent occurrence after confinement or prolonged nursing; but its

connection with an impaired state of health is not so evident as in stye, with which it sometimes co-exists. It is of remarkably slow growth, many months elapsing before it attains its full development.

TREATMENT.—If the tumor is soft and recent, we may sometimes cure it by administering Merc. precip. rub., or Kali iod., internally, at the same time that we use an ointment of these remedies externally. We have known the tumor to disappear without treatment, but this is a rare occurrence. In the majority of cases, even after the faithful use of indicated remedies and due attention to the general health, we have been obliged to resort to the knife. The operation is very simple. The lid having been everted, a crucial incision is made into the tumor with a scalpel or narrow knife, and if the contents are not sufficiently fluid to escape at once, they may be pressed out with the fingers, or scooped out with any convenient instrument. No after-treatment is generally required. It is well to inform the patient that he should not expect any reduction in the size of the tumor for several days, and that the swelling may even undergo a temporary increase, from bleeding within the cyst. The inflammation excited by the operation will cause contraction, and in the course of two or three weeks, the cyst, and the thickened tissues around it, will disappear. If the tumor return, which is very rarely the case, the operation should be repeated, taking care to excite sufficient adhesive inflammation to insure the obliteration of the cyst, by lightly touching its interior with a pointed crayon of nitrate of silver; or, what is frequently more convenient, by dipping a silver probe in nitric acid and cauterizing the cavity with the nitrate of silver thus extemporaneously prepared.

3.—DERMOID TUMORS.

These were formerly called *warts*, *moles* and *horns*. The former are usually small, roundish and projecting. They are of various degrees of consistency, some being quite soft and fleshy, while others are hard and cartilaginous. They also vary greatly in color, being in some cases white, in others yellowish, red, reddish brown, or dark brown. The surface of the wart or mole is sometimes smooth, sometimes rough or granular, and sometimes it has a number of short and delicate, or long and coarse hairs springing from it. These tumors consist, according to Virchow, "of a pad of connective tissue and elastic filaments, covered by a thick layer of epithelium, in which are situated the hair-follicles, either with or without accompanying sebaceous glands." They may be confined to the ciliary margin or to the outside of the lid, or they may occupy both. They also occasionally appear on the conjunctiva, in the form of small, flesh-colored tubercles, either singly or in clusters. These mucous warts bear a strong resemblance to those that occur on the prepuce. Dermoid tumors of a pale, whitish-yellow color, one or two lines in diameter, smooth or lobulated, and either with or without projecting hairs, are also sometimes met with on the cornea.

The so-called "horns," according to Wilson, are "accretions of inspissated sebaceous matter on the edges of the lids, which owe their origin to the drying and hardening, as fast as it escapes, of the contents of the follicles that furnish the material for their growth."

TREATMENT.—Dermoid tumors are mostly congenital, and generally require excision. Warts on the lids are said to have disappeared under the use of one or more of the following remedies, and if the patient is averse to having them snipped off, which is a very trifling operation, there can be no harm in trying them: Bar. c., Calc. c., Caust., Hep., Nit. ac., Kali bic., Lyc., Sep., Sil., Sulph. and Thuja.

4.—SEBACEOUS TUMORS.

These are generally met with in infants and young children. They appear most commonly at the upper margin of the orbit, near the external extremity of the eyebrow, but they are sometimes seen at the internal or nasal end. When first noticed they are about the size of a small pea, and are so loosely covered by the integument that the latter may be easily pinched up into a fold. They always grow very slowly, are unattended by pain or redness, and seldom attain any considerable magnitude, the largest not exceeding an inch or so in diameter. When opened they are found to consist of a compact cyst, the posterior wall of which is somewhat thickened, and generally adherent to the periosteum of the orbit. The contents of the cyst are sebaceous, containing fat molecules and broken-down epithelial cells, mixed in varying proportions with short and imperfectly-formed hair. The tumor appears to be congenital.

TREATMENT.—The proper treatment of sebaceous tumors is operative. Perhaps by a careful selection of our drugs, based chiefly upon constitutional symptoms, we may, in some cases, effect their absorption; but we have never witnessed their removal in this way, and unless the general health can be benefited by it, it is not worth while to waste time by depending upon medical treatment. If, however, the patient is opposed to operative procedures, we may try the following remedies, which have received the endorsement of able physicians: Bar. c., Calc. c., Graph., Hep., Nit. ac., Sil., and Sulph.

Sebaceous, like other subcutaneous cystic tumors, should be carefully dissected out, or rather eneucleated, the handle, instead of the edge, of the knife being used whenever practicable; for if the cyst be opened and its contents allowed to escape, the accident will greatly increase the difficulty of removing the whole of the tumor. If this should happen, however,

it will be advisable to lighly cauterize the remaining portions of the cyst with nitrate of silver, in order to prevent the return of the tumor.

5.—CYSTIC TUMORS.

Vesicular and other cystic tumors, the contents of which are sometimes watery and sometimes glairy, frequently occur about the lids. When of long standing, they are often more or less pedunculated, and either overlap the edge of the lid or extend back into the orbit. They are usually connected with some portion of the conjunctiva, forming, for the most part, small, pinkish, translucent tumors, the walls of which are generally very thin, and but loosely connected with the conjunctiva.

Cysts of the iris are less frequently met with, and are usually the result of some injury to that membrane. They generally spring from the surface of the iris in the form of small vesicles, which may be either translucent or opaque. The contents may be limpid and transparent, sebaceous and soft, or hard and cartilaginous. In most cases they excite considerable irritation and may even give rise to iritis.

Orbital cysts also occur, some of which, as above stated, spring from the glandular structures of the conjunctiva, whilst others are developed from the follicles of the lids. The contents of these cysts are of the most varied character, serous, glairy, sanguinous, fatty, etc. Some also contain hair, others hydatids. The hydatids are the echinococci and the cysticerci. The former, varying in size from a pea to a filbert, have been known to exist in such quantities, that when emptied from the cyst they filled a tea cup half full. These tumors generally grow very slowly, and when small are usually attended with but little inconvenience; but as they increase in size the

eyeball gradually becomes more and more protruded, and the sufferings of the patient are often most intense.

The cysticercus occurs most frequently within the eye. It is occasionally seen in the anterior chamber, but its most frequent seat is in or under the retina. At first it excites severe irritation, but after a while the eye becomes accustomed to its presence, and it may remain for weeks and months without giving rise to any great inconvenience; sooner or later, however, it sets up violent inflammation, and the eye is finally destroyed by irido-choroiditis.

TREATMENT.—Vesicular and other small cystic tumors generally require nothing more than a simple puncture; but when of a certain size the cyst must be removed or the tumor will be liable to return. Cysts of the iris will also require excision, together with the portion of membrane to which they are attached, as simply puncturing or lacerating them proves unsuccessful. It should be remembered, however, that this operation, even when combined with iridectomy, is not entirely devoid of danger, having in one instance given rise to severe purulent cyclitis. The greatest care should therefore be taken to guard against inflammatory complications, by removing every portion of the cyst. Orbital cysts containing fluid should be emptied of their contents, the operation being repeated as often as may be necessary; but other forms should, if possible, be dissected out.

6.—FATTY AND OTHER TUMORS.

1. *Milium.*—This is a small white tumor, about the size of the head of a large pin, and is generally seated at or near the edge of the lid. The cyst wall consists of a thin but dense membrane, containing a soft white substance like boiled rice. These tumors usually occur in elderly persons, and

occasion little or no inconvenience, unless they happen to be numerous, or appear in clusters.

2. *Moluscum.*—This tumor is of the same nature as milium, but larger, and generally seated a short distance from the edge of the lid. It posseses little or no elasticity, retaining for some time any form into which it may be pressed. In this respect it differs sensibly from the

3. *Fatty Tumor.*—This is of frequent occurrence about the eyelids, and is firm and elastic to the touch; it is further characterized by being smooth, of a somewhat lobulated form, and of extremely slow growth. It is occasionally observed on the ocular conjunctiva, especially in the vicinity of the lachrymal gland. In these cases it appears to be due to an hypertrophy of the adipose tissue of the orbit. Sometimes these tumors attain such proportions as to displace the eyeball, and press injuriously upon the lachrymal gland.

4. *Polypi.*—These are small condylomatous elevations, of a pinkish color, attached to the conjunctiva by a distinct pedicle, and generally seated near the semilunar fold. They sometimes attain the size of a pea or hazel nut, and protrude between the lids.

TREATMENT.—Milia and molusca simply require to be pricked, and their contents squeezed out. In removing fatty tumors, care should be taken to sacrifice as little of the conjunctiva as possible, and to unite the edges of the incision by a fine suture. Polypi should be snipped off with scissors, and the hemorrhage arrested by touching the cut surface with nitrate of silver, which will also be likely to prevent a return of the disease.

7.—NÆVUS MATERNUS.

TELANGIECTASIS.

This affection, the name of which is now restricted to congenital tumors characterized by peculiar and excessive vascularity, is generally met with on the eye-brow and upper lid. It is also occasionally found on the conjunctiva, and very rarely on the iris. These growths are generally divided into an arterial or active, and a venous or passive form; but this distinction is quite arbitrary, and we shall find it more convenient to describe them according to the positions they occupy, as cutaneous, subcutaneous, and mixed. The cutaneous variety varies both in depth and extent, appearing in some cases like a mere stain, and in others like a circumscribed mass of blood-vessels. The subcutaneous form, being deeper, is not so well defined, and is either colorless or of a light bluish tint, according to its depth from the surface. When deep, it bears a close resemblance to the common fatty tumor. Most nævi may be diminished in size by pressure, the blood-vessels being more or less emptied by it, but as soon as the pressure is removed they refill. Some are firm and distinctly pulsatile to the touch, while others are soft and impart no arterial thrill to the fingers. They all become distended when the patient stoops, screams or struggles, and when superficial they assume at such times a very dark and tense appearance. On account of their vascularity, they also bleed profusely on the slightest injury.

TREATMENT.—Nævi after reaching a certain size frequently remain almost stationary; in other cases they slowly diminish; and sometimes they disappear altogether. Mere stains seldom undergo natural resolution, but the bluish superficial nævus is more apt to disappear spontaneously than the scarlet variety. The process is said to be hastened in some cases by the use of

the following remedies:—Calc. c., Carb. v., Cund., Fluor. ac., Lach., Lyc., Nux v., Phos., and Thuja.

If it becomes necessary to interfere surgically, the best plan is to endeavor to procure the obliteration of the nævus, by exciting adhesive inflammation in it. This may be readily accomplished by passing a number of fine silk threads, soaked in a solution of the perchloride or persulphate of iron, across the tumor in different directions, and leaving them in for a week or two. The subcutaneous ligature is a less convenient but very effectual operation. The ligature is applied in different ways, according to the size and situation of the tumor. If large, it is best to divide it into sections, corresponding to the peculiar shape of the tumor, and ligature each portion separately; but if small, a single thread may suffice. Another useful plan is to break up the substance of the growth subcutaneously, by means of a cataract needle, repeating the operation from time to time, and in the intervals to keep up pressure upon it. But the most eligible method of operating is by electrolysis, inasmuch as it leaves no scar or disfigurement, and is not attended with any pain or danger.

8.—FIBROUS TUMORS.

These tumors are met with in the eyelids, conjunctiva and orbit. In the eyelids they form small, hard, circumscribed elevations, which are sometimes painful to the touch. In some cases they assume a cartilaginous or bony character. They are mostly seated in the submucous tissue, and are readily brought into view by everting the lid.

In the ocular conjunctiva these fibromata take the form of *pinguecula*. The latter consists of hypertrophied conjunctival and episcleral tissue, and is generally situated close to the edge of the cornea. It is a small, flat, roundish or triangular body,

of a yellowish-white color, and bears a slight resemblance to pterygium, for which it is sometimes mistaken. It does not, as might be inferred from its name and appearance, contain any fat, but is made up chiefly of epitheliel cells and connective tissue. Pinguiculæ generally occur in old people, and are probably due to a chronic irritation of the conjunctiva in consequence of external injuries.

Fibrous tumors of the orbit spring from the periosteum, to which they often adhere by a broad base; but the more movable ones are usually attached to the edge of the orbit by one or more pedicles. Some of them are hard and smooth, and some are soft and lobulated. The former are generally small, circumscribed, and more or less movable. The latter, which sometimes attain a very great size, extend in some cases deeply into the orbit, and may even involve the bones of the head and face.

TREATMENT.—The only successful treatment for fibrous tumors is operative. We are convinced that much valuable time is often lost by practitioners of our school, in vain attempts to disperse such tumors by local applications and medicines. Those attached to the orbit, if capable of being readily extirpated, should be removed early, especially if they encroach upon, or are actually within its cavity. No such operation should be undertaken, however, without duly weighing all the circumstances of the case, some of which may render the case exceptional. Thus, the history and situation of a tumor may be such as not to threaten mischief, when its removal would in all probability injure or destroy the sight. In this case, of course, no good surgeon would undertake an operation. On the other hand, if the growth of the tumor gives rise to cerebral symptoms, the surgeon should not hesitate to sacrifice the eyeball, if necessary, in order to remove it, and even incur the risk of exciting considerable inflammation.

9.—SARCOMATOUS TUMORS.

Sarcoma occurs primarily in all parts of the eye and surrounding tissues. It first appears in the form of nodules, which frequently become quite large, and give to the growth a very irregular appearance. It is characterized by a preponderance of cellular elements, which vary greatly in form and size, being spindle-shaped, stellate, oblong, circular, etc. Sometimes the cells contain pigment, and then it is called melanotic sarcoma. It is not of a benign character, neither is it so malignant as cancer, but rather between the two, developing first in homologous, and afterwards in heterologous tissues. Its structure is equally diverse, sometimes approaching one type and sometimes another of the connective tissue group, giving it at various times more or less of a fibrous, mucous, gliose, melanotic, medullary, cartilaginous, or bony character. It appears much the most frequently in the choroid, where it sometimes developes rapidly; but generally its growth is very slow and interrupted, giving rise to symptoms of glaucoma, usually of a chronic character. Sometimes the disease originates in the ciliary body, and when it has become sufficiently developed, makes its appearance in the anterior chamber, in the form of a dark brown tumor; or it may extend backwards in the same manner into the vitreous. It is also frequently found in the orbit, being, according to Virchow, generally developed from the adipose tissue behind the eye. After a time it pushes the eyeball out of the orbit, and appearing beneath the conjunctiva in the form of round, firm protrusions, finally assumes a fungoid character. Or the disease may grow inward, and after reaching the dura mater, invade the cranium. After implicating the neighboring tissues, the disease generally ends in metastasis.

Sarcoma is less common in childhood than in adult life;

but it frequently developes from warts or maculæ in the integuments of the lids, which were either congenital or observed in infancy. These often remain unchanged till old age, when they suddenly become sensitive and painful, and gradually take on the character of sarcomatous tumors.

TREATMENT.—The only safety in these cases is in complete extirpation. If the tumor is intra-ocular, the sooner the eye is enucleated after the disease is recognized, the better.

10.—GLIOMA RETINÆ.

Glioma retinæ is the name given by Virchow to the medullary fungus of the retina, heretofore known as encephaloid cancer, or fungus hæmatodes. It is mostly, and perhaps entirely, a disease of childhood; for while it is not a very uncommon affection, not a single undoubted case of it, according to Hirschberg, has, up to the present time, been observed in persons over twelve years of age.

SYMPTOMS.—The loss of sight is usually the first symptom that attracts attention. The pupil is then seen to be somewhat widely dilated, and through it, upon careful examination, may often be discerned a glistening, yellowish reflection, formerly called the "amaurotic cat's eye." Examined with the ophthalmoscope, we find the affected portion of the retina somewhat mottled, thickened and opaque. As the morbid growth increases and becomes more prominent, it protrudes more and more into the vitreous humor, where it presents the form of a nodulated yellowish-white mass, over which ramify numerous blood-vessels. The latter inosculate freely with each other, and also with those more deeply seated, the growth being characterized by great vascularity. The tumor continuing to enlarge, the lens becomes absorbed, or pushed forward along with the iris towards the anterior portion of the

globe, where sooner or later perforation usually takes place, and the morbid growth sprouts forth in the form of a dark-red and easily-bleeding fungus. (*Fungus hæmatodes*).

Sometimes the glioma appears first in the external layers of the retina, and then it generally soon perforates externally. This condition may be suspected if the movements of the globe are much limited, and the eyeball protruded. When the tumor penetrates deeply into the vitreous humor, the intra-ocular tension increases, and this furnishes a diagnostic sign of great importance. Primary glaucoma being almost entirely a disease of adult life, a marked increase of the intra-ocular tension occurring in young children, should always excite suspicion. As for the differential diagnosis between simple detachment of the retina and that which occurs in glioma, we have only to remember that in the former the intra-ocular tension is often diminished.

Occasionally the disease, at a certain stage of its progress, is very difficult to distinguish from simple choroiditis; in point of fact, the disease sometimes assumes the character of an irido-choroiditis, with commencing atrophy, the intra-ocular tension being diminished, and the pupil obstructed by lymph. These symptoms are generally due to suppurative choroiditis, but in some rare cases they are said to be caused by suppuration of the cornea. But here the similarity ceases. The atrophy is often accompanied with severe paroxysms of pain, while the eye is perhaps no more sensitive to the touch than usual. At a later period the usual symptoms of glioma again manifest themselves, and the disease progresses in the manner already described.

That the disease is malignant we think there can be but little doubt. The optic nerve frequently becomes implicated, and in this way the affection may be propagated to the brain, giving rise to secondary glioma or inflammation of that organ.

When once the adipose tissue of the orbit becomes implicated, the progress of the disease is very rapid.

TREATMENT.—The only rational treatment for this, as well as every other malignant disease of the eye, is the immediate enucleation of the globe. Cases are on record in which, after the lapse of several years, there was no return of the disease. Care should be taken in performing the operation to excise the optic nerve as far back as possible, in order to include the whole of the diseased structure; and if the disease is found to have extended to the orbit, it would be well to apply the chloride of zinc paste to the orbital cavity, as recommended under

11.—CARCINOMATOUS TUMORS.

Carcinoma differs but little in general appearance from sarcoma. According to Virchow, "the disease is recognized by the alveolar formation of its stroma, and the epithelial character of its cellular elements." It may occur in any part of the eye and surrounding tissues, but generally originates extra-ocularly. It is of the most malignant and destructive nature, invading and destroying the most heterologous tissues, contaminating the circulation, and spreading both by assimilation and metastasis. It is also a very painful disease, being usually attended with more or less suffering from the very commencement. It may be divided into three principal forms, namely: (*a*) the epitheliel, (*b*) the medullary, and (*c*) the scirrhus—melanotic cancer being only a variety of of the medullary.

A.—Epitheliel Cancer.

This form of cancer, which is always superficial, rarely commences upon the lids or conjunctiva, but spreads to these parts from the skin of the nose, forehead or cheeks, invading

most frequently the lower lid, near the inner canthus. It seldom attacks the young, being much more common in those somewhat advanced in life. It generally makes its appearance in the form of small, hard, circumscribed elevations, or tubercles, feeling like knots beneath the skin. These slowly enlarge and increase in number, until by coalescence they assume the form of warts or small thickened crusts. In this condition they may remain for a long time, but sooner or later itching or uneasiness begins to be felt, the surface is rubbed or otherwise irritated, and then ulceration sets in. A thin yellowish discharge oozes from the ulcerated surface, which drys and forms a dark rough crust. The disease now begins to spread in every direction. Sometimes the ulcer becomes temporarily healed over, but it soon re-opens, and the ulceration is renewed. In this way the malady proceeds, irregularly but gradually eating its way along the surface and through the lid, until ultimately it exposes the conjunctiva, and extends perhaps to the orbit. Up to this time the disease is generally attended with but little pain; but as soon as it attacks the deeper tissues, especially those of the globe, acute pain is felt, resulting partly from exposure of the nerves, and partly from pressure of the tumor upon them.

A striking peculiarity of epitheliel cancer is the slowness with which it advances. Several years may pass before ulceration sets in, and many more may elapse before it makes any considerable progress, provided the general health of the patient remains good, and the sore is judiciously treated. Ultimately, however, the cancerous cachexia is induced, and then, if not before, the disease advances with the most destructive rapidity.

B.—Medullary and Melanotic Cancer.

Medullary cancer is distinguished as intra- or extra-ocular, according as it makes its first appearance in the choroid, or on the walls of the orbit. It is easily recognized by its soft consistence,

and by the fungous character (*fungus hœmatodes*) which it presents after the tumor bursts from the orbit, or is released from pressure by ulceration. When connected with the orbit, the tumor may be closely adherent to the periosteum, or it may be but loosely attached to it. It may increase rapidly in bulk, invade and destroy the neighboring tissues, and extend into the adjoining cavities and along the optic nerve to the brain; or it may protrude externally, and form luxuriant fungous masses, giving rise to severe pain, and such a profuse discharge and frequent hemorrhage, as to bring the case to a speedy and fatal termination. On making a microscopical examination of the tumor, we discover large areolar spaces, filled with variously shaped cancer cells, similar to those described under the head of sarcoma. Unlike sarcoma, however, the medullary tumor makes a much more rapid progress, leads much earlier to metastatic affections, and is consequently far more apt to return after extirpation. (See *Glioma Retinæ*).

As melanotic cancer is but a variety of the medullary, and differs from it chiefly in containing a greater or less amount of pigment in its cells, it is unnecessary to describe it in detail. The amount of pigment may be so great as to give the tumor a deep sooty-black color, streaked here and there with various shades of brown or gray. It is the most dangerous variety of cancer, and exceedingly prone to recur within a very short time after extirpation.

C.—Scirrhus Cancer.

Scirrhus is so called from the stony hardness which characterizes it in whatever tissue of the body it may be found. It seldom appears before the middle period of life, and generally developes very slowly. Its occurrence in the orbit is probably due to some injury or prior inflammation; at least it

has been seen to follow a blow or other injury, but more commonly it is preceded by repeated attacks of inflammation, generally of an intractable nature.

TREATMENT OF CANCEROUS TUMORS.

The only proper treatment of any form of cancerous tumor of the eye, consists in prompt eneucleation of the eyeball, and the complete extirpation of the morbid growth. In order to destroy any portions of the tumor which cannot be reached with the knife, it is recommended to dress the raw surface with the chloride of zinc paste, spread upon strips of lint. The paste may be prepared by rubbing up one part by weight of the chloride of zinc with four parts of flour, and adding sufficient tincture of Conium to make a paste of the proper consistency.

DIV. IV.—CATARACT.

Cataract is a partial or general opacity of the crystalline lens, of its capsule, or of both the lens and capsule combined. The first is called *lenticular*, the second, *capsular*, and the third, *capsulo-lenticular cataract.* The term *false cataract* was applied by the old authors to deposits of lymph in the pupil which have become permanent. This condition, which is almost always associated with lenticular cataract, has already been sufficiently considered. (See *Iritis.*)

Lenticular cataracts are divided into two general classes, namely, (1) the *cortical*, or *soft cataract;* and (2) the *nuclear*, or *hard cataract.* This classification, though not strictly correct, is most convenient for obtaining a general notion of the subject; while the exceptional forms will be best understood by considering them in connection with those to which they are most nearly related.

1.—SOFT CATARACT.

CORTICAL OR CONGENITAL CATARACT.

The characteristic feature of soft cataract is, that, although the whole lens may be opaque, it contains no hard nucleus. It occurs in subjects under thirty-five or forty years of age, and is the most common form of congenital cataract. It is divided into two principal varieties, the *lamellar*, and the *cortical.*

A.—Lamellar Cataract.

Lamellar cataract is usually congenital, but as it interferes very little with vision, it may long remain undetected. It is distinguished by the fact that the opacity, which is generally

of a delicate greyish, or bluish-grey tinge, is partial, central and uniform, being surrounded by a transparent or pellucid border, and not increasing in density towards the pole, as would be the case if the nucleus was affected. Examined by the ophthalmoscope, when the light falls perpendicularly upon the cataract, the opacity appears as a dark, sharply-bounded, circular spot, through which the fundus presents a uniform reddish-brown appearance, and beyond the edges of which the details of the retina may be distinctly seen. But the diagnosis is best made out by oblique illumination. The cataractous portion of the lens then appears surrounded by a dark black ring, caused by the heads of the ciliary processes shining through the transparent margin of the lens. But this uniform and sharply-bounded central opacity continues only so long as the cataract is stationary. When progressive, the superficial layers are affected with a cloudy or striated opacity, giving it more or less of a radiated appearance, the striæ extending from the central portion into the cortex, and marked here and there by various minute inequalities. The smaller the opaque specks, and the fewer and more delicate the streaks, the slower is supposed to be the progress of the cataract, and *vice versa*.

A fair degree of vision is usually enjoyed by patients affected with lamellar cataract; but the sight is always greatly improved by dilating the pupil with Atropine, in consequence of bringing into use the peripheral or unaffected portion of the lens. Thus, patients who, previous to dilatation of the pupil, were barely able to make out the heaviest type, have afterwards been able to read with ease the finest print.

B.—Cortical Cataract.

This form of cataract may commence in any portion of the cortical substance of the lens. Hence it may invade both surfaces of the lens uniformly; or it may commence at the

middle, or, which is more common, at the circumference, in the form of small, greyish-white streaks, or radii, running towards the centre, the intermediate lens substance being at first transparent, or but slightly opaque. Shortly, however, a general opacity sets in, which may, or may not, render the striæ invisible. Sometimes the stellate figure may be observed in both the anterior and posterior cortical portion of the lens, the remainder being transparent, or slightly dotted with opaque points. This condition is easily recognized by lateral illumination, the anterior streaks appearing just behind the pupil, and the posterior further back, and having a concave or meridional appearance. These appearances are especially marked through the opthalmoscope, the spots and stripes being projected in dark, well-defined opacities on the red surface of the fundus. Unlike lamellar cataract, its progress is usually rapid, particularly in children, in whom it often matures in the course of a few weeks or months. At a later period its rate of increase may be comparatively slow, especially if the opacities are small and scattered.

Total or mature cortical cataracts are of a grey or bluish-white tint, the color being most intense at the centre, in consequence of the increased density at that point. The stellate rays are broad, white, and sometimes slightly glistening. If the cataract developes quickly, the lens swells so as to push forward the pupillary margin of the iris, which is frequently more or less dilated and sluggish. Viewed obliquely, we discover that the more superficial layers of the cortical portion of the lens are less dense than the central, proving that, although soft, this is not a fluid cataract. In the latter the white opacity is equally as dense at the periphery as at the centre. It is of a milky-white or greyish color, devoid of striæ, and extends quite up to the capsule, the interior of which is sometimes dotted with minute white opacities.

The consistency of cortical cataract, which is always soft,

is in infancy and childhood almost fluid. It increases in density up to the age of thirty or thirty-five, when the nucleus loses to a greater or less extent its soft, pulpy character, and becomes somewhat hard. In the course of time, secondary changes may set in, disintegration and absorption of the affected portions of the lens taking place, causing the latter to contract, and the capsule to become more or less wrinkled. After the more fluid parts are absorbed, the shriveled capsule generally contains only broken-down lens substance, in the form of small, chalky-white chips. In children, the process of absorption may continue until nearly the whole of the over-ripe cataract disappears, leaving only a small, hard, chalky layer or disc, which, from its resemblance to a dried seed-shell, is called by the old writers "siliquose" cataract, (*cataracta siliquata*). After the age of twenty-five or thirty, the nucleus becomes sufficiently hard to resist these secondary changes, and the softening is chiefly confined to the cortical substance. As soon as the latter becomes fluid, the hard nucleus sinks down in it, and thus is formed the so-called "Morgagnian" cataract.

2.—HARD CATARACT.

NUCLEAR OR SENILE CATARACT.

As the name indicates, this form of cataract is characterized by the presence of a comparatively hard nucleus. It is appropriately called "senile," as the change that produces it never begins to take place until after the age of from thirty to thirty-five, when the nuclear portion of the lens becomes harder, and assumes a yellowish tint. The consolidation of the nucleus, which takes place gradually, is at first a purely physiological process, and may exist for years without any deterioration of sight. It is only when vision becomes

perceptibly impaired in consequence of a certain increased density and opacity of the lens, that the process should be regarded as pathological, although the distinction between the two forms of hardness and opacity is merely one of degree. When this stage is reached, the nucleus exhibits a more or less greyish-yellow or brownish-yellow color, quite distinct in appearance from the cortical portion of the lens, which at first retains its normal transparency, except in the immediate vicinity of the nucleus, where perhaps a so-called "arcus senilis of the lens" occurs. Subsequently the cortical portion also becomes affected, constituting what is called "mixed" cataract.

If we view nuclear cataract by lateral illumination, it will appear as a yellowish, or more rarely as a brownish or black opacity, somewhat distant from the pupil, the latter, owing to the transparency of the cortical substance, often throwing a shadow upon the surface of the opacity. Brown and "black" cataracts are due to the absorption of hematine from the aqueous humor. These forms are liable to be overlooked, on account of the dark color of the pupil, unless the examination is made with the ophthalmoscope or by lateral illumination.

Hard cataract at its commencement presents a stellate appearance very similar to that of the cortical variety already described; the opaque streaks being arranged in the form of radii, with clear portions of the lens between them. The opacity generally begins at the periphery, and may be confined to either surface of the lens, or may embrace both. The central portion, as well as the spaces between the rays, may remain for some time sufficiently transparent for the details of the fundus to be seen; but the opacity gradually extends towards the centre of the lens, the intermediate spaces become more and more clouded, and finally the entire lens becomes affected.

Senile cataract occurs most frequently after the age of fifty, and is apt, sooner or later, to affect both eyes. Its

progress is sometimes slow, at others rapid. In its earlier stages, it often remains for a long time almost stationary, and then advances with great rapidity, reaching maturity perhaps within a few weeks. It is generally more rapid the larger, broader, and more numerous are the opaque spots and stripes. Relatively, its progress is far more rapid in the cortical substance than in the nucleus.

The secondary changes that sometimes occur in senile cataract, are similar to those that take place in the cortical variety, the chief difference being that the retrograde metamorphosis is confined to the cortex. Partial absorption takes place, and scattered chalk-like spots are formed, usually at the expense of the cortical substance, which diminishes somewhat the thickness of the cataract. These collect into small masses, and become attached to the inner surface of the capsule, which sometimes appears like a thin veil streched over the hardened nucleus and strewn with white granules. The softening of the cortex may give rise to the so-called "Morgagnian" cataract, as mentioned under the previous head.

The impairment of vision is frequently much less than the degree of opacity would lead us to suspect. This arises in some cases from the cloudiness being confined to the portion of lens usually covered by the iris. The opacity being the same, the clearness depends upon the nearness of the object, the degree to which it is illuminated, and the amount of diffuse light that is allowed to enter the eye. Hence, if the opacity is chiefly limited to the centre of the lens, the patient will see best when the diffuse light is cut off, and the pupil dilated; but if confined to the margin, the reverse will occur; he will see best in a bright light, and with a contracted pupil.

3.—CAPSULAR CATARACT.

We have already alluded to the fact that, during the secondary changes which take place in lenticular cataract, the fluid and fatty elements become absorbed, and the harder portions become attached to the inner side of the capsule, thus rendering the latter apparently more or less opaque. But since these white, chalky appearances are not situated in the capsule itself, it is evident that the term "capsular" cataract is not, strictly speaking, correct. This does not, it is true, disprove the possibility of the capsule becoming cloudy, but so far it has not been observed. Indeed, it is almost certain that capsular cataract never occurs except as a complication of a previous opacity of the lens; the deposit being intra-capsular, and depending on the condition of the lens substance. In making this statement we do not lose sight of the fact, that, in certain cases, the hyaline membrane undergoes a sort of hypertrophy, or is apparently thickened by a deposit of transparent layers, which may subsequently degenerate and become opaque; but as a general rule the capsule itself retains its transparency. (*Stellwag.*)

By capsular cataract, therefore, we understand an opacity of the capsule, generally due to opaque deposits upon its inner surface, consisting mainly of chalky incrustations, or fragments of cholesterine crystals, the capsule being somewhat wrinkled, and perhaps thinned. The opacity is seated chiefly behind the pupil, sometimes on the posterior half, but generally on both halves of the capsule. Sometimes it consists in a simple thickening and cloudiness of the capsule, dotted here and there with small, chalky masses; but in most cases the chalky opacities predominate, and form a more or less complete incrustation on the inner wall of the capsule.

"Central" capsular cataract is sometimes congenital, but in

most cases it is the result of an iritis, or of a perforating ulcer of the cornea. When the latter is situated near the centre of the cornea, the lymph effused in the ulcer comes in contact with the corresponding portion of the capsule, in consequence of the lens falling forward upon the cornea during the escape of the aqueous humor, and a portion of the lymph adheres to the capsule after the lens recedes from the cornea. This interferes with the nutrition of the subjacent tissues, and the latter become more or less cloudy and opaque. These finally undergo the usual secondary changes, shrinking greatly, and forming a cartilaginous, or more frequently a chalky nodule, attached to the inner surface of the anterior capsule, and imbedded, so to speak, in the surface of the lens. Sometimes the cataractous nodule, instead of being rounded, is of an irregular pyramidal shape, the apex projecting above the surface of the capsule, and the base slightly imbedded in the cortical portion of the lens. This form is called "pyramidal" cataract.

Capsular opacities occurring at the posterior pole of the lens, and hence termed "posterior polar" cataract, are sometimes caused by changes in the contiguous cortical substance of the crystalline, or by deposits upon the internal surface of the capsule, which take place in the manner already described. But posterior polar cataract may also be due to inflammatory or nutritive changes in the anterior portion of the vitreous humor. These are distinguished by their smooth and shining aspect, whereas the former are usually rough and granular. They are generally dependent upon chronic inflammation of the deeper tissues of the eye, being frequently met with after certain forms of choroiditis and retinitis.

4.—TRAUMATIC CATARACT.

We shall devote this section chiefly to the etiology of cataract, beginning with the traumatic. Of the numerous causes that give rise to its various forms, wounds and injuries of the lens and its appendages are among the most important.

The opacity generally commences within a few hours after the receipt of the injury. If the latter is slight, such for example as a very fine puncture that does not penetrate deeply, it may cause only a superficial cloudiness in the vicinity of the wound, which may disappear, and leave no permanent opacity; but more frequently, the parts surrounding the wound swell up, and if much aqueous humor is admitted, the whole lens may enlarge, causing the wound in the capsule to gape; and if under these circumstances a portion of the cataractous substance protrudes and becomes absorbed, the edges of the wound may retract, so as to become cemented together by the disintegrated remains of the cataract, and thus give rise to a secondary traumatic cataract. Moreover, the swelling of the lens may cause it to press injuriously upon the ciliary body and iris, and thus lead, perhaps, to irido-cyclitis; and if the iris is badly lacerated, or if it becomes attached to the corneal wound, it may even excite a general irido-choroiditis, with its attendant consequences. The danger of secondary inflammation is considerably less in children than in adults, in consequence of absorption being more rapid and the injurious influences of shorter duration. But no such differences exist in cases where the injury was caused by a foreign body, such as a bit of percussion cap, which still remains in the eye. Here the danger of destructive inflammation is always very great. In such cases the surgeon should not fail to keep a careful watch over the eye, and promptly adopt such measures for its safety, and for that of its companion, as the exigencies

of the case may require. See *Glaucoma*, *Sympathetic Ophthalmia*, etc.

Traumatic cataract may also result from a blow or fall, which may or may not rupture the capsule of the lens, or destroy the continuity of the ciliary processes. If the rupture is partial or incomplete, it may escape detection for years. A careful examination, however, will generally result in discovering the mobility, oblique position, or sinking of the lens, the tremulousness of the iris, etc. If the lens has become completely dislocated, it may be forced into the anterior chamber, between the iris and cornea, where, inclosed in its capsule, it may remain for years without exciting any particular inconvenience, though this is not generally the case; or it may be driven into the vitreous, where severe inflammation of the internal tunics quickly occurs. Spontaneous and congenital dislocations also occur; and although the luxated lens may remain transparent for years, it finally becomes cataractous.

Cataract has also been caused by entozoa perforating the capsule and entering the lens. The *monostoma lentis*, the *filaria* and *distoma oculi humani*, and the *cystercercus*, have all been found in the crystalline lens.

Raphania, or ergotism, is an occasional cause of cataract. The opacity developes slowly; and as it generally affects the young, the cataract is usually soft. The same is true of diabetes, which is a very common cause of cataract.

Finally, while it most frequently results from the faulty nutrition incident to old age, cataract is often both hereditary and congenital, (*cataracta adnata*). The immediate cause in these cases according to Stellwag, is supposed to be, "a faulty development of the lens, which prevents the elements from long maintaining themselves at the height of evolution, and causes their premature destruction; a proceeding that is analogous to the early fall of the hair and decay of the teeth."

TREATMENT OF CATARACT.

Whilst we are free to admit that the vast majority of cataracts, especially the hard, can only be removed by operative procedures, we see no reason to change the opinion we have already expressed, namely, "that incipient cataract has in some instances unquestionably yielded to homœopathic medication."* Even Stellwag, looking at the subject from the Old School standpoint, says that "medical treatment may be of service in so far as it is suited to remove direct or indirect causes of cataract"; and adds, "it can scarcely be denied, that with the removal of the cause, the development of the cataract may be easily impeded, and its progress restricted. But if this succeeds," he says, "it is evidently possible that the already cloudy portion may be caused to disappear by regressive metamorphosis and absorption, and a relative cure thus brought about."† He also admits that "several creditable authors," meaning Tavigno, Arlt, Faye, Himly, and others, "say they have seen existing cataractous opacities clear up under the systematic use of mercury, after frictions of iodide of potassium ointment about the eyes, after the internal and external use of Phosphorus, etc., etc."‡ *Such* admissions, coming as they do from such high authority in the old school, if they do not serve to convince, ought at least to render less positive the opinions of those of our own school who not only still cling to the old notion of the incurability of cataract, but who even claim it to be impossible, under any circumstances, to cure—what? senile cataract? no, but even "incipient" cataract, by therapeutic means.† Besides, it cannot be denied that a large number of such cases are to be found in our literature, and that some of them are vouched for by several of our most

*See *Preliminary Observations.*

†"Treat. on Dis. of the Eye," Fourth Am. Ed., 1873, p. 624.

Loc. cit.

‡See 'Medical Advance," vol. iv, p. 249.

distinguished authors, including such names as Kafka, Quadry, Kirsch, Lilienthal, and others of equal note. We are, therefore compelled to admit that, under some circumstances, cataract is curable, or else of impeaching the integrity and skill of some of the most noted and reliable authorities of both the allopathic and homœopathic schools of medicine.*

But in order to succeed by medical treatment alone, it is requisite that the cataract should be of a favorable character, that the remedy should be rightly selected, and that its administration should be neither irregular nor transient. No one would expect to effect a cure by internal treatment after degeneration of the lens fibres had occurred; nor, supposing the case to be a proper one, and the remedy to be rightly selected, would he look for a permanent and radical change under several months. In all ordinary cases, therefore, we shall be obliged to resort to operative measures; but in complicated cases, or those attended by circumstances contra-indicating an operation, which are by no means rare, we should give the patient the benefit of our improved system of practice, and not, from any preconceived notions of its inefficiency, deprive him perhaps of the only possible means of recovery. Our chief difficulty will consist in selecting the proper remedy. Aside from the pathological condition of the lens, we shall be obliged to fall back upon the symptoms arising from complications, if any, or from the state of the patients health, especially as regards any abnormal action of the heart, kidneys, or uterus, or any other derangement which may in any wise affect either the circulation or nutrition of the organ of vision. In the absence of any such indications, we shall be compelled to address our remedies to the pathological condition itself, and for this we have no other guide than experience. The

*See a very able paper on this subject by Prof. Gilchrist, in the thirteenth volume of the *American Observer*, p. 449, *et seq.*

remedies which have hitherto been employed with favorable results, and which deserve special attention, are the following; —Amm. c., Bary. c., Calc. c., Cann. s., Caust., Chim. u., Graph., Iod., Kali iod., Lyco., Magn. c., Merc., Phos., Physostig., Sec. c., Sep., Sil., Sulph.

OPERATIONS FOR CATARACT.

Before proceeding to describe the various methods now practiced for the removal of cataract by operation, we shall briefly point out some of the principal circumstances and conditions which may render it necessary or advisable to either defer the operation, or abandon it altogether.

1. The most favorable cataract for operation is one that has just reached maturity; that is, the cataract is ripe without being over-ripe. These terms are altogether relative. A cataract is ripe for operation when the connection between the cortex and nucleus of the lens is stronger or more intimate than it is between the cortical substance and capsule. For, if only the external layers of the lens are in a soft or fluid condition, there can be no difficulty in removing the nucleus. Nor can there be any great danger incurred, even if the cortical layer is of normal consistency, provided the nucleus has acquired such a degree of density as to readily prevent its separation from the cortex, for then the latter may be safely detached from the capsule. But if the superficial layers, without being abnormally hard, have lost their transparency, and have become intimately attached to the capsule, their separation can only be effected by violent, and therefore dangerous means. Hence such cataracts are said to be unripe for operation. For, if any portion of the cortex remains in the capsule, it not only swells up and irritates the iris, but is liable to proliferate, giving rise to a secondary cataract, if not to destructive inflammation of the eye.

But a cataract may be over-ripe; that is, the lens may have undergone such retrogressive changes that the cortical substance is either broken down into a creamy or chalky fluid or pulp, filled with minute sand-like grains, or transformed to a dry, cretaceous substance, portions of which are liable to remain in the eye, and thus render the operation extremely dangerous.

2. Authorities differ as to the propriety of operating in monocular cataract. All agree, however, that the operation should not be undertaken unless a favorable result is almost certain. The advantages, in case of success, are, first, the improvement in the personal appearance of the patient; second, the enlargement of the field of vision; and, third, the preservation of vision in case the other eye becomes cataractous. On the other hand, in case of failure, if the inflammation excited by the operation should continue for a long period, or until the other eye has become affected, the patient would be deprived during this period of any service from the sound eye; there is also the danger of the latter becoming sympathetically inflamed.

3. Surgeons also differ as to whether, in binocular cataract, only one eye at a time should be operated on, or both at once. Our practice has been to operate on one eye at a time, and not to touch the other until the first has recovered; thus lessening the danger of inflammation, diminishing the shock to the system, avoiding the risk of any sympathetic influence of one eye upon the other, and furnishing an opportunity to discover any constitutional peculiarity or unfavorable tendency, a knowledge of which would be of service in the subsequent management of the case. Of course, if only one cataract is ripe, there is no occasion to wait for the other to mature; but, if circumstances are favorable, we should promptly operate upon the former, so as to enable the patient to follow his usual avocations whilst the other is maturing.

4. It is highly important not to operate unless the eye is in an otherwise healthy condition. The chief exception to this rule is where an inflammation is kept up by a swollen or dislocated lens, and then the urgency will depend upon the character of the inflammation. Nor would it be safe to operate on an eye that had recently been in a state of inflammation, though chronic inflammation of the surrounding parts sometimes forms an exception.

5. It is also important that the state of the patient's health should be such as to favor an operation, or at least such as not to endanger the result. Hence the various cachexia, such as scrofula, tuberculosis, syphilis, etc., as well as any other condition, whether physical or mental, which greatly depresses the vital powers, is to be regarded as endangering, and, to a corresponding extent, contra-indicating an operation. It is especially important to determine whether the patient is suffering from diabetes, as this is a very frequent cause of cataract, and the lens does not generally become affected until late in the disease, when the health is seriously impaired. If diabetes is found to exist, we should be careful to ascertain whether there is any co-existing affection of the retina or optic nerve, as this would render the prognosis very unfavorable.

6. The season of the year is of but little consequence, provided we avoid thermometrical extremes, and these chiefly on account of their interfering with the comfort or exercise of the patient. Thus, in very hot weather the patient is apt to be restless, and confinement in bed is much more difficult; besides, wounds rarely heal as readily in July and August as they do in cooler months. On the other hand, very cold weather is not only unfavorable for regular exercise prior to the operation, but, by confining the patient to his room longer than is necessary, often greatly protracts convalescence.

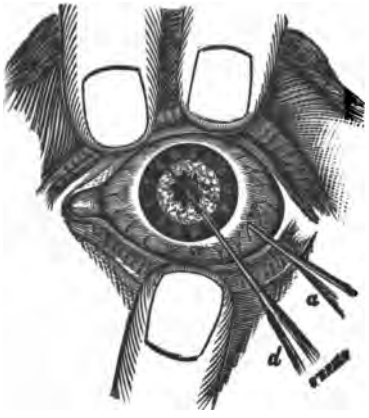
1.—DISCISSION.

DIVISION OR SOLUTION OF CATARACT.

This operation is indicated in the cortical cataract of childhood, in certain forms of lamellar cataract, and in opacities of the posterior capsule, especially such as result from linear or flap extraction.

The operation consists in simply dividing or lacerating the anterior capsule with a fine needle, so as to break up the cataract and facilitate its absorption in the aqueous and vitreous humors. It may be performed either through the cornea (*keratonyxis*) or through the sclerotica (*sclerotonyxis*). The latter is generally done with a Beer's, or spear-pointed cataract needle (Pl. I., Fig. 10); but the former requires a round stop-needle—that is, one the diameter of whose shaft gradually increases as it recedes from the point, in order to prevent the escape of the aqueous humor.

FIG. 14.



DISCISSION.

If the operation by sclerotonyxis is selected (Fig. 14, *a.*), after dilating the pupil with Atropine, separating the lids by a stop-speculum (Pl. II., Fig. 33), or by the fingers of an assistant, who also steadies the globe with a double hook (Pl. I., Fig. 6), or, what is better, a pair of fixing forceps (Pl. II., Figs. 36, 37), fastened to the lower part of the ocular conjunctiva, unless the eye can be fully controlled by the fingers, the operator enters the needle perpendicularly on the temporal side of the sclera, about a line and a half behind the border of the cornea, and the same dis-

tance below the horizontal diameter of the eye, the cutting edges of the needle being directed antero-posteriorly, in order to lessen, as much as possible, the danger of wounding any of the larger vessels of the choroid. The point of the needle is then pushed forward, with its side facing the cornea, through the periphery of the lens into the anterior chamber, as far as the upper and inner margin of the pupil. (See Fig. 14). Then, in order to tear away as large a piece of the anterior capsule as possible, and force it into the vitreous humor, where it will create the least amount of irritation while being absorbed, the operator lays the flat side of the needle directly over the center of the capsule, and presses it slowly backwards towards the vitreous. He then brings the needle back into the anterior chamber, in order to tear away and break up so much of the remaining portions of the capsule and lens as may be deemed advisable. In infants and young children, in whom the lens is very quickly absorbed, the capsule cannot be too freely divided; but in adults this is not the case, and in order not to cause too great a swelling of the lens, or the admission of too many fragments into the anterior chamber, either of which may give rise to severe iritis or irido-cyclitis, it is best not to lacerate the capsule too freely at one time, but to repeat the operation at intervals of a few weeks, or whenever the process of absorption requires to be hastened.

The operation by keratonyxis (Fig. 14, *d*,) is performed by passing the round stop-needle (represented in the cut), instead of Beer's, somewhat obliquely through the middle of the upper or lower outer quadrant of the cornea, in such a manner as to avoid touching the margin of the iris during the division of the lens. Care should be taken not to make the track of the wound too long by entering the cornea too obliquely, as then the motion of the needle in breaking up the cataract would strain and bruise the tissue of the cornea, and probably lead to more or less corneal opacity. The extent to which the laceration and

comminution of the capsule and lens should be carried, will depend chiefly upon the age of the patient. Thus, in infants and young children, where, as above intimated, one operation may be made to suffice, it should be much more extensive than in adults, in whom, for reasons already stated, it would be safer to repeat it.

Very little after-treatment is generally required. The patient should remain in a moderately darkened room for a day or two, with the eyes lightly bandaged, care being taken to keep the iris well out of the way of the lens by the instillation of Atropine. If the lens should swell greatly, so as to cause much irritation, and especially if symptoms of severe inflammation should set in, the cataract should be immediately removed by linear extraction. If this is rendered difficult or hazardous, in consequence of any considerable portion of the lens substance having fallen into the anterior chamber, or for any other reason, it will be best to combine an iridectomy with it, especially if the inflammation has already given rise to an increase of intra-ocular tension, or impairment of vision.

2.—DEPRESSION.

RECLINATION OR COUCHING.

This operation, once so common, has deservedly fallen into very general disrepute, and ought perhaps to be entirely abandoned. The danger lies in the depressed lens ultimately coming in contact with the choroid, and exciting a destructive irido-choroiditis. Stellwag, however, considers the operation "still applicable in cases of a very large sclerosed nucleus, and proportionately thin but tough cortex."

Depression may be performed with a curved Scarpa needle (Pl. I., Figs. 7, 8) or a Pancoast needle (Fig. 9). The prelimi-

nary steps of the operation are the same as for discission (which see). The operator, holding the needle as a pen, with the convexity upwards, introduces its point exactly in the transverse diameter of the globe, and one and a half or two lines behind the cornea. The point is first directed inwards toward the center of the vitreous, but as it is carried forward it is made to appear directly behind the pupil, and in front of the anterior capsule. The needle is then gently pressed backwards against the cataract, so that the lens may become loosened from the zonula, and afterwards, by a half-circular turn, raised above the lens, with its convexity upwards. The lens is then pressed backwards and downwards out of the line of vision, the needle gently rotated to disengage it from the lens, and then lifted a little to see if the lens is inclined to rise with it; if not, the operation is finished, and the needle may be withdrawn. But if the lens should rise, it must be more completely separated from the zonula, or, if the operator prefers, he may rupture the posterior capsule with the needle, after which the lens should be again depressed.

Reclination—This is a modification of depression, in which the lens, instead of being pushed downwards in a straight direction, is turned on its axis, so as to lie horizontally in the vitreous humor, below the pupil. As it possesses no material advantages over the operation just described, it is unnecessary to dwell upon it.

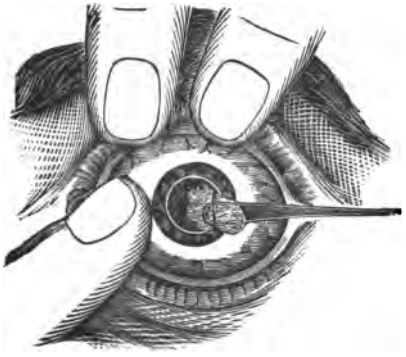
The after-treatment for depression is the same as for flap extraction (which see).

3.—LINEAR EXTRACTION.

This operation, which is indicated in both congenital and traumatic forms of cataract, when the lens substance is fluid or pulpy, is now employed for the immediate removal of the latter through a small linear incision. It may also be performed a few days after the ordinary operation of discission, when the lens has become softened and swollen, instead of leaving it, or its fragments, to be slowly absorbed by the aqueous humor. It is also suited for the removal of siliculose and other forms of regressive and secondary cataracts, in which the capsule is greatly shrunken, and contains but a small portion of degenerated lens substance.

If the capsule is entire, the operation is performed by first dividing the anterior capsule and lens by a very fine curved needle, (Pl. I, Figs. 8, 9), passed through the temporal side of the cornea, near its margin, without evacuating the aqueous humor. This puncture is then enlarged in a perpendicular direction, to the extent of about two lines, by a lance-shaped knife, or one similar to Fig. 13. The cataract, if fluid, will now escape from the opening; but if pulpy it will have to be assisted by the curette, or Daviel's spoon. (Pl. I., Fig. 31.) The operator first presses the spoon against the posterior lip of the incision, so as to cause it to gap, at the same time gently pressing the opposite part of the globe with his finger; and if this does not succeed in causing the lens matter to escape, he endeavors to effect its dislodgement by a circular motion of the ends of his fingers upon the lids; but if this also fails, he

FIG. 15.



LINEAR EXTRACTION.

carefully introduces the spoon into the wound, and scoops out any remaining portion of the lens substance. (See Fig. 15.) If any portions of opaque capsule still remain, they may be removed by means of the canula forceps, (Pl. I, Fig. 3), or by one of the iris hooks, (Figs. 4, 5). Siliculose and other forms of secondary cataracts may also be removed in the same manner; but as it is very apt to set up severe and even dangerous inflammation, in consequence of coexisting synechiæ, or other complications, most operators now prefer to leave the membrane *in situ*, and to make a small clear aperture in it by means of the round stop-needle, as this is found to give excellent sight, and is attended with far less risk of exciting inflammation. The needle opening may be enlarged, if necessary, by means of a pair of canula iris scissors, (Pl. I, Figs. 1, 2, 18, 19), passed through a linear incision. After the operation, the pupil should be kept well dilated with Atropine, and a light bandage should be applied to the eyes. If inflammation supervenes, it should be subdued by ice-water compresses, or other appropriate treatment.

4.—SUCTION OPERATION.

This is an ancient mode of extracting soft cataract, recently revived by Mr. Pridgin Teale. The instruments required are a broad needle for puncturing the cornea and dividing the anterior capsule, and a suction tube, (Pl. II, Fig. 39), consisting of a glass stem, (*B*), five or six inches in length, with a silver tubular curette (*A*) at one end, five-eighths of an inch in length, and of the size of an ordinary curette, and an exhausting tube, (*C*), about twelve inches in length, with a mouth-piece at the other end. The tubular curette is passed through the incision made by the needle, as described under the head of linear extraction, and carried through

the pupil, previously dilated by Atropine, to the centre of the lens substance. Gentle suction is then made upon the mouth-piece, and the lens matter is drawn into the glass tube, which allows the operator to watch its progress, and thus regulate the aspirative efforts. These should be continued as long as any opaque matter appears in the pupil, the end of the curette being slightly moved about within the capsule, so as to take up any portions of the crystalline substance which may be observed to remain. If any portions of the crystalline are too glutinous or tenacious to be readily drawn into the curette, they may be left to dissolve in the aqueous humor, as after an ordinary operation for discission; or they may be removed by a subsequent suction operation, after having become sufficiently softened, provided there has been no rupture of the posterior capsule, nor too much irritability of the eye, nor any iritis; conditions which in the opinion of Mr. Teale generally render the operation unsuitable.

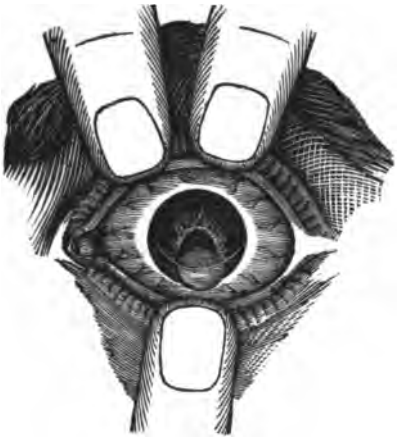
5.—FLAP EXTRACTION.

This operation is most suitable for senile cataracts, but may also be employed for the cortical variety, in cases where the cortical substance has softened, and the nucleus is large and of more than normal consistence. The instruments required are: an ordinary cataract knife, such as Beer's (Pl. I, Figs. 28, 29) or White's, (Fig. 23); a pair of fixing forceps, (Pl. II, Fig. 36); a cystotome, (Fig. 12), for dividing the capsule; a curette, (Fig. 31), which, for the sake of convenience, is generally attached to the other end of the cystotome; and a blunt-pointed secondary knife, or pair of scissors, for enlarging the corneal incision, or what is better, an instrument expressly devised for the purpose, represented in Pl. I, Fig. 20.

The patient being in a recumbent position, and the lids separated by an experienced assistant, the operator, placing himself in a convenient and unrestrained position behind the patient, fixes the globe by pinching up a fold of the conjunctiva with the forceps, and then enters the cornea with the cataract knife about a quarter of a line from its outer edge, and in the line of its transverse diameter, taking care that the point of the knife enters the anterior chamber, instead of between the laminæ of the cornea; he then carries it steadily forward, with the blade parallel to the surface of the iris, until its apex emerges from the cornea at a point diametrically opposite to where it entered, when the forceps are to be laid aside, as the globe is now fully under the control of the operator. The blade is now carried steadily forward until it cuts its own way out; or, when the section is nearly finished, the operator, following the advice of Von Græfe, instead of carrying it straight on, may complete the section by drawing it back from heel to point, thus diminishing the straining by causing a relaxation in the tension of the muscles of the eye, at a time when it would otherwise be at its maximum. The lids are now carefully closed, so as not to cause an eversion of the flap. After resting a moment, the eye is again opened, the cystotome carefully introduced, and the capsule freely lacerated, the operator being careful, in doing it, not to displace the lens into the vitreous humor. We have now reached the third and most delicate part of the operation, namely, the removal of the lens. This will require to be managed with particular care, in order to prevent the escape of any considerable quantity of the vitreous, an accident that may not only give rise to an insidious form of irido-choroiditis, but is likely to be followed by detachment of the retina. After the eye is again opened, the operator places the points of his index and middle fingers, or the end of the curette, against the lid, on the side opposite the incision, and the point of the other index finger on the other side of the

globe, so as to exercise a steady but gentle pressure upon it.

FIG. 16.



FLAP EXTRACTION.

This generally causes the lens to advance through the pupil into the anterior chamber, and to make its exit through the incision (see Fig. 16); if not, we must aid it with the curette, unless the hindrance is behind the pupil, when we must lacerate the capsule again, and proceed as before. After resting the eye a few seconds, the vision may be tested by trying if the patient can count fingers; and if he cannot, we should examine the pupil to see whether any portions of the lens substance have been stripped off and left behind, in which case they should be removed with the curette, or with the canula forceps (Pl. I., Fig. 3).

AFTER-TREATMENT.—After the operation the patient should be placed in bed in a darkened room, and the bed cover fastened above his arms, so as to prevent his touching his eyes during sleep. A binocular bandage should be lightly applied, and changed whenever it becomes very uncomfortable to the patient, The edges of the lids should be kept from sticking together, by sponging with luke-warm milk and water, after which they should be anointed with a little cosmoline, or cold cream, care being taken not to disturb the flap by opening the lids unnecessarily, or without due caution. After union of the flap occurs, which generally takes place within forty-eight hours, or less, after the operation, Atropine should be instilled between the lids, without widely separating them, in order to dilate the pupil and lessen the danger of secondary cataract. If no untoward symptoms occur, the eye should not be opened

for several days, as an early or frequent movement is apt to induce iritis. But if the eye becomes very hot and painful, it should be examined, and if there is no protrusion of the iris, nor any marked suppuration of the cornea, cold water compresses should be applied; but if the iris is prolapsed, a firm compress should be at once applied, which will not only prevent its increase, but will even cause it to shrink. Methodical compression is also the best treatment for suppuration of the cornea, tending, as Wells truly observes, more than any other remedy, to diminish the swelling of the lids and the discharge, and to limit the suppuration of the cornea.

In this country, patients are seldom confined to the bed more than two or three days after an operation for extraction. In favorable cases a shade is generally substituted for the bandage in the course of a week or so, in order that the eye may gradually become accustomed to the light. In the case of children the bandage is frequently omitted altogether, the patient being simply confined to a dark room.

6.—PERIPHERAL LINEAR EXTRACTION.

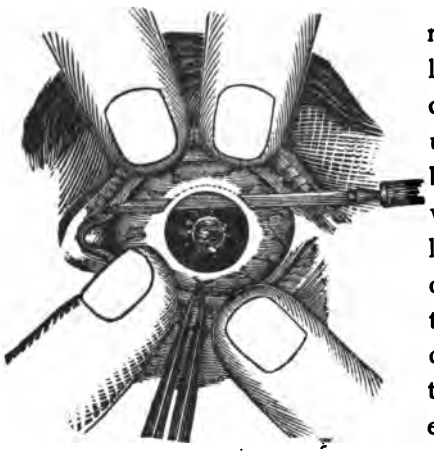
VON GRÆFE'S MODIFIED LINEAR OPERATION.

The indications are the same as for the ordinary flap extraction; and it, or some modification of it, is now very generally substituted for that operation. The instruments employed are: A Græfe's cataract knife (Pl. II., Fig. 34); a sharp and a blunt hook (Figs. 35 *a* and 35 *b*); a delicate, sickle-shaped needle (Pl. I., Fig. 8); iris scissors (Figs. 1, 2, 18, 19); iris forceps, (Fig. 3); toothed forceps (Pl. II., Fig. 36), and a stop-speculum (Fig. 33).

Very few operators now adhere closely to Von Græfe's method of operating. We are in the habit of performing peripheral extraction in the following manner. The patient having been brought under the influence of an anæsthetic (we

generally prefer a mixture of equal parts of chloroform and sulphuric ether), the eyelids separated with the speculum, and the eye fixed and somewhat depressed with a pair of fixing forceps, as represented in the cut, the point of the knife, with its cutting edge upwards, is entered in the sclera, about one-third of a line behind the upper and outer edge of the cornea, and cautiously pushed downwards and inwards until it penetrates about three lines into the anterior chamber, when the point is raised, carried horizontally across the chamber, and made to emerge at a point exactly opposite to that of entrance (see Fig. 17).

FIG. 17.



PERIPHERAL EXTRACTION.

The edge of the blade is now turned somewhat obliquely forwards, so as to complete the section at the upper margin of the cornea, by pushing the knife forward until its length is nearly exhausted, and then drawing it gently backwards toward the point. After completing the section of the cornea, but before severing the conjunctiva, the edge of the knife is turned forwards and somewhat downwards, so as to divide the conjunctiva in such a manner as to form a conjunctival flap of about a line in breadth. The prolapsed iris is then exposed by laying back the little conjunctival flap over the cornea, seized with the forceps, drawn out to the required extent, and excised close up to its ciliary attachment. This requires extreme care, in order to prevent any portion of the iris remaining in the wound, which would not only excite iritis, but retard cicatrization. We

now come to the laceration of the capsule, which should be as free as possible. The sickle-shaped needle is passed flatwise through the incision to the opposite side of the pupil, and commencing as near as possible to the lower margin of the capsule, the incision is carried beneath the iris, as recommended by Wells, to the upper border of the capsule; another incision is made in a similar manner through the proximal side of the capsule; and then the upper border is freely lacerated in the line of the corneal incision, so as to unite the two former incisions. This forms a sort of flap in the anterior capsule, which greatly facilitates the escape of the lens. The stop-speculum should now be removed, and gentle pressure made upon the lower margin of the cornea with the needle or curette, when the upper edge of the lens will probably present at the section; if it should not readily escape therefrom, its exit may be aided by introducing the two hooks, (Pl. II, Fig. 35), one on each side of the lens, and scooping it out. After the lens engages in the section, its removal will be facilitated by gentle pressure with the curette upon the lower portion of the cornea. If it fails to engage readily, by showing a tendency to pass behind the upper lip of the incision, it should be tilted forward by making slight pressure above the wound, the edge of which should also be pressed backward, so as to cause the lens to enter the incision. If portions of the cortical matter should remain behind after the nucleus is extracted, they should be coaxed forward by gently rubbing the lids in a circular manner with the ends of the fingers.

AFTER TREATMENT.—This is the same as that for flap extraction, except that after the first two or three days, if no unfavorable symptoms occur, the patient may be allowed much greater freedom. Atropine should be instilled as early as the second day after the operation. If inflammatory complications occur, the case should be managed as directed under flap extraction, (which see).

DIV. V.—OPTICAL AIDS AND TESTS.

Before entering upon the description of the anomalies of refraction, accommodation, and other functional disturbances of the eye, it will be best to devote a few paragraphs to the consideration of some of the more important of the optical aids and tests relating to their discovery and correction.

1.—THE OPHTHALMOSCOPE.

The reason that the pupil of a healthy eye usually appears black, is not because all the rays of light that enter it are absorbed, for some of them are always reflected, but because the reflected rays, instead of returning to the eye of the observer, are, in consequence of the refractive power of the dioptric media, reflected back to exactly the point from whence they came; that is, the incident and reflected rays exactly coincide. In order, therefore, that the eye of the observer should catch the returning rays, it must be placed between the source of light and the eye under examination, and this, in consequence of the interposition of the observer, cannot be done without intercepting the illuminating rays. Moreover, it must be remembered that the examiner will be unable to perceive light emanating from the eye of another person, when the latter is exactly accommodated for the eye of the observer, since only a dark image will be formed on the retina of the eye under examination, and hence only a reflection of this dark portion of the retina can be returned to the eye of the observer.

In order, therefore, that the interior of the eye may be distinctly seen, it is necessary (1) that it be sufficiently illuminated; (2) that the eye of the observer be situated in the direction of the reflected or emergent rays; and (3) that these rays, which are convergent, be rendered divergent or parallel.

Now, Prof. Helmholtz found that all this could be accomplished by simply allowing the light of a lamp to fall on a polished plate of glass, in such a manner as to reflect the rays into the eye to be examined, and then, after having made the convergent rays divergent by means of a concave lens, placing himself on the other side of the glass plate, so as to catch the emergent rays as they passed through it. But this, the first and simplest form of the ophthalmoscope, is now seldom employed; highly polished mirrors, which possess much greater illuminating power, having been substituted for the glass plate. These mirrors are provided with a small aperture in the centre through which the returning rays reach the eye of the observer.

As our object is merely to illustrate the principle of its action, and not to describe with particularity the various forms of the instrument, we will simply add, that ophthalmoscopes, as now constructed, may be divided into four different classes. 1. The portable or hand opthalmoscope, of which we have three distinct forms, namely, (*a*) Liebreich's, which consists of a slightly concave metallic mirror, attached to a convenient handle, and provided with a small bracket or clip for holding a convex or concave lens; (*b*) the ophthalmoscope of Coccius, which consists of a plane mirror combined with a double convex collecting lens; and (*c*) the ophthalmoscope of Zehender, which differs from that of Coccius in being provided with a slightly convex mirror, instead of a plane one. 2. The fixed ophthalmoscopes, which are especially suited for class demonstrations, as their successful use does not depend on the dexterity of the observer. 3. The binocular ophthalmoscopes, by which we are enabled to use both eyes at once, and thus, by obtaining a stereoscopic view of the fundus, readily distinguish any change of surface on the retina and optic disc. 4. The aut-ophthalmoscope, by which the observer is enabled to examine the interior of his own eye. Of these, the most

useful for the general practitioner is the ophthalmoscope of Coccius, which possesses the following advantages over that of Liebreich, which is the one in most common use:—first, we can more fully concentrate the light upon any given part of the fundus; secondly, we can readily increase or diminish the focal distance and illuminating power of the mirror; thirdly, we can generally obtain a much better view of the fundus through a contracted or natural sized pupil, in consequence of the corneal reflex being considerably less; and, fourthly, it is far better adapted for the direct method of examination.

MANNER OF USING THE OPHTHALMOSCOPE.

1. *Indirect Method.*—The examination of the inverted image, or the indirect method, as it is called, is conducted by seating the patient in a darkened room, with a lamp placed by the side of and a little behind the eye to be examined. The surgeon then seats himself in front of the patient, and holding the ophthalmoscope in his right hand, places the aperture of the mirror close to his eye, directing the instrument in such a manner as to cast the reflection of the flame directly into the pupil. To be able to do this with facility, and at the same time keep the eye well illuminated while conducting the examination, requires considerable care and experience, as the slightest movement of the mirror is liable to throw the reflection far away from the pupil. Having illuminated the eye, the surgeon takes the rim of the object lens between the forefinger and thumb of his left hand, and holding the lens from two to three inches from the patient's eye, according to its focal length, at the same time steadying the hand by placing one of his fingers upon the edge of the orbit, he endeavors to obtain an ophthalmoscopic view of the fundus. This is somewhat difficult for the beginner, who is apt while adjusting the lens to displace the mirror; and it is not until he learns to use the hands independently of each other that he can make a proper examina-

tion of the eye. He then finds that the rays of light reflected from the fundus, after passing thrnugh the lens, form an inverted image. If the eye of the observer is presbyopic or hypermetropic, the image is rendered more distinct by using a convex glass in the clip behind the mirror. The same is true if the eye of the patient is hypermetropic. If the observer wishes to gain a view of the optic disc, he should direct the patient to look toward his (the surgeon's) right ear, if the right eye is under examination, and *vice versa*, in order that the axis of vision may be turned slightly inwards, so as to bring the optic nerve entrance directly behind the pupil. If the patient looks straight forwards, the surgeon will see the region of the macula lutea, which is distinguished by being of a slightly darker color than the rest of the fundus, and without any appearance of blood-vessels passing over it. The ophthalmoscopic appearance of the optic papilla has already been given (see Fig. 10). The color of the fundus of the normal eye differs according to the complexion of the individual. In light-complexioned persons it is light or yellowish-red, while in persons of dark complexion it is dark red.

2. *Direct Method.*—If the examination be made without the lens in the left hand, the image will be erect and much larger than when made by the indirect method. As perfect relaxation of the accommodation is required in order to render the emergent rays parallel, and as this is difficult to obtain without the use of Atropine, in consequence of the close approximation of the patient to the observer leading him, notwithstanding he is directed to look at some distant object, to accommodate for a much nearer point, it is advisable to dilate the pupil with Atropine, as this secures at once the needed relaxation, and at the same time increases the size of the field of vision, and also facilitates the illumination of the fundus. The lamp should be placed on the side and a little behind the plane of the eye under examination, the surgeon seating himself on the same side and examining with the corresponding

eye—that is, using the right eye for the right eye of the patient, and *vice versa*. If the image is indistinct, either in consequence of the surgeon being unable to fully relax his own accommodation, or in consequence of his eye or that of the patient being myopic, he will find it necessary to use a concave lens in order to render the rays parallel. But, if the eye of one is myopic, while that of the other is hypermetropic, the difference in the refractive power of the two eyes may be so far neutralized as to enable the surgeon, by using his accommodation, to examine without the aid of a concave lens. As every ophthalmoscope is supplied with a series of these lenses, of different focal lengths, fitting into the bracket or clip behind the mirror, the surgeon will have no difficulty in selecting one to suit the condition of his own and the patient's eyes, whether emmetropic, myopic or hypermetropic.

The advantages afforded by the direct method of examination are (1) that we are enabled to ascertain the optical condition of the eye independent of its visual power, or of the statements of the patient; and (2) that we are enabled to measure definitely the amount of elevation or depression of any portion of the fundus; such, for example, as the amount of excavation of the optic disc, the height of tumors, the amount of swelling in the retina, etc. On the other hand, the field of vision is more limited, and the examination more difficult, than by the indirect method, the employment of which renders all nice distinctions as to myopia, hypermetropia, and the state of the accommodation unnecessary—conditions which must always be taken into the account in searching for the retinal image by the direct method.

2.—LATERAL OR OBLIQUE ILLUMINATION.

This method of exploring the anterior and central portions of the globe is best conducted in a darkened room. The light is placed in the same position with respect to the patient's

head as in the ophthalmoscopic examination. A double convex lens is then held between the lamp and the eye to be examined, in such a manner as to concentrate the light upon any portion of the cornea, iris, crystalline lens, or vitreous, that the surgeon desires to illuminate. We may obtain a magnified image of these parts, and thus give greater clearness to the details, by holding a second bi-convex lens immediately in front of the eye—that is, directly between the patient's eye and our own. In this manner we may detect slight opacities or irregularities in the cornea which would otherwise escape notice, examine minutely the texture and condition of the iris, discover the faintest traces of cataract, or the presence of foreign bodies in the anterior chamber, observe various morbid changes in the vitreous, hemorrhagic effusions, floating opacities, etc., and, in some cases, the projecting folds of a detached retina. It will thus be seen that lateral illumination is oftentimes no mean substitute for the ophthalmoscope, while the ease and rapidity with which it may be employed renders it doubly valuable as a means of detecting many diseased conditions. A good rule, therefore, and one that is generally observed in practice, is to begin the examination with oblique illumination, and, if there is any remaining obscurity about the case, to clear up the diagnosis with the ophthalmoscope.

3.—SPECTACLES.

These are generally employed for the purpose of correcting such optical defects as cannot otherwise be rectified. They consist of convex spherical lenses for the correction of hypermetropia, concave spherical for myopia, cylindrical for astigmatism, and a combination of both spherical and cylindrical for complicated forms of ametropia. Besides these we have the following special forms and combinations:

Pantoscopic Spectacles, termed by the French *verres a double*

foyer, consist of lenses the upper and lower half of which have different foci. They are especially useful where the presbyopia is combined with myopia or hypermetropia. In the former case the upper half should be concave to neutralize the myopia, and the lower half convex to neutralize the presbyopia.

Periscopic Spectacles, consisting of concavo-convex glasses, are constructed for the purpose of reducing the spherical aberration to a minimum. When the concave surface is towards the eye, the image is less distorted, on account of there being less irregular refraction at the periphery of the lenses; consequently, the observer is enabled to look more obliquely through them.

Prismatic Spectacles, the glasses of which are ground either in the form of prisms, or of prisms and lenses combined, are used for relieving or strengthening certain muscles of the globe. The bases of the prisms are generally turned inwards, for the purpose of relieving the internal recti muscles. (See *Muscular Asthenopia*). The same object may be accomplished by what are called *decentered lenses*. These are so constructed as to throw the centre a little to the inner side of the visual axis in convex lenses, and to the outer side in concave glasses, thus producing a slight prismatic effect.

Cataract Spectacles consist of convex lenses of great refractive power. The eye having lost the power of accommodation, two sets will be required, one for near objects, of about two and a half inches focal length, and the other of about four and a half inch focus for distant objects. The glasses should be small, as large ones, by admitting too much light, generally cause more or less dazzling. They are, of course, adapted to every form of aphakia.

Stenopaic Spectacles are constructed for the purpose of excluding the peripheral, and permitting only the central rays of light to enter the eye. For this purpose, metallic plates with small central apertures are used in place of glasses. They increase the sharpness of vision for near objects, and are

also useful in opacity of the cornea, but as they contract the field of vision, they are not adapted for distant objects.

Protective Spectacles, or eye protectors, are composed of variously colored glasses, amber, brown, grey, blue, green, etc. The majority of ophthalmologists recommend blue glasses, as these exclude the orange rays, which are the most irritating to the retina; but Dr. Dobrowolski, of St. Petersburg, gives the preference to grey or smoke-colored glasses. He argues that in attempting to shield the eyes from too bright a light, we should employ glasses which will diminish equally all the rays which constitute sun-light, and not confine the patient to blue glasses, which only exclude the yellow rays, nor to green ones, which only protect the eye from the red rays, but should use the grey or smoked glasses, which not only diminish the passage of all the rays, but also enable the eye to readily accommodate itself again to ordinary sunlight, a matter of some difficulty after wearing the blue spectacles.*

The most convenient instrument for ascertaining the focal strength of lenses, is formed on the model of the ordinary measuring stick used by shoemakers. The stationary upright, or toe piece, is fitted to receive the lens, and the movable upright, or heel piece, has attached to it a card on which are small printed letters. Placing the card at the focal distance required, the power of glasses is readily ascertained by changing the lenses until a suitable one is found, or by selecting another lens which, placed before the first, will render the letters distinct, and then adding or subtracting its power.

4.—TEST TYPES.

In order to have some generally accepted standard by which the range and acuteness of vision may be readily ascertained, and referred to in published cases, Prof. Jaeger, Dr.

*Am. Hom. Obs., vol. xi, p. 555.

Snellen, and others, have published different series of test letters. Those of Jaeger begin with the smallest type used in printing, and gradually increase to letters of a size to be easily distinguished by a normal eye at a distance of twenty feet. Dr. Snellen's test types extend the scale, by means of letters made up of squares, to two hundred Paris feet. These two scales, which are the ones in general use, do not exactly correspond, that is to say, No. 20 Jaeger does not represent precisely the same point in the scale as Snellen, XX, and hence it is best to specify the particular scale employed in the test when the lower Nos. are used.

Figures are placed above each series of letters, indicating the distance, in feet, at which they may be read by a normal eye. Thus, No. 10 should be read with ease at a distance of ten feet; but if it can be read only at a distance of five feet, we say V, which expresses the acuteness of vision,

$$= \frac{5}{10} = \frac{1}{2}.$$

If No. 18, which should be read by an emmetropic eye at eighteen feet, can be read only at a distance of twelve feet, we say

$$V = \frac{12}{18} = \frac{2}{3}.$$

The numerical values found in this manner do not always accurately represent the acuteness of vision, although sufficiently precise for all practical purposes. For example, a sharpness of

$$\frac{6}{18}, \frac{4}{12} \text{ or } \frac{2}{9}.$$

is not necessarily the same as $\frac{1}{3}$; for eyes that see No. 18 at six feet, may not see No. 9 distinctly at three feet, or No. 3 at one foot. Hence, as Stellwag points out, if we would represent accurately the state of vision, we must avoid all reduction of the fraction.

DIV. VI.—FUNCTIONAL DISEASES.

The diseases which we propose to consider in this section, are those functional disorders immediately influencing the accommodation, more especially asthenopia, and paralysis and spasm of the ciliary muscle; those of refraction, namely myopia, hypermetropia and astigmatism; those affecting the optic nerve and retina, particularly hyperæsthesia, anæsthesia, amblyopia, hemeralopia, and amaurosis; and those involving the ocular muscles, especially nystagmus and strabismus. Assuming that the reader is already sufficiently acquainted with the refractive properties of the different kinds of lenses, we shall proceed at once to consider

1.—THE THEORY OF ACCOMMODATION.

It is assumed, in the first place, that all rays emanating from distant objects, by which is meant all objects at or beyond twenty feet from the observer, are parallel; that is, the divergence being too slight to be taken into account, the objects are considered as if they were placed at an infinite distance. Such rays the refractive media of an emmetropic eye, when in a state of rest, are adapted to bring to a focus upon its retina, and thus to produce distinct images of the objects from which they emanate. The eye is then said to be accommodated for its far point, (*punctum remotissimum*), denoted by the letter *r*. Being thus adjusted for parallel rays, the normal eye perceives distant objects without any effort of the accommodation. And since the more distant the object the more nearly are the rays from it rendered parallel, it follows that the furthest point of distinct vision must be at an infinite distance.

But if the rays, instead of being parallel, are very divergent, as in the case of very near objects, the state of refraction of the normal eye is such that they can only be brought to a

focus *behind* the retina, unless it can increase the amount of refraction sufficiently to focus them *upon* the retina. Now the normal eye is provided with an apparatus by which it is enabled, intuitively and unconsciously, to increase or diminish at pleasure the amount of its refraction, and thus to adjust itself for near vision. When thus adjusted, the eye is said to be accommodated for its near point, (*punctum proximum*), denoted by the letter *p*.

The distance between these two points is called the range of accommodation, and is expressed by the letter *A*. In the youthful emmetropic eye, it extends from about three and a half or four inches, the nearest point of distinct vision, to the furthest point, which, as we have seen, lies at an infinite distance. Anywhere between these points objects may be distinctly seen; but beyond the point for which the eye is accommodated, circles of dispersion are formed upon the retina, and the images appear blurred.

If, as proposed by Prof. Donders, the range of accommodation be expressed by $\frac{1}{A}$, the distance of the near point (*p*) from the eye, measured from the nodal point, by $\frac{1}{P}$, and that of the far point (*r*) by $\frac{1}{R}$, its value in any particular case may be readily determined by the formula

$$\frac{1}{A} = \frac{1}{P} - \frac{1}{R}.$$

Thus, in an emmetropic eye, if the nearest point at which vision is distinct is 5", and the furthest point is an infinite distance, ∞, we have by the above formula

$$\frac{1}{A} = \frac{1}{5} - \frac{1}{\infty} = \frac{1}{5}.$$

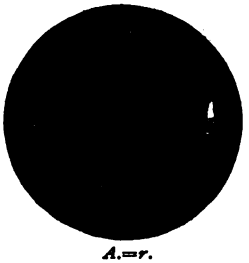
Here the range of accommodation is represented by what is called a 5 inch lens; that is, it would require a convex lens of five inches focus to be placed before the eye, to render the rays coming from an object placed at the near point (5") parallel, or what is the same thing, give them the direction they would have if the object were situated at an infinite distance.

The theory of accommodation upon which these con-

clusions are based, and which is now generally accepted as the true one, though ably advocated by Thomas Young as early as the beginning of the present century, did not receive a full and satisfactory demonstration until Cramer and Helmholtz, working independently of each other, furnished, by means of ingeniously devised instruments, incontestable proof of the alterations of curvature in the crystalline lens, when the eye is accommodated for near and distant objects, and at the same time proved that no change occurs in the curvature of the cornea.

The changes in question may be readily demonstrated, ocularly, by placing a lighted candle at a certain distance to the right of a given fixed point, P, towards which the observed eye is steadily directed, while the eye of the observer is situated at an equal distance to the left of the same point.

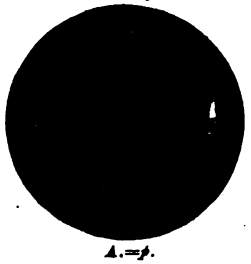
FIG. 18.



A.=r.

Fig. 18, representing the pupil of an eye thus observed in a state of rest, (*r*), shows the three images formed by reflection from the cornea, (*a*), anterior capsule, (*b*), and posterior capsule, (*c*). Fig. 19 shows the same eye in a state of accommodation for the near point, (*p*); the pupil is somewhat contracted, as shown by the circular white line, and the image forms by the anterior capsule, (*b*), is found to be changed both in size and position. The image is

FIG. 19.

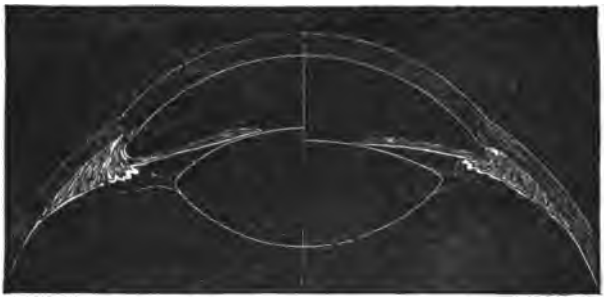


A.=p.

rendered smaller in consequence of the increased curvature of the anterior surface of the lens, which forms a convex reflector of less radius. The change of position is due to the projection forward of the reflecting surface, in consequence of the lens being increased in thickness during accommodation. The other images have undergone

no perceptible change, showing that neither the curvature of the cornea, nor the curvature or position of the posterior surface of the lens, undergo any perceptible change during accommodation.

FIG. 20.



IN FULL ACCOM. EYE AT REST.

Fig. 20 illustrates the changes which occur during accommodation. The right half of the figure represents the eye in a state of rest, *i, e.*, when accommodated for distance; the left half shows it when fully accommodated for near vision. The relative difference in curvature of the anterior surface of the lens, on the two sides, corresponds very closely with the measurements of Cramer and Helmholtz. According to the latter, the changes that occur during accommodation for near objects are, (1) contraction of the pupil; (2) the pupillary margin of the iris is pushed forward; (3) the peripheral portion of the iris moves backwards. (4) the anterior surface of the lens becomes more convex, and is arched forward, so as to render the lens considerably thicker in the antero-posterior diameter, and give it much greater refractive power; (5) the posterior surface of the lens is also rendered more convex, but not to such a degree as to cause any perceptible change in its position.

It was formerly supposed that whilst the chief influence concerned in the function of accommodation is exerted through the action of the ciliary muscle, the iris also materially assists

in the process; but as the accommodation has since been found to remain unimpaired, in a case in which the entire iris was removed after an accident, there can no longer be any room for doubt that the change in the form of the lens is wholly due to the action of the ciliary muscle. But the manner in which the muscle causes the change in question has not yet been satisfactorily answered. The most probable explanation is, that, so long as the ciliary mucles continues passive, the lens remains in its usual condition; but as soon as the muscle contracts the suspensory ligament becomes relaxed, and the lens then increases its convexity by virtue of its own elasticity.

Another factor in the procees of accommodation was, until recently, supposed to exist in the action of the internal recti muscles, in causing the necessary convergence of the optic axes for binocular vision; but a case of Von Graefe's, in which all the external muscles of both eyes were completely paralyzed, and yet the power of accommodation remained unimpaired, clearly proves the contrary.

It is thus seen that refraction and accommodation are two entirely different processes. The former is a passive condition, depending wholly upon the focusing power of the dioptric apparatus, which is chiefly due to the form of the eye and of its different refracting media. In these respects the eye does not essentially differ from any other optical instrument, the images being formed agreeably to the well-known laws of optics. Accommodation, on the other hand, is a purely physiological process, being the result of muscular or vital action, and is none the less real in consequence of being, for the most part, unconsciously and involuntarily performed.

That the focusing power of the crystalline lens is controlled by the action of the ciliary muscle, is clearly proven by the suspension of the function whenever paralysis of the muscle occurs from disease, or whenever it is artificially induced by the action of Atropine.

2.—ANOMALIES OF ACCOMMODATION.

Having shown that the function of accommodation is dependent upon the action of the ciliary muscle, it remains to consider the principal causes which are known to limit or disturb the process. These are, (1), *presbyopia*, which is a limitation of the function due to advancing age; (2), *paralysis of the ciliary muscle*, which is occasionally met with after severe illness; and, (3), *spasm of the ciliary muscle*, which is frequently the result of over-working the muscle in accommodation.

A.—Presbyopia.

This affection, which was formally supposed to arise from deficient refractive power, is now known to have very little effect upon distant vision, the actual change consisting in the recession of the near point, and consequently in a limitation of the range of accommodation. This removal of the near point from the eye, is caused by senile changes in the crystalline lens, whereby its hardness is increased, so that its form becomes less and less susceptible of alteration from the action of the ciliary muscle, and hence the function of accommodation correspondently impaired. As this increase in the density of the crystalline is a purely physiological process, it may commence at any age, and may affect both emmetropic and ametropic eyes. In point of fact, it is found to begin very early, gradually increasing with advancing years, until, at the age of forty or forty-five, the near point is at eight inches from the eye, the distance which, for the sake of definiteness, has been selected as the limit from which to reckon the commencement of presbyopia. As age advances the refractive power of the lens also suffers, so that the eye not only becomes presbyopic, but hypermetropic.

As presbyopia diminishes the range of accommodation, it cannot be of benefit, as is frequently supposed, to the myopic eye. It is true, the senile changes in the refractive power of the lens will have a slight tendency to diminish the myopia, and if moderate may serve to correct it; but as the far point remains pretty much the same, the only effect will be to shorten the range of adaptation, which is already greatly reduced by the approximation of the far point. Presbyopia supervening upon hypermetropia is, of course, still more serious, loss of accommodation being added to diminished refraction.

Since no effort of the ciliary muscle will render the lens sufficiently convex for near vision, it should be aided by suitable glasses. The patient should be advised to commence their use as soon as the presbyopia begins to be noticed, and not postpone wearing them under the mistaken notion that he may thereby be enabled to dispense with them altogether, for this will necessarily fatigue and strain the accommodative apparatus, and may possibly result in even more serious disability.

The strength of the required glasses may be easily found from the formula

$$\mathrm{Pr} = \frac{1}{8} - \frac{1}{p'},$$

where Pr denotes the degree of presbyopia, 8″ the presbyopic near point, and p′ the observed power of the presbyopic eye. For example, if we find the nearest point of distinct vision to be twenty-four inches, then the value of Pr will be

$$\mathrm{Pr} = \frac{1}{8} - \frac{1}{24} = \frac{1}{12};$$

that is, it will take a convex lens of twelve inches focal length to neutralize the presbyopia, and enable the patient to see clearly at the distance of eight inches.

If the presbyopia is complicated with myopia or hypermetropia, it may become necessary to supply the patient with two sets of glasses, the myope with convex glasses for small

objects, to remedy the loss of accommodation, and concave glasses for distance, to neutralize the increased refraction; while the hypermetrope will require two pair of convex glasses, one for near vision, to compensate for deficient refractive power and the loss of accommodation, and the other far distant vision, to neutralize the hypermetropia.

To ascertain the range of accommodation for presbyopic eyes, we may make use of the formula already given, namely,

$$\frac{1}{A} = \frac{1}{P} - \frac{1}{R.}$$

Thus, if the near point (p) be at fifteen inches, and the far point (r) at infinite distance (∞), we have

$$\frac{1}{A} = \frac{1}{15} - \frac{1}{\infty} = \frac{1}{15.}$$

In choosing glasses it is well not to be governed too rigidly by Donder's near point (8″); but to be influenced to some extent by the distance at which the patient has been accustomed to read or sew. If this has been at a considerable distance, it will be more convenient not to have the near point brought within ten or twelve inches. We should also be guided in this matter by the range of accommodation. If this is large, we may, if the patient prefers, bring the near point to eight inches, or even less if the sharpness of vision is diminished; but if the range of accommodation is greatly lessened, weaker glasses should be selected, as these will be less fatiguing to the eye; such, for example, as will enable the patient to read No. 1 of the test types at about twelve inches.

B.—Paralysis of the Ciliary Muscle.

This affection, which is not of very frequent occurrence, sometimes follows exhausting diseases, especially diphtheria. Paresis, or partial paralysis, is occasionally associated with general atony of the muscular system, and is then apt to be mistaken for amblyopia depending upon general debility.

As the paralysis lessens or destroys the power of accom-

modation, emmetropic eyes are unable to accurately distinguish near objects, though their ability to see distinctly at a distance is not impaired. But its effect upon vision is most marked in hypermetropic eyes, as these are obliged to exercise the function of accommodation even at a distance, and consequently lose the power of seeing any object with distinctness, whether near or remote. The myope, on the contrary, only becomes aware of the defect when looking at very near objects. If the paralysis is incomplete, these effects will, of course, be less considerable. In the latter case the symptoms may be mistaken for those of asthenopia, unless the range of accommodation is also examined. This is all the more necessary in these cases, because, in simple paresis, the contractility of the pupil and the various movements of the globe generally remain unimpaired; whereas in complete paralysis of the accommodation there is almost always dilatation of the pupil and divergent strabismus.

TREATMENT.—This consists chiefly in perfect rest of the eyes, and the employment of such hygienic measures as are best calculated to invigorate the general system. If the patient is obliged to exercise his accommodation, he should be supplied with such convex glasses as will enable him to see distinctly without exertion, being careful to gradually diminish the strength of the lenses, in proportion as the accommodative faculty improves.

The remedies which have hitherto proven most beneficial in this affection are: Caust., Physostig. ven. (used externally), and electricity; good results have also been obtained in some cases from the internal administration of Arg. nit., Arn., Cup. acet., Euph., Gels., Kali iod., Opium, Paris q., and Rhus tox.

C.—Spasm of the Ciliary Muscle.

This is not, as was formerly supposed, a very rare affection, being sometimes associated with both myopia and hypermetropia. It is most frequently met with in young subjects who

have strained their eyes in reading or fine work, the spasm being the result of over-tasking the ciliary muscle, in accommodating the eye for near objects. This causes an apparent myopia, so that the patient sees better through concave glasses; but if we paralyze the ciliary muscle by means of Atropine, we shall generally find that the eye is really hypermetropic. Such persons perceive distant objects very indistinctly; and although near objects may be seen clearly for a short time, the effort at accommodation soon fatigues the eye. The pupil is generally contracted; and the iris is bulged forward by the increased curvature of the lens. If we examine with the ophthalmoscope, we shall find that the refraction is highly hypermetropic, and that the optic disc and retina are more or less hyperæmic; there is also, not unfrequently, a co-existing posterior staphyloma.

TREATMENT.—The most speedy and effective treatment consists in completely paralyzing the ciliary muscle with Atropine. For this purpose we require a strong solution, say four or five grains to the ounce, which should be used three or four times daily, until the spasm is entirely overcome. If it returns we should enjoin complete rest of the eye, and endeavor to improve the general health by regular out-door exercise, and other hygienic means. If necessary, we should prescribe strong convex glasses for near objects, and weak ones for distance, the regular use of which will diminish the spasm by producing complete rest of the accommodation. Internally, we obtain the best result from the Physostigma ven.

3.—ANOMALIES OF REFRACTION.

An emmetropic eye is one whose dioptric media possess a refractive power just sufficient, when the accommodation is at rest, to form well-defined images of distant objects upon the retina; it also possesses the power of increasing or diminishing

the refraction at pleasure, thus adapting itself to distinct vision at any distance. But there are eyes which do not possess these optically normal powers, namely, those in which the optic axis is too long, constituting *myopia;* those in which it is too short, producing *hypermetropia;* and those in which the cornea or lens have an unequal curvature in different meridians, giving rise to *astigmatism.*

A.—Myopia.

NEAR-SIGHTEDNESS.

We have already remarked, that in the myopic eye parallel rays are brought to a focus before reaching the retina. This optical defect is due to the refractive power of the eye being relatively in excess; that is, although the refractive power may not be too high for a normally constructed eye, it is so in relation to the myopic eye, the antero-posterior axis of which is too long. It was formerly supposed that in myopia the cornea or lens was too convex, or that the latter was misplaced; but exact measurements have shown this not to be the case, and that the lengthening of the optic axis is due to a bulging of the posterior portion of the globe, in consequence of which the retina is situated too far back of the lens and cornea. The consequence of this displacement is, that while divergent rays, or those coming from near objects, may be brought to a focus upon the retina, and thus afford distinct vision when the accommodation is at rest, parallel rays, or those coming from distant objects, form upon that membrane greater or less circles of dispersion, which render the images indistinct. It does not necessarily follow, however, that because a patient holds small objects very near to his eyes, or because he cannot see well at a distance, he is myopic, as similar symptoms may occur in hypermetropia. But if, in proportion as the object is removed from the eye, the vision becomes rapidly indistinct,

and there is no other apparent cause, we may strongly suspect the existence of myopia; and if the vision is greatly improved by the use of weak concave lenses—say of thirty or forty inches focus—the myopic condition is rendered almost certain. But, as slight changes in refraction may be overcome by the accommodative power, and also by extreme degrees of myopia, it is better to ascertain at once the far point, and then, by placing concave glasses of the corresponding number before the patient's eyes, he will, if myopic, be able to see clearly at a distance, and there will no longer be any doubt.

We may also determine the existence of myopia with the ophthalmoscope. If we make use of the direct method of examination, we may be able to perceive the details of the fundus at some distance from the eye, and if we move our head to either side, we shall find that the retinal image moves exactly in the contrary direction. But in order to obtain a distinct image of the fundus, we shall, if the eye is strongly myopic, require a concave correcting lens behind the mirror. We shall now probably discover that the malformed eye is also a diseased one, there being, in the majority of cases, a greater or less degree of posterior staphyloma. This condition, which exists chiefly in progressive myopia, is generally associated with a sclero-choroiditis posterior. If the myopia is stationary, or but slowly progressive, it causes but little inconvenience in reading, sewing, etc; but if rapidly progressive, it is apt, in consequence of the choroiditis, to be accompanied with symptoms of high irritation and inflammation, and may even prove a source of great danger to the eye. (See *Sclero-choroiditis Posterior.*)

Myopia is frequently congenital, and sometimes hereditary, but the researches of Dr. Cohn and others show that, in all probability, it is very often acquired. Dr. Cohn found that, of one hundred and thirty-two compositors, more than half (51, 5 per cent.) were myopic; and of the sixty-eight myopes, not

less than fifty-one (75 per cent.) were possessed of normal vision in early life. It is almost certain that the continuous use of the eyes for near objects, especially by the young, is a fruitful cause, if not of the origin of myopia, at least of its development. Out of ten thousand and sixty school children examined, this investigator found one thousand and four myopes, the proportion increasing in the higher departments, according to the increased demand for study. Thus, of the four hundred and ten students in the University of Breslau nearly two-thirds were affected with a greater or less degree of myopia.

TREATMENT.—This will vary according as the myopia is stationary or progressive. The latter, if marked, and especially if occurring in youthful subjects, will require similar treatment to that recommended for *Sclero-choroiditis Posterior* (which see). But if stationary, or if the progress is too slow to be perceptible, and especially if it does not give rise to any marked inflammatory symptoms, no preliminary medical treatment will be called for, and we may immediately proceed to select the requisite glasses.

It is very important that the strength of the glasses required for correcting the refraction should be determined with the greatest accuracy. As the degree of myopia (M.) is measured by the far point (*r.*) for distinct vision, we first determine, by means of the test types, the furthest point at which the patient can clearly distinguish the letters. For example, if he reads No. 1 with facility at one foot, but is unable to distinguish No. 2 clearly at two feet, or No. 3 at three feet, and so on, and yet is able to read No. 2 easily, say at twenty inches, we represent the degree of myopia by the formula,

$$M = \frac{1}{20},$$

twenty inches being the furthest point at which vision is distinct; it will, therefore, require a concave lens of twenty inches focus to neutralize the myopia. But, although No. 20 is theo-

retically the proper glass, it is rarely the case that the strength can be accurately determined in this manner; as a general rule the glass will be found somewhat too strong, and will require to be corrected by subtracting the power of the weak *convex* lens necessary to correct it. On the other hand, if the original glass is too weak, we should add the power of the weak *concave* lens required to give it the appropriate strength. The correction is made according to the following formula:

$$x = \frac{a \pm b}{ab},$$

that is, the power of the required lens (x) is equal to the sum or difference of the powers of the two lenses divided by their product. Take, for example, the case above cited. We first try the patient with a pair of 20-inch concave glasses, and direct him to read, say No. XX. Snellen at twenty feet. He will no doubt notice at once a marked improvement in his vision. We now place in front of the former glasses a very weak pair, say No. 60 *concave*, and, if his vision is still further improved, the original pair are too weak. Suppose that upon repeated trial this No. 60 concave is found to be the best corrective of the first pair of glasses, then, according to the formula

$$x = \frac{a \pm b}{ab} = \frac{20 + 60}{20 \times 60} = \frac{1}{15},$$

which gives concave 15 as the proper glass. But suppose, instead of a No. 60 concave, it takes a No. 60 *convex* to render distant vision distinct through the original glasses. This proves that the latter are too strong, and we have

$$x = \frac{a \pm b}{ab} = \frac{60 - 20}{60 \times 20} = \frac{1}{30},$$

Showing that only a concave 30 would be required to correct the myopia.*

*Convex lenses are generally designated by the positive or + sign, and concave lenses by the negative or — sign. If two or more are used in conjunction, the power of the compound lens will be represented by their sum, if the signs are alike, and by their difference, if unlike.

If the patient wishes to procure glasses for some special purpose, such as reading music, he will need a pair of less power than those required for distant vision. For example, if his myopia $=\frac{1}{6}$, and he wishes to read at twenty-four inches, the formula will be

$$-\frac{1}{6}+\frac{1}{24}=-\frac{1}{8};$$

Hence a concave 8 will be required.

In order to decide the question as to whether or not it will be proper to allow the use of glasses for near objects, it will be necessary to determine the range of accommodation. For this purpose, we may make use of the method already given; that is, we first find the nearest and furthest point at which No. 1 of the test types can be clearly distinguished, and then deduct one from the other, according to the formula

$$\frac{1}{A}=\frac{1}{P}-\frac{1}{R}.$$

For example, suppose the far point is at eight and the near point at two inches; then we have

$$\frac{1}{A}=\frac{1}{2}-\frac{1}{8}=\frac{1}{2\frac{2}{3}}$$

But this method is less certain than that of Prof. Donders, which only requires the patient to accommodate for his far point. Having first neutralized the myopia, which is done by using such concave glasses as render distant objects distinct (No. 20 at twenty feet), the near point is ascertained by requiring the patient to read No. 1 of the test types. Suppose this point is found to be at three inches; then, as $r=\infty$, and $p=3''$, we have

$$\frac{1}{A}=\frac{1}{3}-\frac{1}{\infty}=\frac{1}{3}.$$

If only one pair of glasses is used, it is safest to wear those which do not quite neutralize the myopia. If of full strength they will be too strong for near vision, and will be likely to overtask the accommodation. To prevent this, the confirmed myope generally employs only one eye for near ob-

jects, and thus avoids the convergence of the optic axes required in binocular vision. But this leads insensibly to a still greater evil, namely, divergent strabismus, which is found to be of very frequent occurrence in myopia. We should be careful, therefore, to follow the advice of Prof. Donders, and prescribe only "spectacles so weak as to avoid these results."

B.—Hypermetropia.

This affection, the opposite of myopia, was formerly confounded with presbyopia; or, rather, the condition now called hypermetropia was regarded as a particular form of presbyopia. This opinion, however, was erroneous, the refractive power for distant objects being normal in presbyopia, whereas in hypermetropia it is deficient, in consequence of the shortening of the optic axis; hence parallel rays are brought to a focus behind the retina, and only convergent rays come to a focus upon it. And since in this affection even parallel rays require an effort of accommodation to concentrate them upon the retina, it follows that, although hypermetropic eyes may be able to accommodate themselves to distinct vision for a short period, the constant use of them must soon become fatiguing and painful, especially for near objects. In fact, this is often the most obvious symptom in hypermetropic eyes, for while there may be no apparent disease existing, the vision being perfectly good, the eyes are incapable of continued use, especially upon small objects, without causing so much fatigue and confusion of sight as to compel the patient to desist from his employment, (*asthenopia*).

Prof. Donders divides hypermetropia into three forms, namely, the *faculative*, the *relative*, and the *absolute*. The faculative form is that in which the eye readily accommodates itself for all distances, and the patient experiences no fatigue while at work; but presbyopia sets in early, accompanied by

symptoms of asthenopia. In the relative form of hypermetropia, the eye is also enabled to accommodate itself for any distance, but only by great effort, and by a too strong convergence of the optic axes. This form, which generally occurs soon after puberty, is always attended with more or less asthenopia. Absolute hypermetropia, on the contrary, is a form in which no effort of the accommodation will enable the patient to see distinctly, without glasses, at any distance. It generally occurs at a later period in life than either of the preceding forms.

If we examine the hypermetropic eye with the ophthalmoscope, by the direct method, we get an erect image, contrary to what occurs in the myopic eye; for if we fix our attention upon any of the details of the fundus, such as the optic disc or retinal vessels, and move our head to either side, the image is seen to move in the same direction. By the indirect method, the image appears much larger than it does in the emmetropic eye, in consequence of its being formed further from the object lens.

As the asthenopic symptoms depending upon hypermetropia may be cured by the use of spectacles, it is important, in order to select the proper glasses, to ascertain the actual degree of hypermetropia. This is often considerably greater than the manifest hypermetropia, (Hm,) in consequence of a certain amount being rendered latent by the accommodative power, (Hl,) which, as we have seen, is exercised to some extent at all distances. Hence it becomes necessary to paralyze the ciliary muscle by Atropine, before we can estimate correctly the amount of absolute hypermetropia, (Ha). If we then test the vision for distance, we shall find that the patient requires the aid of a convex lens, or if presbyopic, he will require much stronger glasses than he did before the accommodative function was suspended. The power of these glasses being the measure of the absolute hypermetropia, the latter may be expressed by the formula, Ha $= \frac{1}{10.}\ \frac{1}{16.}\ \frac{1}{20.}$ etc.

Having neutralized the hypermetropia by the proper glasses, we may readily ascertain the range of accommodation by measuring the nearest point at which the patient can distinctly read No. 1 of the test types with these glasses. In young individuals, in whom the accommodative power is generally very strong, it often amounts to $\frac{1}{4}$ or even $\frac{1}{8}$.

Hypermetropia is of frequent occurrence in childhood, and is often hereditary. It is generally caused, however, by senile degeneration of the lens, the latter becoming more and more flattened and less susceptible of a change of form by the accommodative power. It may also be caused artificially, by removing the lens from the optic axis, as in operations for cataract. In these cases, the power of accommodation is entirely lost, and the hypermetropia is always absolute.

According to Dr. Cohn, nearly two-thirds of the cases occurring in childhood lead to convergent squint. Later in life it causes accommodative asthenopia. As age increases, the range of accommodation diminishes, and the patient can only see large and remote objects.

TREATMENT.—We have already pointed out the principles to be observed in the selection of the proper convex glasses, the use of which constitutes the only scientific treatment of this affection. They should be prescribed upon the first appearance of asthenopic symptoms. It is important that they should not be too strong. De Wecker recommends the neutralization of the manifest, and about one-fourth of the latent hypermetropia, for near vision; but even these glasses are sometimes found to be too strong for the patient. The only safe rule is, to prescribe glasses which may be used for a length of time without causing any sense of fatigue or pain to the eye. They will generally be found to be glasses of about thirty inches focus.

In order to cure the asthenopia, it will often become necessary, after a few weeks, to change the first pair of glasses for

stronger ones. If the hypermetropia is faculative, the cure is generally soon accomplished, and the glasses may then be dispensed with; but if the hypermetropia is relative or absolute, their use, even for distant vision, will require to be continued.

The main point in treatment is, to relieve, and at the same time strengthen, the power of accommodation. Hence the patient should never attempt to read or work without the aid of glasses, and should always rest the eyes whenever they become weary. He will find it beneficial, also, to follow the advice of Dr. Dyer, and exercise the eyes for a few minutes every day, at stated hours, in reading with proper glasses, gradually increasing the time as the eyes improve, observing at the same time not to overtask the accommodative power.

C.—Astigmatism.

We have hitherto regarded the dioptric apparatus as being perfectly symmetrical, and its different planes as having one and the same focus. But this is not the case even with the normally constructed eye, as it is found that rays entering it in the vertical meridian are generally brought to a focus sooner than those which enter it in the horizontal direction. This variation in the refraction of the eye in different planes, which exists in nearly all eyes, is too slight to exercise any perceptible effect upon vision. But abnormal astigmatism, which generally results from a marked want of symmetry in the curvature of the cornea, makes the refractive power of the eye so unequal, in one or another of its meridians, as to confuse the retinal image and render it more or less indistinct. Similar effects may also be produced by a similar irregularity in the curvature of the lens, but such cases are comparatively rare. Nor is it every case of irregular corneal refraction that is included in our inquiry; for such symptoms as occasionally re-

sult from the cicatrization of corneal ulcers have already been considered. (See Keratitis, etc.)

Regular astigmatism may be either *simple*, *compound* or *mixed*. It is called *simple* when one meridian of the cornea is normal, or emmetropic, and the other myopic or hypermetropic. It is *compound* when both meridians are myopic or hypermetropic, but in different degrees. It is termed *mixed* astigmatism when one meridian is myopic and the other hypermetropic.

One of the most convenient tests of astigmatism is, to have the patient look at the cross-bars of a window, and if he sees either the perpendicular or the horizontal bars more clearly than the others, he is astigmatic. Or he may be examined in a similar manner at different distances with Snellen's large test types, say No. LXX or C, and if a point can be found at which one portion of the letters appear clear and the other portions indistinct, the defect in vision is due to astigmatism; otherwise it must be referred to some other cause.

The readiest method of determining the exact direction of astigmatism, is, to require the patient to look through a stenopaic disc, which consists of a metal plate perforated with a narrow slit. When this slit is held in a proper direction, that is, in a line with the emmetropic meridian of the cornea, the confusion of vision disappears, and the patient can see clearly. The degree of astigmatism may be ascertained by simply placing convex or concave glasses before the slit until we find the number which renders vision most distinct.

TREATMENT.—Stenopaic spectacles will suffice to correct simple astigmatism; but the compound and mixed forms will require convex or concave cylindrical glasses, according as the astigmatism is hypermetropic or myopic. Cylindrical glasses cause no refraction in the plane of their axes, whilst those rays which pass through them at right angles to their axes are refracted most. Hence this line of the lens should be so placed

as to correspond with the line of the greatest astigmatism. Sphero-cylindrical glasses are required for compound astigmatism, one surface being convex- or concave-spherical, to correct the hypermetropia or myopia, and the opposite surface cylindrical to correct the astigmatism. Mixed astigmatism requires bi-cylindrical glasses for its rectification, one side of which is concave, to suit the myopic meridian of the eye, and the other convex, to suit the hypermetropic meridian.

The selection is best made by trial. We first ascertain how much vision can be improved by means of the ordinary convex or concave glasses. We then select a convex- or concave-cylindrical glass of corresponding strength, and rotate it before the eye until its axis is brought into the right direction to correct the astigmatism. If it is found too weak or too strong we try others.

Having ascertained by trial the exact angles which the transverse diameter of the glasses makes with that of the eye, the greatest care should be taken to have them set in precisely the same position in the frames, as the least deviation from the proper plane will lessen or destroy their beneficial effect. For the same reason, spectacles are to be preferred to eye-glasses, the latter being less nicely and less securely adjusted to the eye.

4.—AMBLYOPIA.

Amblyopia is a general name, used to denote any form of blindness not due to optical defect. Hence it embraces hyperæsthesia and anæsthesia of the retina, hemeralopia, or night-blindness, and even amaurosis; though the latter term is sometimes confined to cases of complete or absolute blindness, while the various degrees of impaired vision, except such as arise from anomalous refraction, are included under the term *ambly-*

opia. In addition to the amblyopic affections above mentioned, which will be separately considered, we note two distinct forms, namely, such as are due to functional disturbances of the circulation, and those which seem to depend upon a depraved state of the blood, such as occurs in scarlet or typhus fever. Thus we have what is called *anæmic amblyopia*, from a deficiency of blood. This may originate in any of the causes which give rise to general anæmia, such as excessive hemorrhage, hyper-lactation, etc. *Congestive amblyopia*, on the other hand, generally results from a suppression of some customary discharge, and is due to over-fullness of the vessels of the eye or brain. It is most apt to occur during gestation, amenorrhœa, etc. *Toxæmic amblyopia* is commonly due to the poisonous influence of such agents as tobacco, (*amblyopia nicotiana*), alcohol, (*amblyopia potatorum*), quinine, lead, etc. *Uræmic amblyopia* has already been referred to under the head of nephritic retinitis, (which see). *Transitory amblyopia* sometimes occurs in the course of low diseases, such as diphtheria, scarlatina, typhus fever, etc.; and it may also occur in connection with derangement of the stomach from indigestion, disease of the liver, etc. Finally, we have *traumatic amblyopia*, resulting from concussion, shock, lightning-stroke, etc.

The ophthalmoscope reveals at first no abnormal appearance, unless a slightly hyperæmic condition of the retina and optic nerve is regarded as such; but even this is frequently wanting. Besides, the appearance in question is no greater than is frequently met with in a normal state of vision, and may therefore be regarded as physiological rather than pathological. Subsequently, symptoms of atrophy of the optic nerve make their appearance, and then the disease assumes the character of amaurosis, (which see).

PROGNOSIS.—This will depend chiefly on the nature of the cause, the length of time the disease has existed, and the age, habits, and constitutional condition of the patient. In most

cases progressive atrophy of the optic nerve sooner or later supervenes, and then the vision, although it may not be entirely lost, is seldom capable of being fully restored. Von Græfe founds the prognosis upon the state of the pupil, especially in the transitory form of the affection; for if the pupil reacts under the stimulus of light, he regards the prognosis as favorable, even though all perception of light may have been lost. Cases have occurred, however, in which the pupils have retained their activity, and yet the sight has never returned. This is especially the case with the blindness of pregnancy, many instances of which have terminated unfavorably.

TREATMENT.—The treatment of amblyopia should be chiefly directed to the removal of the cause. Thus, anæmic amblyopia requires a liberal and nutritious diet, exercise in the open air, and such internal remedies as Anac., Ars., Chin., Ferr., Igna., Nux v., Phos. ac., etc. Congestive amblyopia, on the other hand, is most frequently benefited by such remedies as are specially suited to the characteristic symptoms, as, for example, Acon., Puls., and Sep., in menstrual suppression; Bry. and Cimicif., in rheumatic cases; Cactus and Lycop. in heart troubles; Bell., Cact., Gels., Glon., Phos., and Zinc. in hyperæmia of the optic nerve; Nux v., Sec. c. and Zinc. in paralysis of the retina; Bell., Glon., Phos. and Sang., in cerebral congestion, etc. Amblyopia potatorum et nicotiana require the immediate and complete abandonment of the use of spirituous liquors and tobacco, and the internal administration of such remedies as are best calculated to invigorate the general system, especially Ars., Chin., Igna., and Nux v. Amblyopia saturnina has been greatly benefited by Opium. Traumatic cases, and such as result from fright or shock, are best treated with Ars., Coff., Cyp., Hyos., Igna., Scut., etc.

5.—HYPERÆSTHESIA RETINÆ.

SYMPTOMS.—This affection, which is frequently mistaken for inflammation of the retina, is characterized by symptoms of extreme irritation, such as severe photophobia, lachrymation and ciliary neuralgia, accompanied in some cases with spasmodic twitchings of the lids. The irritability of the retina is so intense as to give rise to painful photopsies, even in the dark. These generally take the form of spontaneous flashes of light, accompanied with sensations of dazzling before the eyes; and are greatly aggravated by the least exposure of the eyes to light, or by motion, excitement, exertion, or pressure upon the globe. The sensibility of the retina is so much exalted, that former impressions are manifested for an abnormally long period; and even the power of seeing in the dark (*nyctalopia*), or with an insufficient amount of illumination for normal vision, has in some rare instances been observed. The so-called phosphenes, or luminous rings, such as appear when the globe is firmly pressed, likewise occur, either with or without the dazzling sensations and photophobia. Moreover, the former, like the latter, may appear even in complete darkness. In some cases objects are seen as through a mist, or surrounded by circles of various colors (*chromopsia*).

Examined with the ophthalmoscope, the eye is found to be free from every appearance of disease. The sight is good in a subdued light, but owing to an anæsthetic state of the peripheral portion of the retina, the field of vision is considerably contracted.

ETIOLOGY.—Hyperæsthesia of the retina is most frequently met with in patients of an excitable, nervous temperament, especially young and delicate females. It sometimes arises from irritation or congestion caused by exposure to very bright lights; but the most common cause is straining or over-working the eyes by strong artificial light. It may also result from

a blow or other accident about the eye; but in many cases it can be traced to no apparent cause, unless it be an impaired state of the general health, such as comes from a disturbance of the menstrual function, etc.

TREATMENT.—Blue glasses, which diminish equally all the rays of the spectrum, should be worn as long as the eyes are sensitive and painful, especially in the open air, and when exposed to bright lights. If the photophobia is very severe, it may be necessary for a time to exclude all rays of light from the eyes; but as the irritation subsides we should gradually accustom them to bear the light, which in a mild form is not injurious to the retina.

Internally we should prescribe such remedies as will benefit the general health, and at the same time ameliorate the local symptoms. We have generally obtained the best results from Bell., Cimicif., Con., Gels., Merc., Nux v. and Puls,; but have also derived benefit, in suitable cases, from Chin., Hep., Igna., Nat. m., Sulph., and Tart. em.

6.—ANÆSTHESIA RETINÆ.

This condition, which consists in a diminished excitability of the retina, is unattended by any objective symptoms. It is chiefly characterized by the very feeble impression which moderate degrees of illumination make upon the eye; and seems to arise from the blinding effect of intense light upon the nerve elements of the retina, whereby the latter appears to lose, to some extent, its power of responding to the stimulating effects of ordinary degrees of light. One of the most common forms of the affection, *snow-blindness*, is characterized by a dimness of vision which lasts as long as the affected eyes remain exposed to the dazzling reflection of the bright sunlight upon the snow or ice.

Partial anæsthesia generally results from direct or reflected sunlight, or other strong light, acting suddenly or continuously upon the retina; and usually takes the form of a dark cloud in the centre of the field of vision. This cloud is often temporary, lasting but a few hours; but it may continue for several weeks or months, and then, if circumstances favor, gradually clear up and disappear. When confined to the periphery of the retina, the visual field is more or less contracted, while the degree of central vision is generally but little, if at all, diminished.

There is a monocular form of anæsthesia, usually called *amblyopia exanopsia*, which results from disuse of the eye, as in strabismus convergens, (which see). It is also frequently associated with paralysis of the accommodative function. It is generally confined to the central portion of the visual field, and this will commonly serve to distinguish it from other pathogenetic forms of anæsthesia, in which the periphery is mostly involved.

TREATMENT.—This should consist in attention to the general health, regular exercise in the open air, rest and protection of the eyes, and the internal administration of Igna., Nux v., Sec. c., and Zinc.

7.—HEMERALOPIA.

NIGHT-BLINDNESS.

SYMPTOMS.—Hemeralopia is characterized by a state of vision in which the patient sees well during the early part of the day, or when objects are brightly illuminated, but imperfectly towards night. In high grades of the affection, the patient is unable to distinguish even large objects towards the close of the day. This is not simply owing to the time of day, as was formerly supposed, but chiefly to the diminished intensity of the light; for it is observed that, *cæteris paribus*,

the degree of amblyopia corresponds with the amount of illumination, the patient being able to see even at night, provided the artificial light is sufficiently bright. It is true, however, that the patient can always see best in the morning; but this may be accounted for, in part, by the reinforcement, so to speak, of the retinal sensibility during the night. It appears, therefore, that the dimness of vision is due to torpor of the retina; an abnormally great amount of light being required in order to see distinctly.

In the morning, or when there is sufficient illumination to see clearly, the pupil is generally of normal size and mobility; but as night approaches, and the illumination decreases, it usually becomes dilated and sluggish. In old and severe cases, however, the pupil is always enlarged and torpid, and it requires the stimulus of a very strong light to excite contraction.

Hemeralopia is not always equally developed in both eyes, the patient being able sometimes to discern objects with one eye and not with the other; or perhaps some parts of the visual field may be clouded over, while in the other eye it may be clear, and admit of a certain degree of indirect vision.

ETIOLOGY.—The chief predisposing cause of this affection is an impoverished state of the blood, in consequence of which the nerve elements of the retina are insufficiently nourished. This accounts for the fact that soldiers and sailors suffering from scorbutic diseases, are especially prone to be affected with the disease. We also find that by far the largest number of hemeralopes are individuals whose constitutions have become impaired by severe illness, or whose general condition is one of debility. It is likewise owing to this cause, doubtless, that the disease sometimes prevails epidemically in camps, jails, poverty-stricken fever-districts, etc.

The principal exciting cause of night-blindness is prolonged exposure to intense and unaccustomed light. Hence its frequent occurrence in the spring and summer, increasing

in clear, and diminishing in cloudy weather. Hence, also, its frequent appearance amongst harvest hands, soldiers who exercise much in the sunlight, and sailors who are similarly exposed within the tropics.

TREATMENT.—The chief indications are, to restore the general health, and protect the eyes from bright light. If the case is very severe, or very chronic, the speediest way to effect a cure is, to apply a binocular bandage, or else confine the patient in a dark room, and feed him with the most nourishing and easily-digestible food, soups, etc. In this way, protracted cases have been cured in a very few days.

Internally, the following remedies, which have given great relief in some cases, may be prescribed, the selection depending mainly upon the general condition of the patient:—Arg. nit., Chin., Hyos., Lyco., Ranun. bulb., Stram., and Sulph.

8.—AMAUROSIS.

The term *Amaurosis* was formerly used to denote any impairment or loss of vision depending upon congestive, inflammatory, organic, or functional disease of the nervous apparatus of the eye, whether seated in the retina, optic nerve, or brain. At present its signification is more restricted, the term being mostly confined to cases depending upon degenerative atrophy of the optic nerve, while those arising from irregularities in the circulation of the nervous system, are included under the head of amblyopia, (which see). Amaurosis therefore differs from other amblyopic affections in being both functional and organic.

SYMPTOMS.—The only characteristic symptoms of amaurosis are ophthalmoscopic. Of these, the most marked are: a faint, white or bluish-white appearance of the papilla; an absence, or diminution in the size of the nutritive vessels of the disc; a contraction and attenuation

of the retinal vessels, especially the arteries; and an opaque, somewhat irregular but sharply defined optic disc, which is often slightly excavated. The amaurotic excavation is liable to be mistaken for the physiological excavation, which is congenital and frequently seen in the normal eye, unless we bear in mind that in the latter the other symptoms of atrophy above-mentioned are absent, the optic nerve being in its normal state. In the amaurotic excavation, the retinal vessels are never displaced, as in glaucoma, the cavity being so shallow, and its edges sloped so gradually, that the vessels appear to pass over a nearly level surface. In many cases of spinal amaurosis, a bluish, or bluish-green discoloration of the papilla is especially marked, and is best seen by the direct method of examination. In other cases the disc appears pale and white, sometimes as white as paper. This is particularly the case in the form of cerebral amaurosis caused by the excessive use of tobacco. In the first stage of the tobacco amaurosis, which is one of congestion and very transitory, the disc is abnormally red; this is followed by pallor of the outer half, or the part nearest the macula lutea; finally, the whole disc becomes pale, white, and in an advanced state of atrophy. These changes all occur within a few months, during which the sight becomes progressively impaired, and often extinct.

ETIOLOGY. - The most frequent cause of amaurosis is basilar meningitis, especially the chronic form. It may also be produced by chronic periostitis at the base of the brain, or by tumors within the brain or cerebellum. Other causes are: cerebral hemorrhages, epilepsy, and diseases of the spinal cord, especially chronic myelitis and locomotor ataxy.

PROGNOSIS.—This will depend mainly upon the cause, the mode of attack, the state of the field of vision, and the condition of the optic nerve. All cases, of course, are serious, and should be considered more or less doubtful; hence the

prognosis should always be guarded. Sudden attacks are generally less unfavorable than the more gradual, especially in the case of children. Cases that remain stationary for a considerable period are also hopeful, as they usually depend upon causes which are removable, or which are more or less amenable to treatment, such as the too free use of alcohol or tobacco, or some disorder of the stomach, liver, or uterine system, etc. So, also, if the visual field remains uncontracted for a considerable time after the disease sets in, or if the edges of the field are regular and well-defined, the prognosis is not altogether bad. On the other hand, irregular contractions, occurring rapidly in both eyes,are very unfavorable ; and so, also, are central scotomata, especially if the peripheral portions of the field are likewise affected. Although the appearance of the optic nerve is not sufficient of itself to determine the result, yet atropic changes in it are always of serious import, and, in most cases, render the prognosis very unpromising.

TREATMENT.—These cases will generally tax the skill of the practitioner to the utmost. To be successful even in a small proportion of cases, he will need to pay particular attention to the cause, and to select his remedies with the greatest care. The hints and indications given under the head of Amblyopia, are no less appropriate to the treatment of Amaurosis, and will be suggestive. In addition to electricity and the hypodermic injection of Strychnia, both of which have been used with benefit, the following remedies, which have proven successful in some cases, should be carefully studied :—Acon., Ars., Bell., Calc. c., Cimicif., Crotal., Gels., Glon., Hep., Igna., Lycop., Merc., Nat. m., Nux v., Phos., Puls., Ruta g., Sant., Sec. c., Sep., Sulph., Zinc.

9.—MYDRIASIS.

ABNORMAL DILATATION OF THE PUPIL.

SYMPTOMS.—This is a functional disease of the iris, characterized by an abnormal dilatation and immobility of the pupil. As slight degrees of dilatation seldom produce any special inconvenience, they are not apt to attract attention; and hence the term is only applied to those cases in which the dilatation is well marked. The pupil is not always regular, the opening being sometimes greater in one direction than in another. Whatever may be its shape and size, the pupil is generally more or less fixed, varying but little, if at all under the stimulus of light, or from use. It is also less black than the normal pupil, in consequence of the increased illumination of the fundus. The affection is generally confined to one eye.

Vision is commonly more or less impaired, especially for near objects. This arises partly from glare or dazzling, in consequence of the dilated state of the pupil, and partly from the circles of dispersion formed upon the retina, in consequence of the loss of accommodation. The latter, however, is not always present, nor is there any fixed or necessary relation between it and the degree of dilatation; for this may be extreme and the ciliary muscle but little affected, and, on the other hand, if the mydriasis is but slight, the power of accommodation may remain unimpaired.

ETIOLOGY.—The causes of mydriasis, though numerous, may be reduced to a very few heads. When binocular, the disorder is due to some deep-seated intra-ocular disease affecting the sensibility of the retina, or to certain diseases of the brain, such as basilar meningitis, apoplectic effusions at the base of the brain, chronic hydrocephalus, and diseases of the cerebellum. In the great majority of cases, however, the my-

driasis is monocular, and is caused either by spasm of the dilator pupillæ and of the vessels of the iris, arising from irritation of the oculo-pupillary branches of the sympathetic nerve—in which case the ciliary muscle, and consequently the power of accommodation, remains unaffected—or else it depends upon paralysis of the constrictor pupillæ, in consequence of injury to the conducting power of the third nerve. In these cases there is often more or less paralysis of the accommodation, and in some instances the entire region supplied by this nerve is implicated, and then it is generally considered to be of rheumatic origin. In some cases, however, it is undoubtedly syphilitic. When due to irritation of the sympathetic ganglia, it can sometimes be traced to helminthiasis, spinal irritation, derangement of the digestive organs, etc. To the same class, also, belongs the ephemeral mydriasis which has been observed only at certain hours of the day, and which, as pointed out by Von Græfe, is sometimes premonitory of insanity.

TREATMENT.—This should be especially directed to the removal of the cause; for although Atropine, Bell., and other mydriatic remedies are homœopathic to the condition of the iris, they cannot be expected to prove curative unless the cause itself be removed. Hence, rheumatic cases call for such remedies as Bry., Cimicif., Colch., Rhus., etc.; syphilitic cases for Merc., Kali iod.; traumatic cases, Arnica; helminthiasis, Sant.; paralysis, Nux v., Rhus., etc. When associated with paralysis, the treatment should generally be similar to that recommended for paralysis of the ocular muscles, (which see).

10.—MYOSIS.

ABNORMAL CONTRACTION OF THE PUPIL.

SYMPTOMS.—This affection, the opposite of mydriasis, is characterized by extreme contraction of the pupil, which is sometimes reduced to the size of a pin's head, and even less.

The pupil is regular in form, black, extremely limited and sluggish in its movements, and yields but slightly to the influence of Atropine.

Vision is generally impaired in proportion to the degree of contraction, the field of vision being greatly diminished and but feebly illuminated. In some cases the patient can see only during the middle hours of the day; in other cases he may be almost totally blind.

ETIOLOGY.—Myosis may be due to paralysis of the radiating fibres of the iris, or to spasm of the constrictor pupillæ. The former is most frequently met with in disease or injury of the cervical portion of the spinal cord; the latter in iritis and inflammations accompanied by great irritation of the ciliary nerves. It may also be caused by too great and long continued use of the eyes in the examination of very small objects, as in watch-making, engraving, etc.

TREATMENT.—As this disease is very rarely idiopathic, the treatment, to be effective, should be especially directed towards the removal of the cause. Simple idiopathic cases would probably be benefited by such remedies as Opium, Physostigma ven., etc.

11.—PARALYSIS OF THE OCULAR MUSCLES.

SYMPTOMS.—The symptoms vary according as the paralysis is complete or partial; that is, according as it affects all or only a part of the muscles supplied by a particular nerve. Most frequently the affection is limited to the muscles furnished by the third nerve, or motor oculi, namely, the rectus superior, inferior, and internus. If the paralysis is complete, we have, in the first place, *ptosis*, or dropping of the upper lid, while the motion of the globe is restricted in the upward, downward, and inward directions; but as the rectus externus still retains its power, the eye is readily turned towards the temple,

and may also be rolled somewhat downward and outward, through the action of the superior oblique. Subsequently, the sixth nerve generally becomes affected, and then the paralysis extends to the rectus externus. In this case the eye can no longer be turned towards the temple, but looks directly forward. Occasionally the fourth nerve becomes implicated, and gives rise to paralysis of the superior oblique.

Diplopia, or double vision, is a very annoying symptom in these cases, and is sometimes the only one of which the patient complains. This symptom is always experienced when the patient endeavors to look in the direction opposite to that assumed by the affected eye. Thus, in paralysis of the superior rectus, the inferior oblique muscle will cause the eye to deviate outward, and crossed double images will appear in the upper half of the field of vision. On the other hand, if the paralysis affect the superior oblique, the deviation of the visual line will be but slight, the double images will be homonymous—that is, on the same side—and will be confined to the lower half of the visual field.

ETIOLOGY.—Paralysis of the ocular muscles is most frequently found to be due to syphilis. Von Græfe refers nearly one-third of all cases to this cause. Many cases, however, are of rheumatic origin, or arise simply from exposure to damp and cold. Others, again, may be produced by some centrally acting cause, such as cerebral hyperæmia, effusion of blood, softening of the brain, hydrocephalus, etc. Occasionally, also, syphilitic nodes, tuberculous deposits, and tumors of various kinds, are so situated at the base of the brain, or within the orbit or cranium, as to press injuriously upon the affected nerves, and thus cause paralysis of the muscles to which they are respectively distributed.

TREATMENT.—Recent cases, especially those of a rheumatic or syphilitic nature, are found to be the most amenable to treatment. Bry., Caust., Cimicif., Euphr., and Rhus, are

generally indicated in the former, and Aurum, Kali iod., and Merc., in the latter. Of these, Causticum is the one most frequently and successfully employed, especially where the paralysis is caused by exposure to cold. The following remedies have also been recommended in particular cases :—Arnica for paralysis resulting from a blow or other injury ; Cup. acet. for paralysis of the nervus abducentis ; Senega for paresis of the superior rectus or superior oblique, especially when the diplopia is relieved by bending the head backwards ; and Spigelia when accompanied with sharp, stabbing pains. Alum., Con., Gels., Hyos., Igna., Nux v., Phos., and a few other remedies, have also been employed with advantage, when indicated by constitutional or other general symptoms, but not so frequently as those above mentioned.

Galvanic electricity has relieved a large number of cases, and may often be advantageously associated with internal treatment. According to Benedict, who cured no less than seventeen out of twenty-seven cases by galvanization, the curative action takes place, not by the direct excitation of the paralysed nerve, but by a reflex irritation through the fifth nerve. The same authority states, that in most cases a curative action is only observed when the galvanic current is relatively weak.

Prismatic glasses are sometimes used to neutralize the diplopia, by making the double images to coincide. They may also be used therapeutically, by adapting them to the eye in such a manner as merely to approximate the images, the paralyzed muscles being benefited by the efforts to unite them.

If all other means fail, and the affected muscle is not too much disabled to be incapable of producing the requisite degree of contraction, the abnormal direction of the eye may sometimes be remedied by tenotomy of the opposing muscle, as described under the head of Strabismus, (which see).

12.—NYSTAGMUS.

This affection consists in a tremulous or oscillatory movement of the eye-balls. The oscillations, which are involuntary and exceedingly rapid, vary in direction, being either horizontal, oblique, or rotatory. In most cases the movements occur simultaneously in both eyes, and in the same direction; but sometimes they take place alternately, and in different directions. The oscillations are not generally perceptible to the patient, nor do they prevent his seeing objects in their true relations; but they always impair the sight, rendering the retinal images more or less confused, in proportion to the severity and extent of the movements. It is also observed that, although the eyes appear to act in concert, and the movements take place simultaneously, the condition of the sight is often very different in the two eyes, and binocular vision is more or less disturbed. It is especially difficult for the patient to obtain a correct view of small objects, and even large ones, if numerous, or in a state of motion, may produce confusion and uncertainty. This is remedied to some extent by a habit which the patient acquires of involuntarily and unconsciously moving his head in a contrary direction to the movements of his eyes, by which he is often enabled to keep the visual axes fixed upon the object under examination.

ETIOLOGY.—The chief cause of nystagmus appears to be, over exertion of the ocular muscles in maintaining the necessary convergence of the optic axes for very near vision. This over-taxing of the external muscles is generally produced by holding objects very near the eyes, in cases of myopia, central and other partial cataracts, opacities of the cornea, strabismus, functional diseases of the optic nerve and retina, etc.

TREATMENT.—As nystagmus usually sets in during infancy, there is some chance for it to diminish or disappear in

after life; but as a general rule it undergoes but little change or improvement, even under the most suitable treatment. This is due, no doubt, to the fact that a cure can only be effected by restoring acuteness of vision to the diseased eyes, and this is seldom possible in this class of cases. But good results are sometimes obtained by diminishing or neutralizing the impairment of vision, correcting errors of refraction, and employing the eyes in such occupations as will avoid all straining of the ocular muscles. We may also derive benefit in some cases from the internal use of Agar., Calab., Hyos., Igna., Kali brom., Nux v., Puls., and Sant.

12.—STRABISMUS.

Although the various forms of squint and their surgical treatment have been long known to the profession, yet it has been only within a comparatively recent period that our present more accurate knowledge of the pathology of strabismus, the result of a careful re-investigation of the whole subject, has been obtained. To Prof. Donders, especially, the profession are indebted for the first correct view of its nature, and of the intimate relations which it sustains to the eye as an organ of vision. He has clearly shown that, in the beginning, it is in most instances only a symptom resulting from certain conditions of refraction; but that after it has once become established it frequently proves highly injurious to vision, and may even lead to its entire destruction. We are also indebted to his investigations for our knowledge of the highly important fact, that one form of strabismus frequently depends upon myopia, and the opposite form upon hypermetropia.

By the term *squint*, or strabismus, (*strabismus concomitans*) we understand an inability to direct both visual lines simultaneously upon the same point. If the eye squints inward it is called convergent strabismus; if outward, divergent strabis-

mus; if the deviation is upward, it is called strabismus sursumvergens; if downwards, strabismus deorsumvergens. If confined to one eye it is monocular or monolateral; if it alternates between the two eyes it is alternating or bilateral.

Strabismus is also divided into real and apparent, periodic and permanent. Apparent strabismus is a form in which, though there is a well marked convergent or divergent deviation of the optic axis, as in real squint, both eyes are nevertheless fixed upon the object, and neither of them undergo the slightest movement when the other is closed. Periodic squint is occasionally merely a reflex symptom, as in dentition, but generally its pathology is the same as that of confirmed strabismus, of which it is usually but the forerunner.

A.—Convergent Strabismus.

As already defined, convergent strabismus is characterized by excessive convergence of the visual lines. The convergence takes place only during binocular vision; for if the more healthy eye is screened, the squinting eye changes its position and looks forward. This also proves that the squinting eye is but little concerned in ordinary vision. In these cases, if the squinting eye is covered, the more healthy one will be found to squint. This is called the secondary squint, and is generally equal to that of the eye chiefly affected; but in confirmed strabismus it is usually more difficult for the squinting eye to direct its visual line towards a given point than it is for the other. In paralytic squint, on the contrary, the secondary deviation is the greater. This serves as a ready means of distinguishing it from concomitant squint, in which, as we have seen, the primary and secondary movements are equal.

The extent of the squint may be determined with sufficient exactness by first marking upon the lower lid the precise situation of the pupil or edge of the cornea, when the squinting eye is turned strongly inward or outward, and then, having cover-

ed the healthy eye and fixed the other upon some convenient object, measuring the distance between their present and former position.

Convergent squint is generally due to hypermetropia. The latter is found to be present in about eighty per cent. of the cases of convergent strabismus. The reason it is so often overlooked in these cases is, doubtless, because the majority of the patients are too young to read. This will also account for the fact that periodic squint generally first appears at about the fourth or fifth year, or when the child is learning to read and spell. The explanation is this: In the hypermetropic eye the refractive power is too low, parallel rays reaching the retina before being focused, thus creating circles of dispersion upon that membrane, and thereby rendering the vision indistinct. To remedy this defect, the hypermetropic eye is obliged to accommodate for distance, just as the normal or emmetropic eye does for near objects. And since near vision requires a still greater strain of the accommodation, the accommodative faculty, which in hypermetropic eyes is never at rest, is soon over-worked. In order to lessen the strain, and at the same time increase the power of accommodation, one eye squints inward. At first it is periodic, occurring only when viewing near objects; but as the habit becomes confirmed it becomes more and more frequent, and finally it takes place at all distances, and the strabismus becomes permanent. It is not surprising, therefore, that hypermetropia should be a frequent cause of convergent squint. The only wonder is that it does not occur more frequently amongst hypermetropes than it does. Prof. Donders thinks it arises from an effort to avoid double vision; for if one eye of a hypermetrope is screened, it will soon turn inward when the other is fixed upon near objects. On the other hand, if the degree of hypermetropia is greater in one eye than in the other, or if, in consequence of opacity, the defect of vision is greater, the tendency to squint is

increased, the annoyance from diplopia being no longer sufficient to prevent it. In fact, next to hypermetropia, no more frequent cause of strabismus is known, than impaired vision. It is often seen in cases of opacity of the cornea and lens, or in some affection of the deeper structures of the eye in which the retinal image is rendered indistinct. In order to avoid the confusion resulting from the difference in the visual power of the two eyes, the patient involuntarily squints with the diseased or more defective eye. The strabismus soon becomes confirmed, and finally amblyopia from non-use of the eye is added to the defect of vision already existing. It should not be forgotten, however, that in many of these cases hypermetropia is also present, and may constitute the chief cause of the complaint.

B.—Divergent Strabismus.

As convergent strabismus is generally associated with hypermetropia, so divergent squint is most frequently met with in connection with myopia. And as the latter is most marked at a later period of life than the former, so divergent strabismus generally occurs later, not manifesting itself in some cases until after the formation of extensive posterior staphyloma. In fact, this is the chief reason that myopes are so frequently subject to divergent strabismus. For, as we have seen, the elongation of the antero-posterior diameter of the globe in myopic eyes, is due in a great measure to the yielding of the posterior portion of the globe, which gives it more or less of an ellipsoidal shape. In consequence of this extension, the mobility of the globe is diminished, and the difficulty of rotating it in the orbital cavity is correspondingly increased. Now, as myopic vision requires a very great convergence of the optic axes, and as this is rendered impossible by reason of the ovoidal shape of the globe, it follows that binocular

vision for near objects cannot be maintained without extreme exertion. The internal recti muscles soon become fatigued in the attempt to maintain the necessary inclination of the optic axes, and so to relieve the muscular weariness, and the asthenopic symptoms arising from the strong efforts at accommodation, one eye is allowed to diverge, giving rise to one of the most common forms of divergent strabismus. But Prof. Donders has shown that divergent squint may also be produced whenever the degree of myopia becomes so excessive as to require too great a convergence of the optic axes for distinct vision, or in other words, whenever objects have to be brought so close to the eyes that the requisite amount of convergence for clear vision cannot be obtained. This is most likely to happen if the internal recti muscles are relatively weak. Divergent squint is also apt to occur if one eye is amblyopic, or more myopic than the other, the diseased eye deviating outward, in consequence of the patient relinquishing all effort at binocular vision. This form of relative divergence may therefore be denominated passive.

TREATMENT OF STRABISMUS.

This will differ according as the squint is either paralytic or concomitant, convergent or divergent, periodic or permanent. If dependent on nervous irritation, the removal of the primary disease will be required. Thus, squint arising from dentition is best treated by such remedies as Acon., Bell., Cham., Coff., etc. If dependent on verminous affections, we should give Cina, Cyclamen, Merc., Sant., Sep., Spig., Sulph., etc. Pertussis calls for such remedies as Bell., Cast., Cin., Cupr., Dros., Phos., Verat., etc. When produced by spasm and convulsions, we may give Agar., Bell., Cic., Cycla., Hyos., Stram., Tabac., etc.

Recent cases depending on hypermetropia or myopia may be frequently corrected by using suitable convex or concave

glasses, so as to neutralize the errors of refraction. If this is not done, the squint will soon become permanent, and then tenotomy of the affected muscle will be required.

As true concomitant squint, when confirmed, can only be cured by an operation, the surgeon cannot insist too strongly on its early performance, more especially as the neglect to perform it has, in thousands of instances, resulted in the loss of sight. The operation consists in dividing the tendon of the muscle in whose direction the squint occurs, thus permitting it to recede slightly, so that it may reattach itself somewhat further back. As the pain is severe, nervous persons and children will require to be anæsthetized. Then, having separated the lids by the stop-speculum, (Pl. II, Fig. 33), an assistant, if the case is one of convergent strabismus, turns the globe outwards with a pair of fixing forceps, (Figs. 36, 37); and the surgeon, seizing a small fold of the conjunctiva with a pair of delicate forceps near the lower margin of the insertion of the internal rectus, snips it through with the scissors, being careful to make the incision small, so as to obtain, as nearly as possible, the advantages of a sub-conjunctival operation. Having separated, to a limited extent, the sub-conjunctival tissue from the muscle, the surgeon now inserts the strabismus hook (Pl. I, Fig. 17), beneath the tendon, to hold it and raise it from the globe, and it is then carefully divided close to its insertion in the sclerotic, unless we desire to increase the effect to be produced, when the division may be made farther back; but, on the other hand, if we desire to limit the effect of the operation, the edges of the external wound should be brought together with a suture. It was formerly the practice in cases requiring only a slight degree of correction, say of from one to one and a half lines, to sever the tendon only partially, leaving a few of the upper or lower fibres undivided; but this is not found to answer the purpose.

Owing to the great change in the form of the globe, and

the consequent difficulty experienced by the internal recti in overcoming the deviation, after section of the external rectus for divergent strabismus, it is frequently desirable to keep the eye in a position of forced inversion, until the rectus externus has acquired a new union with the globe at a point further back than would be the case if left to itself. This may be accomplished by passing a suture through the conjunctiva near the inner edge of the cornea, and then attaching it to the skin near the inner canthus. The suture will cut itself out in the course of two or three days, but if the patient is careful not to make undue traction upon it, it will not do so until after the muscle has formed the requisite attachment.

The question as to whether we should operate upon one or both eyes does not depend upon whether or not both eyes are affected with squint, but solely upon its extent. It is found by experience that a deviation of from two and a half to three lines is all that can be overcome by a single operation; and therefore if the deviation exceeds this amount, we should divide it between the two eyes, assigning the greater amount of correction to the squinting eye, in order to diminish as far as possible the muscular effort.

After the strabismus has been rectified by division of the muscle, if there is any coexisting hypermetropia or myopia, it should be immediately neutralized by the proper convex or concave glasses, as already explained under the head of anomalies of refraction. This is necessary in order to secure binocular vision, to prevent a recurrence of the deformity, and to overcome the amblyopia due to the long disuse of the eye. The amblyopia is often greatly improved after the operation, especially if the sight is exercised with strong and suitable glasses.

14.—EXOPHTHALMIC BRONCHOCELE.

MORBUS BASEDOWII, GRAVES' DISEASE, ETC.

SYMPTOMS.—This disease, the pathology of which is not well understood, is characterized by certain functional disturbances of the circulation, which give rise to violent palpitations of the heart, bronchocele, and exophthalmos. The palpitations, and other cardiac symptoms, generally occur in paroxysms, and are usually accompanied by more or less nervous excitement and dyspnœa. At first the patient may complain only of weariness and exhaustion; but the breathing is almost always difficult; the mucous membranes are pale and anæmic, especially the conjunctivæ; digestion is apt to be more or less disturbed; and, if we notice particularly, we may observe a peculiar staring expression about the eyes. As the disease progresses, the hearts' action becomes strong and tumultuous, and is accompanied by loud systolic murmurs; the paroxysms of dyspnœa increase in severity and frequency, during which the vessels of the neck frequently beat with great violence; the pulse, which previously was large, full, and perhaps not more than 80 or 100 per minute, now ranges from 120 to 150, and is irritable and jerking; the thyroid gland becomes enlarged; the exophthalmos increases, so that the lids no longer cover the globes; the stomach becomes still more disturbed, and the debility more marked; and, as the disease reaches its height, the respiration becomes shorter, more accelerated, and frequently orthopnœic. Some of these symptoms, however, are not always present, especially those connected with derangement of the stomach. On the other hand, the digestive troubles may become still more pronounced, giving rise to dyspepsia, severe

and even bloody vomiting, diarrhœa, hemorrhage from the bowels, etc.

Bronchocele is generally, but not always present in Basedow's disease. An interesting case of this kind has been reported by Dr. J. E. Morrison. The patient was a woman, aged 33, of nervous temperament, inclined to hysteria; menses "interrupted" since the third month after their first appearance. The catamenia usually appeared in the morning and flowed until noon, then suddenly ceased, or they would last from half an hour to six hours, intermitting in this manner for ten or twelve days. During the menstrual period there was active congestion of the genital organs, with puffiness of the parts on and around the pubis and vulva, exophthalmos, and forcible and tumultuous action of the heart, which could be heard several feet from the bed.

The exophthalmos is generally binocular, but does not usually become very manifest until some time after the appearance of the cardiac symptoms and goitre. Like the latter it often varies considerably, especially during the first stage, sometimes almost disappearing, at others becoming so considerable that the lids cannot be closed. The protrusion of the globe, which, as well as the swelling of the thyroid gland, has been found to depend upon a dilatation of the vessels, particularly of the veins,—generally occurs in an oblique direction, and most frequently towards the inner or nasal side. In consequence of the long-continued exposure of the cornea to atmospheric and other irritating influences, the epithelial layers become dry and rough, the xerosis increasing with the degree and duration of the exophthalmos. Sometimes, also, ulcerations of the cornea occur, which if unchecked may even lead to perforation, and, finally, to atrophy of the globe. At the same time the lids and conjunctivæ become more or less swollen and inflamed, and in some cases there are disturbances of vision; but the latter are generally caused by the coexisting

xerosis, dilatation of the pupil, etc., and very rarely by real amblyopia or amaurosis.

PATHOLOGY.—As already stated, the exopthalmos is found to be due, in the first place, to a hyperæmic swelling of the adipose cellular tissue of the orbit, which afterwards becomes more or less hypertrophied. This swelling, which may generally be diminished by pressure, is said by Virchow to rapidly disappear after death. But the true nature of the disease, and the relation which the cardiac affection sustains to the bronchocele and exopthalmos, are still involved in much obscurity and doubt. Some have referred the disease to anæmia; but anæmia, even when it gives rise to palpitations and cardiac murmurs, is not generally associated with goitre and exophthalmos, nor do these affections produce anæmia. Others, again, have attributed the protrusion of the eyes to the pressure of the enlarged gland upon the cervical vessels; but, as we have seen, the disease may occur without any enlargement of the thyroid, and on the other hand very large bronchoceles exist without any exophthalmos. The most rational and generally received theory is that which refers the disease to functional disturbances of the central parts of the sympathetic nerve. Not only do the general symptoms point to disturbances of the vaso-motor centres, but the almost numberless complications of the disease, many of which are of an extremely variable and transient character, appear strongly to confirm this view of its origin.

ETIOLOGY.—The disease is generally less severe, occurs at an earlier period, and much more frequently, in women than in men. It is often associated with disturbances of the uterine functions, especially chlorosis, menstrual suppression, etc, or with some cutaneous neurosis, such as urticaria. It has also been caused by great mental depression, sudden fright, severe bodily exercise, hemorrhages, and other debilitating influences.

PROGNOSIS.—This should always be guarded, especially

in the case of males, in whom the symptoms are usually more severe and more permanent. The disease is generally slow in its progress, especially during the first stage, or before the appearance of the goitre and exophthalmos. The symptoms frequently abate, or become less frequent; but relapses often occur, and lead sooner or later to faulty nutrition, and in some cases to death. Complete recovery is unusual, occurring only in about one third of the cases. As a general rule the function of the retina remains unimpaired.

TREATMENT.—Dr. Morrison's case, above-mentioned, was cured by the internal administration of Lycopus virg., a remedy which would seem from its provings to be pre-eminently adapted to the disorder. Cures, or beneficial results, are also said to have followed the use of Amyl nit., Brom., Cact., Fer., Iod.,* Spong., Nat. m., and Bary. c; the Amyl nit., being used by olfaction alone. Other remedies which deserve attention are:—Bell., Calc., China, Cimicif., Dig., Gels., Plat., Puls., Sep., Sil., and Sulph.

Galvanic electricity, applied to the sympathetic nerve, has been employed with good success in many cases, especially in curing the goitre and exophthalmos, and also in improving the general health. This agent is also highly useful in regulating the menstrual function, upon the disturbance of which many of these cases measurably depend.

DIET AND REGIMEN.—Experience shows that whatever tends to invigorate the general system and improve the health, usually exerts a beneficial influence upon the disease. Hence, the patient should abstain from the use of stimulants, take regular but gentle exercise in the open air, make use of a plain, but liberal, nutritious, and easily digestible diet, and, avoiding all emotional or other excitement, enjoy as much quiet cheerfulness as circumstances will permit.

* See *Am. Hom. Obs.*, vol. xiii, p. 603.

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